

BUREAU OF WATER

—
ANNUAL REPORT

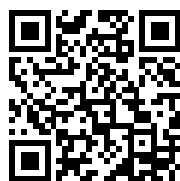
PHILADELPHIA

—
1891.

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Engineering Water

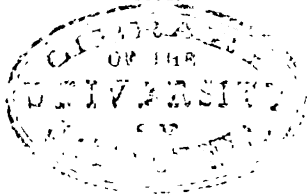
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NINTIETH ANNUAL REPORT
OF THE
BUREAU OF WATER,
For the year ending December 31, 1891,
AND
FIRST ANNUAL MESSAGE
OF
EDWIN S. STUART,
Mayor of the City of Philadelphia,
WITH
ANNUAL REPORT
OF
JAMES H. WINDRIM,
Director of the Department of Public Works,
ISSUED BY THE CITY OF PHILADELPHIA, 1892.

1892.

PHILADELPHIA:
DUNLAP & CLARKE, PRINTERS & BINDERS, Nos. 1306-8-10 FILBERT ST.
1892.



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FIRST

ANNUAL MESSAGE.

OFFICE OF THE MAYOR, CITY HALL.

Philadelphia, April 4, 1892.

TO THE SELECT AND COMMON COUNCILS
OF THE CITY OF PHILADELPHIA.

GENTLEMEN:—In accordance with the Act of Assembly approved June 1, 1885, entitled “An Act to provide for the better government of Cities of the first class in this Commonwealth,” I have the honor to herewith transmit to your Honorable Bodies my First Annual Message upon the finances and general condition of the affairs of the City.

On Monday, April 6, 1891, I took the oath and assumed the office of Mayor of the City of Philadelphia, and thereupon appointed Mr. George Roney, Director of the Department of Public Safety, and Mr. James H. Windrim, Director of the Department of Public Works; the President and Members of the Board of Directors of the Department of Charities and Correction having been appointed by my distinguished predecessor for a term of five years, in accordance with the above Act, were continued in office.

On September 4, 1891, Mr. George Roney resigned the office of Director of the Department of Public Safety, and I appointed Mr. John Lamon, the then Superintendent of Police, as Acting Director of the Department, *ad interim*, and on October, 1, 1891, I appointed as the Director the present incumbent, Abraham M. Beitler, Esq.

Finances.

I was met at the very commencement of my term of office with a financial calamity such as none of my predecessors had ever experienced. In consequence the greater part of my first official year has been taken up with complications growing out of the condition of affairs in the Department of City Treasurer, under the incumbency of John Bardsley.

On March 20, 1891, the Keystone National Bank, one of the active depositories of the City, suspended payment and closed its doors, the City having there then on deposit \$141,554.32, this at a time when a Committee of your Honorable Bodies had been in active examination and investigation of the administration of the Department of City Treasurer. The mal-administration of that Department had placed the financial affairs of the City in such a complicated and critical condition, that I deemed it my duty to appoint, under the authority in me vested by Section 1 of the above Act, a Committee of three competent persons to examine the accounts of that Department, and on May 21, 1891, I appointed such a Committee, consisting of Messrs. Taylor Faunce, Lawrence E. Brown and John S. Kuen. On the same day John Bardsley resigned his office. On May 23, 1891, the members of the above Committee made affidavit to the fact that they had discovered a misappropriation of public moneys by John Bardsley, and immediately a warrant was issued; that evening he was placed under arrest, and, subsequently, pleading guilty, was sentenced to imprisonment. On May 8, 1891, the Spring Garden National Bank, which was also a City depository, suspended payment and closed its doors, holding \$148,402.25 of the City's money. On May 26, 1891, Mr. John S. Kuen, one of the members of the above Committee, owing to the pressure of private duties, resigned his position. As his successor, I appointed Thomas W. Barlow, Esq., a member of the Philadelphia Bar, who continued to act until the Committee had completed its labors and made its final report, which final re-

port was transmitted to your Honorable Bodies on October 3, 1891, having been preceded by a number of partial reports transmitted to you when and as received by me during the course of the examination by this Committee.

In my Inaugural Address I stated that if we expected the great improvements we so much desired we must have money, and money in an amount considerably exceeding that which we have had in the past.

On January 1, 1891, the Funded Debt was \$56,579,320.22 ; on January 1, 1892, the Funded Debt was \$56,701,320.22. This indebtedness will be reduced by the payment of \$2,741,500.00 of the six per cent. loan, and of \$400,000.00 of the four per cent. loan that matures this year.

The assessed valuation of property as furnished by the Board of Revision of Taxes, is as follows :

For the year 1892.....	\$735,696,772 00
For the year 1891.....	713,902,842 00
	<hr/>
An increase of.....	\$21,793,930 00

For the year 1891 there was appropriated to the various Municipal Departments \$16,484,027.01, and for this year, \$17,755,202.76, an increase of \$1,271,175.75 ; which is about the average yearly increase during the last ten years.

I had hoped to start upon the second year of my administration with greatly increased appropriations, in order that many of the permanent improvements contemplated by me could have been commenced, but was met with a deficiency from the year 1891 of over one-half of a million of dollars (\$522,645.80). To aid in making up this deficit I had to permit \$373,513.58 to be charged off from the appropriations to the Department of Public Works, for the year 1892 in order that there would not have to be returned to you all the appropriation bills for the year, that they could be scaled down, rearranged to come within the legal limit and be re-appropriated. This deficit in addition to the sum of \$1,015,384.80 which would otherwise have been available for this year, as

follows :—In Keystone National Bank, \$441,554.32 ; in Spring Garden National Bank, \$148,402.25, and School Fund, \$425,428.23, does not make, to say the least, a very encouraging outlook for the second year of my administration

If we are to have the permanent improvements we all so much desire and which we all agree should be commenced, we should have the money to perform the work, and the quicker we settle the problem as to how this money shall be raised, the earlier will we be able to start with these improvements, otherwise the same may be delayed for years to come.

There are two methods for providing the ways and means : one, by increased taxation, the other, by creating a loan. I most respectfully recommend to the earnest consideration of your Honorable Bodies, the question of creating an additional loan, in an amount which will provide for the improvements that the present condition of our City demands so that we may begin at once permanent improvements and progress as other large cities. If any loan is created I most respectfully recommend that it be made for and appropriated to three or four specific and very much needed improvements ; first, the repaving of our streets with improved pavements upon a systematic and well defined policy, laid by the best and most improved methods, for I believe that one mile of pavement well laid is better than two miles improperly done ; second, in the extension of our system of main sewers, and, third and fourth, in the extension of our gas and water systems. Such improvements will, after being finished, benefit the future generations, and those generations should be required to bear their proportionate share of the cost, and the present not be required to pay for all. The other general improvements may be provided for gradually by the annual appropriations.

I also beg to respectfully recommend that you immediately consider the subject of refunding at a lower rate of interest the City's six per cent. loan, which, could it be accomplished, and I firmly believe it may, would save in interest a large amount.

DEPARTMENT OF PUBLIC SAFETY.

The Director of the Department of Public Safety has submitted a full and detailed report of the workings of his Department for the year 1891.

Bureau of Police.

During the year the Bureau of Police has been increased in efficiency by the addition of 102 patrolmen and the opening of new station-house at Twentieth and Berks street; a station and fire-house at Roxborough; a station, patrol and fire-house at Sixty-first and Thompson streets; a station and fire-house at Tacony; a station and fire-house at Sixty-fifth and Woodland avenue; alterations and additions were contracted for station-houses at Moyamensing avenue below Dickinson street; at Tenth and Taylor streets; at Germantown; at Front and Master streets, and at Twentieth and Fitzwater streets.

There was also purchased a lot at Front and Westmoreland streets upon which to erect a police and fire station-house. The new houses are now all completed and occupied, the improvements to the old ones nearing completion.

Much credit is due to this Bureau for the very vigorous and successful methods taken to suppress the illicit sale of liquor, the arrests for this offence numbering 514, being an increase of 297 over the year 1890. The arrests for lottery policy selling were seventy-four for the year 1891, as against nine for the year 1890.

Bureau of Fire.

During the past year there were added to this Bureau eight men and five Silsby Rotary Engines, and if you continue the annual appropriations made for the past four years for a few years more, it will be thoroughly equipped with the newest and best apparatus. In the appropriation for the year 1892 you made provision for the purchase of a fire-boat, which will be the first in this City—such boats have been very successful

and of great benefit in other cities and no doubt will be here. We will enter into the contract for this boat at the earliest possible moment and hope in the near future to have it in commission. For faithful, courageous, and successful services I consider this Bureau second to none, and it should in the matter of the appropriations by your Honorable Bodies receive most careful and liberal consideration.

Electrical Bureau.

This Bureau has continued its rapid advances and maintained its reputation as the finest equipped, most practical and best managed Municipal Electric Bureau in this country, a fact admitted and conceded by all electrical experts.

During 1891 there have been successfully laid 8,624 feet of conduits throughout the different sections of our City. The report of the Chief shows that there are 1,571 arc lights in use, including 59 owned by the Girard Trust, and this year we will add 879 to that number, being 441 more than has been added before to the City's service in any one year.

One of the most important questions now before your Honorable Bodies is the one requiring the removal of the unsightly poles for over-head electric service. We are far behind the other large cities in this respect, and while the City herself has been gradually extending her underground service she has not been followed in any just proportionate degree by the private corporations. I most respectfully and yet earnestly recommend to your careful and deliberate consideration the advisability of enacting at once a general ordinance upon this subject, requiring the gradual removal of all poles and overhead wires and the placing of all wires underground. There is no valid reason whatsoever why this should not be done, and every reason, from the standpoint of the City's best interest, why it should. We must sooner or later meet this question, and there is no better time to commence this much needed improvement than the present. Every delay will make the accomplishment of this greatly desired result that much more difficult.

I respectfully recommend to your consideration the question of establishing for the City her own electric light plant. We could build and equip stations upon City property in various localities, and I believe eventually get not only a better service in every respect, but also have absolute control of all the lights that may be needed for street lighting.

Bureau of Health.

The report of the Bureau of Health shows the general condition of the health of the City to be good. The Municipal Hospital, as now located, is in a portion of the City in which improvements are being made very rapidly, and some measure must be taken at the earliest possible moment to remove this hospital to a location where it will not interfere with or retard the advance of improvements.

We have been afflicted for several years past with the sale of diseased meats within the City limits. The present Director of the Department of Public Safety has given the subject his careful and earnest consideration, and after consultation with the Board of Health has made a vigorous and determined effort to stamp out this growing evil. He recommended, and your Honorable Bodies gave him, an appropriation to organize a force whose particular duty it should be to investigate and prevent the sale of diseased meats. There is nothing so prejudicial to the health of a community as the sale of unwholesome food, and I am glad to state that by reason of the action of the Director of the Department the City is now comparatively free from such affliction.

Bureau of Building Inspectors.

The report of this Bureau shows a decrease of permits issued and receipts since 1890: there were 4,272 permits issued, covering 9,142 separate operations, showing a decrease in permits of 210, and in building operations of 3,136; the total value of buildings and alterations authorized by permits being \$20,088,236.50.

Bureau of City Property.

This Bureau reports receipts during the past year of \$82,571.47 as against \$80,548.54 for 1890, being an increase of \$2,022.93. The City should own as far as practicable the various buildings occupied by her, for municipal purposes, thereby saving the large amount now paid in rentals for the private properties so used. The Public Building Commission, by finishing with all possible rapidity quarters in which these Departments would be installed, would make an immediate saving to the City of many dollars, there being thus saved, in the removal of the Recorder of Deeds office to the City Hall, \$18,500.

The questions of erecting a new Morgue and of improving the City's property along the river fronts are both commended to your attention.

Bureau of Boiler Inspectors.

This Bureau still successfully continues its important work. The number of boilers inspected and approved during 1891 being 2,979; the number of certificates issued being 2,540; the number of new boilers 500, making under the supervision of this Bureau 3,334. There was paid into the City Treasury by this Bureau \$3,316.31, the amount earned over and above the yearly expenses.

DEPARTMENT OF PUBLIC WORKS.

The Fifth Annual Report of the Director of the Department of Public Works is herewith transmitted, presenting detailed statements of the great amount of important work accomplished, with also that which it is hoped to accomplish in the future, provided the recommendations of the Director meet with your approval and the ways and means necessary to carry out the same are provided.

Bureau of Gas.

The itemized statements of the receipts and expenditures of this Bureau will be found in the report hereto attached, as follows :

In 1891 the receipts were.....	\$3,774,072 09
In 1890 the receipts were.....	3,659,644 30
	<hr/>
Being an increase of.....	\$114,427 79

Increased quantity of gas sold for which payment is not due is as follows :

1891, 40,601,900 cubic feet, at \$1.50.....	\$60,902 85
1890, 14,538,694 cubic feet, at \$1.50.....	21,808 04
	<hr/>
	\$ 39,094 81
Which, added to the increased receipts.....	114,427 79
	<hr/>
Total increase over 1890.....	\$153,522 60

The expenditures for 1891 were.....	\$2,826,274 70
And for 1890 were.....	2,806,551 42
	<hr/>
Being an increase of.....	\$19,723 28
Showing a net increase in profits during the	
year 1891 of.....	\$133,799 32

The amount of gas furnished free to the City during	
the year 1891 was.....	587,398,328 cubic feet.
And in 1890.....	551,459,572 “
	<hr/>
Being an increase during the present year of.....	35,938,756 “

This total amount of gas (587,398,328 cubic feet) thus consumed, if sold to the public at the present rate, would have placed in the City Treasury \$881,097.49. Economy in the use of gas by the Municipal Offices can only be enforced when you shall provide by ordinance that each Department shall pay out of its appropriation for the gas it consumes.

It is expected that with the completion of the Walnut street bridge there will be laid a new twenty-inch main thereon for supplying additional gas to West Philadelphia. This will then be connected with the present circuit of large mains laid

during the past year. With the additional supply and the further extensions contemplated for that section there will be secured that which it has so long needed, and should certainly have, an adequate supply of gas.

One of the most important problems which confronts us now is the question of increasing as well as of improving our supply of gas. We have a contract with a private corporation for which you have appropriated \$500,000 for the purchase of gas manufactured in the plant located at the City's Twenty-fifth Ward Gas Works. It is of the utmost importance that we should at once make arrangements to purchase this plant, in order that the entire control of the same will be in the hands of the City, and I beg to respectfully recommend that in the consideration given to this subject you shall appropriate money, not only to make such purchase, but also to hereafter extend the works that the City may make the necessary quantity of gas, instead of purchasing from private parties. The control of our supply of gas should forever remain with the City of Philadelphia herself, and should never be surrendered by either sale or lease. The experience of all other Municipal corporations has been where the gas works were owned by the City, and were afterwards purchased or leased by private corporations, there has always followed an endeavor on the part of such city to regain control of the same.

Bureau of Highways.

The appropriations to this Bureau for the year 1890 for the repaving of streets not occupied by passenger railway companies was \$380,000.00, and for streets occupied by passenger, railway companies was \$175,000.00, making a total of \$555,000.00. In 1891 the total for streets not occupied by passenger railway companies was \$405,263.75, with no appropriations for railway streets. On October 5, 1891, the Supreme Court of the Commonwealth of Pennsylvania handed down a decision affirming the opinion of the lower Court, declaring that passenger railway companies within the City

of Philadelphia must repave with improved pavements from curb to curb the streets they occupy. It was then too late in the season to begin any of this work. There have been several conferences between representatives of these various companies, the Director of the Department of Public Works, and myself, to arrange some general plan of action under which they should begin work, but as yet we have been unable to arrive at any conclusion.

If we do not arrive at a settlement of this question within a short time, I will submit, by special message, for your consideration the plan and recommendation of the Director for the prosecution of this work.

On December 15, 1891, I transmitted to you a communication upon the question of the repaving of Broad street with a new and improved pavement. You have already appropriated for the year 1892 enough money to start and partially finish this improvement, and I most sincerely trust that you will appropriate the balance of the money necessary to complete this great work, which, when done, will give us one grand highway with an improved pavement extending from the northern limit to the southern limit of the City, a distance of thirteen miles, connecting many of the streets which have already, from time to time, been so repaved.

The Belgian blocks with which this street is now paved will be utilized in paving adjacent streets now paved with cobble stones, these cobble stones being utilized as a foundation for the improved Broad street pavement. I most respectfully refer you to the recommendation of the Director in his report, hereto attached. He has given much time and study to this important question, and his recommendation, if carried out, would solve the question of good and well-paved streets, a matter in which every citizen is most directly interested.

Bureau of Street Cleaning.

The work of this Bureau during the past year has been very satisfactory; the number of complaints being 257 less than in the previous year.

A new policy was inaugurated in asking for bids for the removal of garbage, waste, etc., by disposing of it on dumps, as heretofore, and also by cremation. The bids for the latter system, however, were found to be too expensive for the appropriation available. I recommend that the City shall erect upon her own land crematories and grant the contractors the privilege of using them as a condition of their contract.

On account of the growth of our City and the improvements already made, in what is now our suburban district, the territory in which deposits of waste and offal can be made is rapidly becoming limited, and in consideration of the great distance it will eventually have to be carted, I beg to recommend to your early attention the question of determining how to dispose of the same.

Bureau of Lighting.

The expenses of this Bureau must necessarily increase each year upon the annual extension of the public lighting. The number of electric arc lights in 1890 was 1,293, and in 1891 was 1,719, an increase of 426 over 1890; the number of gasoline lamps in 1890 was 7,160, and in 1891, 7,911, an increase of 751. The total number of electric, gas and gasoline lamps now under the charge of the Bureau of Lighting in 1890 was 28,013 as against 30,141 in 1891, an increase of 2,128. This statement presents additional support to my argument recommending that the City at the earliest possible opportunity erect and control her own electric light plant for Municipal purposes. Each additional arc light upon the public highway is not only a convenience to the citizens generally, but is also of material aid in the prevention of crime.

Bureau of Surveys.

There has been built within the last year 20 main sewers, 3 sections of the Wissahickon High Level sewer, 1 section of the intercepting sewer, in all 36,102 linear feet.

The Westmoreland street section of the Aramingo Canal system has been completed from the Canal to the Delaware river. The Department has under contract four sections of the High Level Intercepting sewer along the Wissahickon valley, and it is expected these extensions will be completed by summer. There was also 133,216 linear feet of branch sewers built, and 23,465 linear feet of branch sewers built under private contract. There is still a great deal to be accomplished in this important branch of public work which is so closely connected with the health of our City.

The Walnut street bridge is approaching completion and work is progressing thereon very satisfactorily. With additional appropriations for the completion of the road bed of the river spans, the railings and general finish, this bridge can be open for public travel in the latter part of this year.

I beg to also call your special attention to the condition of the bridge continuing Girard avenue over the Philadelphia and Reading Railroad, and the timber bridge over the Schuylkill river at the Falls. The repairing of these bridges, on account of their condition, is practically impossible, and the question of their reconstruction should receive your early attention.

Bureau of Water.

On October 8, 1891, I transmitted to your Honorable Bodies the report of the Director upon the future water supply of our City, and I beg to again call your attention to this report, which was made after a most thorough and exhaustive study of the subject.

The total increase of the number of gallons of water supplied during the last five years has been 23,238,868 235 gallons; the consumption during 1891 was 140 gallons per day per capita. Strange to state, while this has rapidly increased year by year, we have to-day no greater pumping capacity than we had in 1887. It was impossible during the past summer, to keep the East Park Reservoir filled to

its entire capacity, the depth of water only averaging 12 feet, which is 13 feet less than can be stored therein. This has been caused by our limited pumping capacity, which will be very materially improved by the 1st of July next, when we expect to have completed and in service the new 20 million gallon pumping engine contracted for with the Southwark Foundry and Machine Company by my distinguished predecessor. This would, however, have still left our pumping capacity inadequate, and on October 8, 1891, in a special message, I also presented the necessity for additional pumping engines and urged still further appropriations to remedy this very dangerous and long-continued defect in our water system.

By reason of the appropriations for 1892 the Department will contract for an additional 20 million gallon engine for the Spring Garden pumping station; a 10 million gallon engine for the pumping station at Belmont; a 10 million gallon engine for the Roxborough station; a 15 million gallon engine at the Frankford pumping station at Lardner's Point on the Delaware river. With these additional facilities we will be able to store in the reservoirs now finished a much larger quantity of water and permit it a longer time in which to subside before supplying it.

The new Roxborough reservoir, which will have a capacity of 148 million gallons, intended for supplying the Twenty-first and Twenty-second Wards and that portion of the Twenty-eighth Ward above Westmoreland street, we will have finished during the present year. This, with the reservoir already there, will afford such storage capacity as to provide at all times an ample supply of subsided water for the above District.

The most important question decided this year was the selection of the Indian Queen Lane site, for a storage reservoir to supply the entire northwest section of the City, which has a population of upwards of 250,000 people now, and is rapidly increasing. This section is, and always has been,

supplied by water from direct pumpage. For two years the Water Committee of your Honorable Bodies has been considering the question of selecting a site in this very important district, and now that the question has been decided, it is due to the health and comfort of the population living in that section that you immediately make an appropriation which will enable the Department to start the work on this reservoir, which has been much too long delayed. There is no question in connection with the water supply that demands greater and more immediate attention than this.

The next matter in importance for your early consideration is the question of building a reservoir in the West Park to supply the present demands of West Philadelphia and those of the future which will be made necessary by the rapidly increasing population.

As previously stated, all moneys spent for reservoirs is a permanent investment; they will always be available no matter from whence may come the future water supply of our City.

I also most sincerely trust that you will very carefully consider the practical and thoroughly sound recommendation of the Director of the Department of Public Works upon this entire question of our water supply, as made in his report herewith transmitted, which I beg to state has my unqualified and entire approval.

DEPARTMENT OF CHARITIES AND CORRECTION.

I beg leave to call to your attention the able and comprehensive report of the President of the Board of Directors of the Department of Charities and Correction, herewith transmitted, showing in detail the great amount of work in the way of permanent improvement that has been accomplished during the past year.

On November 12, 1891, the new buildings for the Insane, after a thorough inspection, and upon the Architect's certifi-

cate, were accepted by the Department. The total cost of these buildings, including steam heating, and fixtures for electric and gas lighting, and the laundry building, was \$236,344.53.

Included within these buildings is one main dining room, in which all the insane patients may be fed at one time. This dining room is as perfectly arranged as any in the country.

I beg also to call to your attention the very interesting and exhaustive description of all of these buildings, made by the President of the Board, which is hereto attached, and also to call your special attention to the many other suggestions, recommendations, etc., in the accompanying report, all of which have for their ultimate purpose the improvement of the condition of the unfortunates whom our City has to care for, in the two Bureaus in the Department, the Bureau of Charities and the Bureau of Correction.

The ordinance just passed, placing upon the City plan a Boulevard will be of advantage and benefit to the citizens generally. I most earnestly recommend that you consider the advisability of providing at the earliest moment the necessary appropriation for commencing this great public improvement, that it may be pushed to completion with all possible dispatch, and, as it will be the principal approach to Fairmount Park, it should be made the most beautiful and attractive.

I have the honor to also transmit herewith for your consideration the Annual Reports of the following Departments :

Receiver of Taxes,
 City Treasurer,
 City Controller,
 Law,
 Education, and
 Sinking Fund Commission.

There ends to-day another municipal year—the first of my administration. During that time much that has been of detriment and of disadvantage to the good name of our City has occurred, yet material progress has been made in bettering her condition and advancing her toward the foremost place among other great cities. Many improvements in the public service have been inaugurated and successfully established, and much in the way of permanent improvements has been added to our City's prosperity.

We are starting upon a new municipal year, and while despite the misfortunes of the past twelve months much was accomplished for her good, there yet remains very much more to be undertaken.

The people expect, and properly, too, that careful, considerate, and conscientious administration of public affairs from you, the Legislative, and me, the Executive Branch of the Municipal Government, which will assure and advance the best interests and material welfare of the City of Philadelphia.

To that end let us both bend our earnest thought, our best endeavor, our every energy, that at its close we may merit and receive the approbation and commendation of our fellow citizens.

I am,

Respectfully,

EDWIN S. STUART,

Mayor.



FIFTH ANNUAL REPORT

OF THE

Department of Public Works.

—♦♦—

JAMES H. WINDRIM, Director.

OFFICERS
OF THE
Department of Public Works.

Director,
JAMES H. WINDRIM.

Chief Clerk,
HARRY W. QUICK.

CLERK—WILLIS SHEBLE.
STENOGRAPHER AND CLERK—W. W. ALEXANDER.
STENOGRAPHER—CLEMENT L. BURNETT.
TYPEWRITER—GWILLEM S. DAVIS.
MESSENGER—JAMES A. JUNIOR.

Superintendent of City Ice Boats,
H. E. MELVILLE.

Chiefs of Bureaus :

GAS—WILLIAM K. PARK.
HIGHWAYS—GEORGE A. BULLOCK.
LIGHTING—JOHN J. KIRK.
STREET CLEANING—SYLVESTER H. MARTIN
SURVEYS—SAMUEL L. SMEDLEY.
WATER—JOHN L. OGDEN.

FIFTH ANNUAL REPORT
OF THE
DEPARTMENT OF PUBLIC WORKS.

JAMES H. WINDRIM, Director.

Philadelphia, January 2, 1892.

HON. EDWIN S. STUART,
Mayor of Philadelphia.

SIR:—In compliance with the Act of Assembly, approved June 1, 1885, I have the honor to present the Fifth Annual Report of the Department of Public Works of the City of Philadelphia for the year ending December 31, 1891.

The works of the several Bureaus of the Department have progressed satisfactorily, and the year closes with much accomplished. The reports of the Chiefs of the Bureaus, herewith submitted, show in detail the works completed by each; a general summary of said work is here presented, with suggestions for improvements to certain classes of the same under the direction of the Department.

City Ice Boats.

The repairs necessary to place the boats in condition for service were made during the summer months, and they are ready for duty should they be required to keep navigation open and the river free from obstruction by ice.

The boats are located at the wharf of the House of Correction, without expense to the City.

The following comparative summary is an abstract of the work done by the City Ice Boats, and of the receipts for towage, and the expense of maintenance during the years 1889-90, and 1890-91 :

	1889 and 1890.		1890 and 1891.	
	No.	Tonnage.	No.	Tonnage.
Vessels Outward.....			2	1,060
“ Inward.....				
“ Assisted.....			1	2,000
Total.....			3	3,060

	1889 and 1890.	1890 and 1891.
Amount received for towage and assistance rendered.....		\$428 64
Amount received from the sale of old material.....	\$296 50	66 35
Total paid City Treasurer.....	\$296 50	\$499 99

	1890.	1891.
Total amount of warrants drawn.....	\$11,040 50	\$23,441 90
Deduct cash paid City Treasurer.....	296 50	499 99
Actual current expenditure.....	\$10,744 00	\$22,951 91

Bureau of Gas.

During the past year the improvements and additions made to the City Gas Works have been as follows :

In distributing mains there were added to the supply system 45.1 miles, making a total of nearly 1,036 miles of gas mains laid in the streets, the property of the City.

Twenty-sixth Ward Works :—An original stack of 3's was

substituted by building a stack of 6's of the Flemming half regenerative system, making the third stack of these improved benches completed and in operation.

An exhaust fan, engine and boiler have been located for the distribution of gas from the holder at this station.

Twenty-fifth Ward Works:—An Ordinance of Councils, approved March 24, 1891, authorized "The Philadelphia Gas Improvement Company" to increase its facilities for manufacturing and purifying water gas, the improvements and changes in mains to be made at the expense of the Philadelphia Gas Improvement Company, said company to pay rent to the City for the use of a purifying and condensing house in the sum of \$5,000 per annum. These works have been completed and are in operation.

Ninth Ward Works:—The carpenter shop and stables, which were destroyed by fire on June 25, 1891, have been reconstructed in a substantial manner. The insurance on the buildings was promptly paid by the companies into the City Treasury, and by Councils appropriated for their reconstruction.

During the year 1892 it is expected that with the completion of the Walnut street bridge, a 20-inch main will be laid over the bridge to West Philadelphia, and there connected with the circuit of large mains laid during the past year. With the additional supply led across the river, and the further extension of mains contemplated, West Philadelphia will have an adequate supply of gas.

Twenty-first Ward Works:—The increase in the manufacturing capacity at the Twenty-fifth Ward Works, the enlargement of holder at Ninth and Diamond streets, with the equalization of pressure, have given a satisfactory supply of gas to Manayunk and Roxborough, not requiring the firing of the stacks in these works which heretofore had been necessary during the winter months. It is the purpose of the Department to further extend the mains in the eastern part of the Twenty-second Ward, as the opening of streets will permit, and thus obtain a better supply of gas for Chestnut Hill.

*HOLDERS :—*The minor repairs and repainting holders located at the several works, at Ninth and Mifflin streets, and at Ninth and Diamond streets, have been done by the employes of the Bureau.

A contract was made with the Camden Iron Works, to be completed August 15, 1891, upon its proposal for the Pease guiding system, for the enlargement of the two holders at Ninth and Diamond streets, to increase the capacity of each from 1,000,000 cubic feet to 1,500,000 cubic feet. Upon October 5, 1891, one of the holders was turned over to the Department and put in use. The construction adopted for the enlargement of the holders has proved complicated and difficult to take care of in winter weather.

It is optional with the Department to select the column system for guides and supports in the reconstruction of the second holder; the contractor has been notified of the selection of the latter, and it is expected that the second holder will be completed for use about July 15th next.

By substituting larger sized pipes in the older districts of the City, and increasing the sizes of pipes in streets previous to repaving, with the extension of the larger supply mains and connecting them in circuits, great improvement has been made to the service, and with an equalization of pressure, a more uniform distribution has been secured to the several districts of the City.

The plant at the Twenty-sixth Ward Works is the most productive to the City of any making gas from coal, for the reason that modern improved stacks have been introduced (the Flemming benches) which yield more gas per mouth piece than any others in the works; these stacks are discharged by machinery, economizing labor. These works were originally equipped with the primitive style of benches, and of them 30 per cent. still remain unaltered.

In the Twenty-fifth Ward Works the stacks erected, which were the best of the kind at the time of construction, remain, and will not produce gas as economically as those of the im-

proved modern patterns, nor can they be operated to compete with them.

In the Ninth Ward Works there are two types of improved stacks; the Kloenné and the Stanly-Steadman, which were the best at the time of their selection; there yet remains in these works at this time 66 per cent. of the early form of stack for the manufacture of gas.

The adoption of the manufacture of water gas by the city was occasioned by the demand for an increased supply of gas with a higher illuminating power, which the city had not the facilities to provide. It is imperative for the city to extend its plant for the manufacture of the entire quantity of gas required by the consumers. The amount of consumption is increasing with the growth of the city, and if the department is to supply all of the gas manufactured by the city, appropriations should be made to construct additional works, or the city must continue to purchase gas in the manner already instituted, from a private corporation.

The city should own its entire plant, increasing its capacity to supply the public, and in doing so, adopt the improved methods for the manufacture of gas which science and business enterprise have proven efficient, in order to supply satisfactory illuminating and fuel gas at the lowest possible price to the consumer.

With such improvements made, there can be a reduction in the price of gas; with that reduction there would naturally be a greater consumption; but the city is not at the present time in condition to do either—make the reduction in price or make the additional gas.

The department suggests that means be provided to establish a plant by the city for the manufacture of at least six million cubic feet of water gas per day, and supply the necessary scrubbers, condensers, purifiers, an additional holder with capacity of 3,000,000 cubic feet, exhausters and the necessary mains for distribution to the other holder stations; the improvements would involve an expenditure of about

\$800,000.00, and they should be constructed to form a part of any future extensions.

These additions, supplemented further with modern Flemming benches for the production of coal gas in place of those idle and non-producing in the Twenty-sixth Ward Works, would give equal proportions of the two makes of gas, which fixed as one, is claimed by expert authorities to have the best possible illuminating power and is of desirable gravity.

The city has ample ground well adapted for a plant to manufacture the entire supply of gas. With a view to furnishing gas at a reduced rate for lighting, and at a still lower rate if used as fuel for heat and power, the most economical methods to produce a satisfactory supply of gas should be provided.

The betterments above referred to, offer the best way for the improvement of the service, and would be the step leading to a reduction in the price of gas to the consumer. Councils should appropriate money for this especial purpose.

The following is a summary of the receipts and expenditures for the years 1890 and 1891 :

Comparative Statement of Receipts.

YEAR.	Receipts.	Increase.
1890.....	3,659,644 30	
1891.....	3,774,072 09	114,427 79

Comparative Statement of Expenditures.

	1890.	1891.
Current expenses.....	2,495,196 52	2,552,150 39
Extensions.....	311,354 90	274,124 31
Total.....	2,806,551 42	2,826,274 70

The receipts, as reported in detail by the Chief of the Bureau, are :

	For gas, services, etc.	Coke, tar, etc.	Miscellaneous.
1891.....	\$3,440,380 34	\$306,387 55	\$27,304 20
1890.....	3,377,251 77	275,714 09	6,878 44
Increase,	\$63,128 57	Increase, \$30,673 46	Increase, \$20,625 76
Total, 1891.....	\$3,774,072 09		
“ 1890.....	3,659,644 30		
Increase.....	\$114,427 79		

To the receipts from gas should be added the value, at \$1.50 per 1,000 cubic feet, of the increased quantity of gas sold for which payment is not due, as follows :

December 31, 1891.....	522,687,800 cu. ft.	
“ 31, 1890.....	482,085,900 “ “	
		40,601,900 cu. ft.—\$60,902 85.

The operations of the Bureau during the year 1890 and 1891 are summarized as follows :

	1890. Cubic feet.	1891. Cubic feet.
Total output.....	3,311,995,000	3,391,887,000
Largest production of gas in any 24 hours.....	* 14,058,000	† 14,253,000
Largest consumption in any 24 hours.....	a. 16,103,000	b. 16,196,000

*† On December 16th and 4th.
a. b. on December 17th and 24th.

	Bushels.	Bushels.
Quantity of coke on hand January 1.....	212,886	256,090
Made during the year.....	5,959,784	5,905,109
Total.....	6,172,670	6,161,199

Coke sold during the year.....	2,925,894	2,005,163
Breeze sold during the year.....	554,425	606,000
Used under retorts.....	2,085,965	2,002,845
Used under boilers and lime-kilns.....	387,513	368,066
In offices, yards and in pipe-laying.....	62,788	68,510
On hand December 31.....	256,090	110,615
Total.....	6,172,670	6,161,199

	1890.	1891.
Number of meters introduced during the year.....	5,674	5,465
Total in use.....	133,290	138,755
Services introduced during the year.....	10,789	10,515
Total in use.....	158,905	169,420
Lights added during the year.....	122,973	120,284
Total in use.....	2,328,986	2,449,270
Total number of consumers.....	134,555	140,052
Number of public lamps	18,984	19,947

The average candle power of the several tests was as follows :

January	19.78	July....	19.49
February	19.99	August.....	19.12
March	20.19	September.....	20.25
April	20.58	October	20.24
May	20.39	November	20.53
June.....	19.75	December.....	19.95

Equal to 20.02 candles.

In 1890 it was equal to 19.73 candles.

The following table gives the amount of gas consumed in the offices of the several departments, for the transaction of the public business :

Quantity of free gas burned in 1890.	551,459,572	cubic feet.
" " "	1891, 587,398,328	" "

In the report of 1890, the Director suggests that economy in the use of gas will only be enforced when Councils shall, by ordinance, provide that the gas used by any department shall be paid for from the appropriations made to it. The increase in the consumption of gas during 1891 is further evidence why Councils should, by legislation, make each department responsible for the quantity of gas it uses. All waste or misuse of gas is a direct loss, reducing the profits of the works to the City.

Manufacturing and Holder Capacity.—The following tables give in detail the capacity of the several Works, and the date of construction, the location and the capacity of all the holders :

Works.	Stacks.	Retorts per Stacks.	Total Retorts.	Grand Total.	Maximum Capacity per Works, 24 hours.	Total Maximum Capacity, 24 hours.
Ninth Ward.....	4	150	600			
	2	194	388			
Experimental Bench.....			3	991	6,600,000	
Twenty-first Ward.....	1	30	30	30	200,000	
Twenty-fifth Ward.....	6	120	720	720	4,000,000	
Twenty-sixth Ward.....	2	72	144			
	3	144	432			
	1	120	120	696	5,500,000	16,300,000

The above does not include the plant of the Philadelphia Gas Improvement Company, which has a capacity of 11,000,000 cubic feet per day.

There are at the Ninth Ward Works, in addition to the above, eight (8) retorts used exclusively for vaporizing naphtha, for maintaining clear pipes about the Works.

Holdings.

Location.	When Erected.	Dimensions.	Capacity.	Total.
Ninth Ward Works.....	1851	Feet. 140 x 70	Cubic feet. 1,000,000	
"	1871	140 x 70	1,000,000	
"	1844	80 x 40	200,000	
"	1847	80 x 40	200,000	2,400,000
Twenty-fifth Ward Works...	1876	140 x 70	1,000,000	
"	1876	140 x 70	1,000,000	
"	1885	140 x 70	1,000,000	
"	1885	140 x 70	1,000,000	
"	1889	140 x 70	1,000,000	5,000,000
Twenty-sixth Ward Works...	1852	160 x 90	1,800,000	1,800,000
Twenty-first Ward Works.....		60 x 88	103,000	
"	1874	78 x 44	200,000	303,000
Frankford: Frankford ave- nue and Buckius street.....		50 x 16	31,000	
Frankford: Frankford ave- nue and Buckius street.....		45 x 16	25,000	
Frankford: Frankford ave- nue and Buckius street.....	1869	80 x 26	130,000	186,000
Bridesburg: Richmond and Bridge streets.....	1869	60 x 21	59,000	59,000
Ninth and Diamond streets...	1869	140 x 70	1,000,000	
"	1874	140 x 70	1,500,000	2,500,000
Ninth and Mifflin streets.....	1874	115 x 62	600,000	
"	1890	160 x 84	1,577,000	2,177,000
Twenty-fifth and Callowhill streets.....	1851	100 x 50	390,000	
Twenty-fifth and Callowhill streets.....	1888	80 x 42	203,000	593,000
Germantown, near Wister Station, P. & R. R. R.....	1870	100 x 50	390,000	390,000
Total.....				15,408,000

The holder capacity aggregates 15,408,000 cubic feet. The capacity of holders should not be less than fifty per cent. greater than the maximum manufacturing capacity. The City is deficient in holder capacity 6,000,000 cubic feet.

The following is a comparative statement of the pipe laid during the years 1890 and 1891.

	1890. Feet.	1891. Feet.
3 inch.....	10,911	8,072
4 "	119,797	130,973
6 "	10,940	5,420
8 "	24	25,486
12 "	16	83,494
16 "	4	.....
20 "	84,451	26,152
30 "	15,308	8,640
Total.....	*191,451	†238,192

* 1890 equal to 86 $\frac{1}{4}$ miles.

† 1891 equal to 45 $\frac{1}{4}$ miles.

The following table gives in detail the total output of gas and its distribution during the years 1890 and 1891 :

Total output and distribution of Gas.

			1890.	1891.
			Cubic feet.	Cubic feet.
Stock delivered and not paid for, and on hand January 1.....			467,447,206	482,085,900
Manufactured and purchased during the year.....	{	1890	Manufactured.	Purchased.
	1891	2,177,073.000	2,092,315.000	1,134,922.000
			1,299,572.000	}
			3,311,995,000	3,391,587,000
Total to be accounted for.....			3,779,442,206	3,873,972,900

	1890.		1891.	
	Cubic feet.	Per ct.	Cubic feet.	Per ct.
Delivered to private consumers, for which bills have been rendered.....	2,227,323,700	58.93	2,270,595,900	58.61
Delivered to consumers (bills not rendered), and in holders, December 31st.....	482,085,900	12.76	522,687,800	13.49
Public lighting, etc.	1890.		1891.	
	Cubic feet.	Per ct.	Cubic feet.	Per ct.
Bureau of Police.....	13,404,300	00.35	16,415,900	00.42
Bureau of Fire.....	8,698,500	00.23	10,747,400	00.27
Bureau of Water.....	2,419,300	00.06	2,549,900	00.07
Public Buildings.....	19,821,600	00.52	26,941,900	00.70
Almshouse.....	14,275,600	00.38	13,793,100	00.36
City Property.....	4,957,400	00.13	4,622,900	00.12
Public Squares.....	7,376,802	00.20	7,203,342	00.19
Park Commission.....	338,700	00.01	376,300	00.01
Schools.....	7,764,400	00.21	9,428,600	00.24
	79,056,602	2.09	92,079,342	2.38
Street lamps.....	472,402,970	12.50	495,318,986	12.79
Used at works, offices, stations, etc.....	23,747,300	00.63	25,320,700	65
Unaccounted for, leakage, etc.....	494,825,734	13.09	467,970,172	12.08
Total.....	3,779,442,206	100.00	3,873,972,900	100.00

Bureau of Highways.

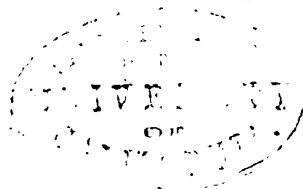
The paved streets of the City aggregate about 756.78 miles, of which 281.96 miles are occupied by Passenger Railway Companies; there are 37 miles of macadam roads, and 452.05 miles of unpaved streets and country roads.

The work of the Bureau during the past year is shown in detail by the accompanying tables. The number of square yards of streets paved and repaved with improved pavement, the repaving of tramway streets with Belgian block, the grading and opening of streets, repairs to paved streets, etc., have been continued to the full extent of the funds available.

The following tables give comparative statements, in detail, of the work done during 1890 and 1891, of the paving of new streets, of the repaving of old streets, and of the receipts and expenditures of the Bureau of Highways.

Comparative Statement of Work Done.

	1890.	1891.	
New Paving.....	205,923.00	197,511.00	Linear feet
Macadamizing (new).....	31,411.00	34,344.00	" "
Grading.....	516,424.68	626,058.31	Cubic yds.
New footway paving.....	47,199.00	305,513.00	Square yds.
Repairs to paved streets.....	390,336.94	336,980.7	" "
Footways repaved.....	12,310.75	12,684.8	" "
Ditches repaved.....	38,461.00	64,366.	
Gutter stone laid.....	63,262.00	53,023.00	Linear feet
Crossing stone laid.....	46,406.00	50,887.00	" "
Tramway stone laid.....	10,685.00	2,053.00	" "
Curbstone reset.....	221,564.00	272,137.5	" "
Wooden trunks.....	5,531.00	6,284.00	" "
Brick and stone drains.....	311.00	386.5	" "
Hand railings.....	2,802.00	2,907.00	" "
Broken stone used.....	17,117.00	23,429.7	Cubic yds.
Macadamizing (resurfaced).....	44,561.00	23,860.00	Linear feet
Footway, curb and railroad notices served.....	22,999.	21,264.	



Summary of Work done in Improved Pavements. New streets.

	1890.		1891.	
	Square yards.	Linear feet.	Square yards.	Linear feet.
Granite blocks.....	121,895.00	43,540.00	183,918.16	57,296.00
Sheet asphalt.....	80,774.00	13,423.00	40,654.8	16,126.00
Vitrified bricks.....	187,015.00	45,608.00	192,692.00	58,122.00
Asphalt blocks.....	5,068.00	2,986.00	671.00	400.00
Macadamizing.....	70,290.00	31,411.00	74,900.00	34,344.00
Slag blocks.....	1,310.00	500.00		
Total.....	366,352.00	*137,463.00	492,835.96	†166,283.00

Replacing Cobblestone with Improved Pavements. Old streets.

	1890.		1891.	
	Square yards.	Linear feet.	Square yards.	Linear feet.
Granite blocks.....	153,314.00	68,099.00	94,588.00	41,344.00
Sheet asphalt.....	124,578.00	31,767.00	78,894.00	23,984.00
Vitrified brick.....			860.6	239.00
Total.....	282,892.00	*99,866.00	174,342.6	†65,567.00

*1890. Total amount of new paving, 237 334 linear feet, equal to 44 miles, 5,014 linear feet
†1891. " " " " 231,855 " " " 43 " 4,815 " "

Comparative Statement of Receipts.

Year.	Receipts.	Increase.
1890.....	\$71,514 32	\$1,310 79
1891.....	71,815 89	301 57

Comparative Statement of Expenditures.

	1890.	1891.
Current expenses.....	\$365,013 15	\$293,522 41
For extensions.....	1,043,857 99	820,401 64
Total.....	\$1,398,871 14	\$1,113,924 05

The Supreme Court having decided that the passenger railway companies are liable for the repaving from curb to curb of the streets occupied by them, makes it possible to have the work of repaving the streets for which such railway companies are responsible resumed by them, and the City reimbursed for the paving it has had done on streets occupied by said companies.

It is the intention of the Department, under this decision, to have the several companies extend, during the year, the repaving on the streets upon which work has been commenced by the City for the companies; while the progress may not be as rapid as desired, if the work is continuous and of substantial quality, in a few years the business streets will be placed in a creditable condition.

The Department has recommended that the appropriation for repaving during 1892 be utilized for laying an improved pavement on Broad street, the main highway, which extends from the extreme southern to the extreme northern limit of the City. This street is now paved with granite blocks that were put down at different times upon an imperfect foundation; the surface has become irregular, rutted and worn beyond repair, necessitating the repaving of the street. The blocks to be removed will be utilized to repave adjacent streets now paved with cobble stones; by this method the greatest amount of improved paving will be secured to the City at reasonable cost.

Curbing.—The quality of the curbing and its alignment

has so much to do with the appearance of a street, the condition of the gutters and the permanence of the road-bed, that an ordinance should be passed making it conditional that a dressed granite curb shall be set upon all streets hereafter prior to paving or repaving.

In the matter of crossings, gutter-stone, tramways and the repairs to streets, the revised specifications of the Department for the year 1892 require materials of better quality and a better grade of work.

The breaking of the surface of streets to make underground improvements or connections, has been in this City as elsewhere, the cause of irreparable injury to the paving; Councils have by ordinance required that before repaving, the sewer, gas and water pipe shall be first introduced; to still further protect the streets to be repaved, Councils should legislate that before any street is paved or repaved, connections shall be made with the underground works, sewers, water and gas pipe; these to be led inside the line of the curb by the City, at such distance apart as will secure to all properties on the streets the privilege of drainage, of water and gas supply, the parties applying for use of the same to pay the cost of the connections to the City.

Macadam Roads.—The appropriation for macadam roads is not sufficient to keep them in proper condition, and the Department can only do work so far as the money appropriated will permit.

Grading.—The opening of the streets in the suburban districts give facilities of travel to the local public, and greatly benefits the adjacent property owners, while the expense of grading is with few exceptions borne by the City.

The Department has no authority to enforce the grading of footways with the grading of streets in the suburban districts; when a street is opened and graded, delay by owners to grade the footways in front of their properties causes additional expense to the City for materials and labor to maintain the street.

The dirt from slipping banks of ungraded footways obstructs the drainage and the road, and increases the liability of the City for damages from accident cases on uncompleted highways. During the year 1891 there has been 109,633.63 cubic yards of grading in excess of that done in 1890; while the opening of streets adds to the extent of the City, and to its income when the new streets are built upon, it is but reasonable that the owners of land immediately benefited should grade and pave the footways at the time the City opens the roadway.

In order to enforce the ordinance relative to grading, curbing and paving sidewalks on streets newly opened and graded in suburban districts, additional legislation is required to give the Department power to compel property owners to comply with the requirements of the ordinance.

The report of the Chief of the Bureau of Highways contains detailed statements of the streets paved, in order of merit of the materials used. An earnest effort has been made during the past year to improve the quality of the material used in street paving, and the character of the work, with good results.

The endurance of any street paving is first dependent upon a uniform solid foundation; the foundation should be capable of sustaining the traffic the street surface is subjected to; it should be kept dry or properly drained; the base of the paving material should either be broken stone, screenings or a material that will retain the least water, or a concrete that will exclude moisture from it; the practical difference in the cost of the two is the addition of the cement to make a concrete and the labor to mix and spread it. A properly prepared foundation for a pavement adds to the cost of the paving.

The greatest endurance and wear of any class of paving material will be shown if it is laid upon a substantial concrete base; the latter will bridge over inequalities in the foundation, and keep the street surface free from irregularities other

than occur from the wearing or failure of the top surface of the paving material; all improved street paving in a city should be laid on a concrete base, which, when properly placed, is permanent for the renewal of any paving surface upon it.

It is to be noted that the street pavements in the cities of the old world are laid upon a cement concrete base, while in this City, on account of the first cost of this best foundation, this important addition to the permanence of street paving is excluded.

Repairs to Sewers.—By systematic inspection of the sewers their condition was ascertained, and, where necessary, repairs were made through the year at a cost of \$19,962.02.

Bridges.—As far as the appropriations permitted, the iron bridges were repainted and minor bridges were repaired.

In July last the Peoples Passenger Railway Company renewed the planking and roadway of the South street bridge.

The bridge continuing Girard avenue over the Philadelphia & Reading Railroad, reported by message to Councils June 10, 1891, with an estimate of cost for its reconstruction, continues with nothing done, but with increasing necessity for its renewal; the timber bridge over the Schuylkill river above the Falls has been repaired, its timbers renewed from time to time, but the condition of this bridge warrants that it should be replaced by a steel or iron structure at an early date as contemplated by plans of the Bureau of Surveys.

Repaving Streets occupied by Passenger Railways.—The system already instituted by Councils of laying improved paving in the streets not occupied by passenger railway companies, to complete continuously the street its entire length, is the policy that will secure well paved streets for business traffic, and which can be economically repaired and kept clean.

The number of main streets for which the passenger railway companies are responsible to repave and maintain, limits the progress of street improvement by the Department, as the streets in portions of the City where repaving is most needed are dependent upon the action of the said companies.

Councils, by ordinance of February 2, 1882, which still remains in force, defined the amount of repaving the several companies should do each year. Some advance may be expected from the companies during the year 1892.

The specifications of the Department will require the repaving in the business thoroughfares to be first class in every particular, and laid upon concrete foundations with granite block paving, finished with pebble and pitch cement joints. The character of paving, while more expensive in first cost, will be enduring, and its foundations more readily reinstated when broken or displaced for any purpose.

Good paving provides a means for quick transit and facilitates business. Most of the principal streets north and south, east and west, not occupied by railway companies have improved pavements. The oblique streets, crossing at angles the regular streets, are the shortest and most direct lines between remote points, and connect the improved pavements of all streets intersecting with them; they should be paved with improved pavement, and facilitate rapid transit over their route. Portions of these oblique thoroughfares, running northeast, northwest, or southeast and southwest, on each side of the Schuylkill river, are occupied by passenger railways. They should be repaved by the companies and by the City. The business of the City would be benefited by such improved streets.

Subway for Underground Conduits.—Councils by ordinance grant privileges to corporations to lay underground conduits in the streets of the City for conducting a private business; the ordinances usually require each company to repave the streets displaced to lay these works; the number of grants has so increased upon the main business streets that all the available space is practically taken up by them.

On account of the sub-divided responsibility of the corporations to make repairs, it is becoming almost impracticable to have the streets thus occupied maintained in proper condition, and the companies become indifferent about it. Connections

have to be made to the conduits, repairs are frequent, so that the street surface is broken, then imperfectly patched, and the street made discreditable in appearance and unsatisfactory for travel.

The privilege granted in the future to any company to occupy the streets of the City should contain a proviso, that it shall remove or transfer its conduits, or other property, into any subway or other structure the City may in the future build or provide, and the company pay a rate per annum for the use of the same.

Such legislation would make it practicable at any time for the City to construct in the streets a subway which would receive all character of electric wires, pneumatic tubes, mains for steam plant, etc., each company paying a rental therefor to the City.

A system devised to accommodate existing companies and of capacity for prospective use, should yield a revenue to the City; solve the problem of exposed electric wires; provide a way for the introduction into the City any device requisite to facilitate business enterprise, or furnish additional convenience to the householder, when to be obtained by underground works; give better streets and relieve the companies from the expense of their maintenance and repairs.

Board of Highway Supervisors.

The report of the Secretary of the Board states in detail the number of permits that have been granted for underground works in the streets of the City for the construction of vaults, for the extension of railroad tracks, curves and turnouts, and erection of bridges.

The receipts of the Board for the year 1891 show it is not only self-supporting, but still a source of revenue to the City; the receipts exceed the expenses of the Board \$352.10. The draughtsman continues to keep of record by plans all the works authorized by the Board.

The following is a statement of the number of permits

authorized to be issued to the several underground companies during the year 1891 :

West End Electric Light Co.....	6
Frankford Avenue Merchants Electric Light Co.....	3
Manufacturers Electric Light Co.....	6

The following is a summary of the transactions of the Board and of the work of the draughting department for the years 1890 and 1891 :

Transactions of the Board of Highway Supervisors.

Permits authorized to be issued.	1890.	1891.
For vaults.....	4	3
For railroad tracks, curves, and turnouts.....	58	70
For underground pipes.....	7	4
For electrical conduits.....	110	15
For artesian wells.....	1	
For erecting bridges.....		1

Work done by the Draughtsmen of the Board of Highway Supervisors.

	1890.	1891.
Street record plans corrected.....	223	460
New street record plans prepared.....	22	58
Blue print plans placed on file.....	127	62

Receipts and Expenditures for 1891.

Receipts.....	\$3,780 00
Expenditures.....	3,427 90
Profit to the city.....	\$352 10

Bureau of Lighting.

Prior to January 1, 1892, the City was divided into five lamplighting districts. The increase in the number of lamps,

due to the growth and extension of the City, made an additional district necessary, which, with an increase of twenty lamplighters, has been authorized by Councils; a better service will be secured by this increase.

The following comparative statement shows the number of lamps and the expenditures during the years 1890 and 1891.

	1890.		1891.	
	No.	Cost.	No.	Cost.
Electric Arc Lights.....	1,238	\$201,289 29	1,719	\$231,741 13
Gasoline Lamps.....	7,160	147,550 54	7,911	162,904 55
Gas Lamps Supplied by the Northern Liberty Gas Company.....	354	8,186 78	317	7,420 51
Under Charge of Bureau of Lighting.....	*18,984	154,689 43	19,947	161,260 89
Electric Arc Lights under charge of Board of Directors of City Trusts.....	50	.....	50	.....
Gas Lamps under charge of Bureau of Correction.....	172	.....	197	.....
Total.....	28,013	\$511,686 04	30,141	563,327 06

* Not lighted because of proximity to electric lights:

1890.....2,789 1891.....3,296

The Bureau of Lighting, in conjunction with the Electrical Bureau, prepared specifications for electric lighting upon which, on December 3d, 1891, proposals were received and contracts awarded to the several electric light companies for furnishing 2000 candle-power arc lights for street lighting during 1892.

The following is a schedule of the number of electric lights, the price paid per light per night, and the cost of lighting the several districts during the year 1891 :

	1891.	
	Number.	Price.
BRUSH ELECTRIC LIGHT COMPANY.		
From south of Callowhill street to the south side of Washington avenue, between Broad street and the Schuylkill river, including the bridges (except west end of South street bridge). From and including the south side of Market street to and including the north side of South street, from and including the east side of Eighth street to the Delaware river. Chestnut street between Eighth street and Broad street.....	223	42½
On Broad street, south of Market street to South street. Underground cable.....	9	40
South of Washington avenue, between Broad street and Schuylkill river.....	12	50
PHILADELPHIA ELECTRIC LIGHT COMPANY.		
From and including the south side of Callowhill street, to and including the north side of Poplar street, west from and including the west side of Eighth street.....	82	42½
West from and including the east side of Broad street, and north from Poplar street, including Girard avenue bridge....	54	43½
Broad street, north of Callowhill street.....	40	40
Diamond street, west of Broad street.....	24	40
Spring Garden street, east of Broad street.....	40	40
Spring Garden street, from Broad street to Twenty-fifth street, Twenty-fifth street to Green street, and Green street to Broad street.....	22	40
NORTHERN ELECTRIC LIGHT AND POWER COMPANY.		
North of Poplar street to Dauphin street, east of and including Thirteenth street to the Delaware river.....	168	45
North of and including Dauphin street to Erie avenue, east of and including Thirteenth street to the Delaware river.....	73	47
UNITED STATES ELECTRIC LIGHT COMPANY.		
From and including the north side of Market street to and including the north side of Poplar street, from and including the east side of Eighth street to the Delaware river. From and including the north side of Vine street, to south of Callowhill street, west from and including the west side of Eighth street, to and including the east side of Broad street....	144	42½
WISSAHICKON ELECTRIC LIGHT COMPANY.		
Manayunk, Wissahickon, Roxborough, and Falls of Schuylkill	34	55
GERMANTOWN ELECTRIC LIGHT COMPANY.		
Entire district of Germantown.....	50	55

	1891.	
	Number.	Price.
FRANKFORD ELECTRIC LIGHT AND POWER COMPANY.		
Bounded by Leiper street on the northwest, Bridge street on the northeast, and Frankford creek on the southeast and southwest, being in the Twenty-third Ward.....	37	40
SOUTHERN ELECTRIC LIGHT AND POWER COMPANY.		
All lights within the district bounded by the south side of South street and the north side of Government avenue, between Broad street and the Delaware river.....	150	30
Broad street, south of South street. Underground cable.....	8	30
THE POWELTON ELECTRIC COMPANY.		
All that portion of the City of Philadelphia lying west of the Schuylkill river known as West Philadelphia, being all of the Twenty-fourth Ward, the Twenty-seventh Ward, and the Thirty-fourth Ward. The boundaries of this district are the Schuylkill river on the east, Darby creek and Cobb's creek on the west and south, and City avenue on the north. Including west end of South street bridge.....	106	47
SUBURBAN ELECTRIC COMPANY.		
In all of the Thirty-fifth Ward, and that portion of the Twenty-third Ward lying north of Bridge street, in the City of Philadelphia.....		55
THE ELECTRIC POWER COMPANY.		
All lights within the district bounded by the west side of Eighth street, the east side of Broad street, the south side of Vine street, and the north side of South street, except Chestnut street.....	57	32 $\frac{1}{4}$
Average price, 42 cents.		

The following is a schedule of the number of electric lights, the price to be paid per light per night, and the cost of lighting the several districts during the year 1892.

	1892.	
	Number.	Price.
SOUTHERN ELECTRIC LIGHT AND POWER COMPANY.		
In the district bounded by and including the south side of South street, to and including the north side of Washington avenue, between the Delaware and Schuylkill rivers.	147	42 $\frac{1}{2}$
In the district bounded by and including the south side of Washington avenue and all streets south thereof between the Delaware and Schuylkill rivers.....	97	50

	1892.	
	Number.	Price.
BRUSH ELECTRIC LIGHT COMPANY.		
From the north side of South street to the south side of Callowhill street, between the Delaware and Schuylkill rivers: <i>Provided</i> , that should we be awarded all the lights within the last named district, including those bid for on cables owned by the City, then there will be no charge for the thirty-one (31) lights now located on Chestnut street, between Broad street and the Delaware river.....	348	42½
	31	Free
On Broad street south of South Penn Square to McKean street, Underground cable.....	81	40
On Locust street, between Fifteenth and West Washington Square (Underground cable).....	16	40
UNITED STATES ELECTRIC LIGHT COMPANY.		
North of and including the north side of Callowhill street, south of and including the south side of Poplar street, west of but not including the west side of Seventh street to the Schuylkill river.....	94	42½
PHILADELPHIA ELECTRIC LIGHT COMPANY.		
North of and including the north side of Poplar street, to and including the south side of Montgomery avenue, from but not including the west side of Seventh street to Thirty-third street, excepting Columbia avenue, on both sides between Seventh street and the east side of Broad street.....	90	42½
On Spring Garden street between Sixth street and Broad street, and on Broad street between Spring Garden Street and Columbia avenue (Underground cable).....	36	40
DIAMOND ELECTRIC COMPANY.		
North of and including the north side of Montgomery avenue, to and including both sides of Lehigh avenue, west of but not including the west side of Broad street to the Park.....	14	45
North of but not including the north side of Lehigh avenue, west of the west side of Broad street, west of and including the west side of Germantown avenue, south of and including the south side of Roberts avenue, east of and including Wissahickon avenue, east of and including Twenty-third street, south of and including Allegheny avenue to Ridge avenue, east of and including both sides of Ridge avenue to the north side of Lehigh avenue.....	14	50
On Broad street between Columbia avenue and Germantown avenue, and on Diamond street between Broad street and Thirty-third street (Underground cable).....	51	40
MANUFACTURERS ELECTRIC COMPANY.		
From Lehigh avenue (both sides) to Frankford and Wingo-hocking Creeks, and east of the east side of Broad street to the Delaware river.....	64	50
WISSAHICKON ELECTRIC LIGHT COMPANY.		
Manayunk, Roxborough and Falls of Schuylkill, north to Fountain street, south to Allegheny avenue, east to Township Line, west to the Schuylkill river.....	46	55

	1892.	
	Number.	Price.
GERMANTOWN ELECTRIC LIGHT COMPANY.		
All of the Twenty-second Ward, including lamps now in Nicetown, and for such additional lights as may be located in said district.....	67	55
THE SUBURBAN ELECTRIC COMPANY.		
In the Twenty-third and Thirty-fifth Wards, from Frankford Creek on the south, to Pocussing Creek on the north, Montgomery County Line on the west, Delaware river on the east, including lights already located by Ordinance, and all that may be located during the year 1892.....	55	55
PHILADELPHIA ILLUMINATING COMPANY, LIMITED.		
Spring Garden street, from Broad street to Twenty-fifth, on Twenty-fifth to Green, and on Green street to Broad street (Underground cable).....	46	25
FRANKFORD AVENUE MERCHANTS' ELECTRIC LIGHT CO.		
Bounded and described as follows: Commencing at intersection of the Delaware river front and the north side of Callowhill street; thence along the north side of Callowhill street to the west side of Seventh street; thence along the west side of Seventh street to the south side of Columbia avenue; thence along the south side of Columbia avenue to the east side of Broad street; thence to the north side of Columbia avenue; thence along the north side of Columbia avenue to the west side of Seventh street; thence along the west side of Seventh street to the north side of Susquehanna avenue; thence along the north side of Susquehanna avenue to the west of the west side of Front street; thence southerly to the north side of Poplar street; thence along the north side of Poplar street to the Delaware river front; thence along the same southerly to place of beginning.....	206	39
NORTHERN ELECTRIC LIGHT AND POWER COMPANY.		
Front street (both sides) to the Delaware river, north of the north side of Poplar street to the south of the south side of Lehigh avenue.....	112	25
North of the north side of Susquehanna avenue to south of the south side of Lehigh avenue, and from Germantown avenue (both sides) to west of the west side of Front street.....	9	49½
North of, including the north side of Montgomery avenue; east of, but not including the east side of Broad st; south of, but not including the south side of Lehigh avenue, to Germantown avenue; west of, but not including the west side of Germantown avenue, to Susquehanna avenue; north of, but not including the north side of Susquehanna avenue, to Seventh street; west of, but not including the west side of Seventh street, to Montgomery avenue.....	25	57½
THE POWELTON ELECTRIC COMPANY.		
Twenty-fourth, Twenty-seventh, and Thirty-fourth Wards, all west of the Schuylkill river, Philadelphia, upon any street in either of said wards, or at any point to be designated by the proper authority of the Department of Public Works within the above-described territory.....	148	47
Average price, 42.48 cents.		

As the City extends its underground cable service the overhead wires should decrease. These cables will furnish lights of a uniform standard, and the City will be supplied with the best, most secure, and economical service.

Considering it to be the best interests of the City that it should own the electric light poles, the specifications provide that all poles erected during 1892 shall be the standard pole adopted by the City, and become the property of the City at the completion of the contracts awarded for the year 1892.

On account of the superiority of the electric light for street lighting, Councils should appropriate liberally for the extension of this branch of the public service; electric lights should displace gas lamps in all the principal streets. With an underground service established by the City for public lighting, it could not be considered unreasonable if the City should then require all corporations now using overhead wires to lay them underground and free the streets from an unsightly and dangerous obstruction.

In this connection the Department earnestly endorses the recommendation of the Director of the Department of Public Works in his report for the year 1890, of the desirability of the City erecting and controlling its own electric light plant. The excellence of the electric arc light upon the streets and highways commends its extension until the whole City shall have the advantages of this method of lighting.

Well-lighted streets are a necessity for the convenience of the public, and will prove to be a direct benefit, assisting to expose crime and prevent violation of law.

Bureau of Street Cleaning.

The work of this Bureau during the year 1891 has been of a very satisfactory character, as evidenced by a decrease in the number of complaints.

The number of complaints of all kinds was 1844—257 less than in the previous year.

The Chief of the Bureau being requested to furnish this

office with a list of all streets so far out of repair as to render the cleaning of them difficult, promptly complied with the request, and as a result many of the streets were repaired, and the Bureau was thus enabled to keep them in a cleaner condition.

On December 4, 1891, after public advertisement, proposals were received, opened, and contracts awarded to the lowest bidders for 1892; the awards amounting to \$525,758.00, a decrease of \$26,240.00.

Bids were asked for the removal of garbage, waste, etc., by disposing of it on dumps, etc., and by cremation. The bids for the latter were found excessive. It is worthy of the consideration of Councils, whether the City should not upon its own land erect crematories and grant contractors the privilege of using them as a condition of their contracts. The spread of the City and improvements in the suburban districts are rapidly limiting the dumping ground for the deposit of waste and offal, and the greater distance that it has to be carted will so increase the expense that it will be necessary, at an early day, to determine the most expedient way to dispose of it.

The following is a comparative statement of the operations of the Bureau of Street Cleaning for the years 1890 and 1891:

The total Work done during the Year 1891, is as follows :

DISTRICTS.	CLEANED.					REMOVED.				Number of Complaints of all Kinds.
	Squares.	Inlets.	Crossings.	Market Houses.	Snow from Fire Plugs.	Number of Dead Animals.	NUMBER OF LOADS.			
							Dirt.	Ashes.	Garbage.	
First.....	126,185	49,643	4,742	626	.....	1,709	56,263	100,366	11,083	277
Second.....	152,449	61,203	8,093	622	.....	2,367	63,326	95,038	9,901	455
Third.....	115,946	39,807	4,446	592	54	3,411	42,782	110,965	18,125	366
Fourth.....	252,579	59,816	9,308	.....	.....	6,535	100,955	209,505	32,920	428
Fifth.....	62,216	30,077	9,564	.....	.....	773	27,354	58,125	12,036	318
Total, 1891.....	709,375	240,546	36,153	1,840	54	14,795	290,680	573,999	84,065	1,844
Total, 1890.....	566,223	177,819	70,132	1,361	208	12,274	266,531	458,004	64,934	2,101

The expenses for Street Cleaning for the year 1891 were \$559,728.00.

Bureau of Surveys.

Registry Division.—The report of the Chief of the Bureau gives in detail the work of the Registry Division, which has materially increased during the past year, in the preparation of plans for the opening of streets in the suburbs of the City, in making the many descriptive plans of properties to file for municipal claims; and since the removal of the office of the Recorder of Deeds to the City Hall, descriptions of property which were formerly made in that office are now made in this division of the Bureau of Surveys.

The work of the Registry Division of the Bureau of Surveys is shown by the following summary of its operations :

	1890.	1891.
Number of certificates registered owners issued.....	7,771	10,522
Number issued for use of the Law Department.....	477	507
Receipts from certificates of registered owners.....	\$1,948 00	\$2,517 00
Number of original lots plotted.....	12,478	11,705
Number of transfers registered.....	21,554	22,265
Number of plans made for use of city departments, bureaus, etc	268	543
Number of examinations of registry plan books made by the public.....	20,521	21,896
Number of descriptions of property filed for registry.....	32,027	34,070
Number of titles perfected.....	1,705	1,858
Number of certificates of legal opening of streets, issued to bureaus, etc.....	4,842	3,071
Number of certificates of registered owners in municipal lien cases for Law Department.....	2,468	6,527

Main Sewers.—There has been built within the year twenty main sewers, three sections of the Wissahickon Valley sewer, and one section of the intercepting sewer, aggregating 36,102 linear feet. Of the Aramingo Canal system, the Westmoreland Street sewer has been completed from Aramingo canal to the Delaware river. There are under contract four sections of the high level intercepting sewer along the Wissahickon valley; one section is carried on a stone arch viaduct, a span

of 116 feet. These extensions will probably be completed by midsummer.

Branch Sewers.—Of branch sewers there was an aggregate of 133,216 linear feet built; of branch sewers under private contracts, there were built 23,465 linear feet. The Bureau has insisted that in their construction all inlets requisite for surface drainage should be set and connected with the sewers, and the requisite manholes provided.

The Bureau has continued the testing of cement and materials before they are approved for the works, which secures a standard and uniform quality in them.

The following is a comparative statement of the operations of this Bureau in the active construction of work during the years 1890 and 1891:

Summary of Bridges, Main, Branch and Private Sewers built during the years 1890 and 1891.

	1890.		1891.	
	No.	Linear feet.	No.	Linear feet.
Bridges.....	10	.....	4	
Intercepting sewer (section).....			1	3,184
Intercepting sewer connections.....	3	5,473		
Wissahickon Valley sewer (section).....			3	5,600
Storm water conduit, Falls Village.....				
Main sewers.....	20	24,096	20	27,318
Branch sewers.....	188	122,463	196	133,216
Private sewers.....	69	21,120	60	23,465
Total.....	280	*173,152	284	†192,733

* 1890, equal to 32.793 miles.

† 1891, equal to 36.50 miles.

Bridges.—There have been completed during the year, the McCallum street viaduct over Cresheim creek, and the bridge

on Second street over the tracks of the Richmond branch of the Philadelphia & Reading R. R.

There are now under construction by the City, bridges at Kensington avenue over Frankford creek, at Oxford street over the Connecting R. R., and at the Falls, where a stone arch bridge, 56 feet span, is being erected to carry the tracks of the Norristown branch of the Philadelphia & Reading R. R. over Penn street.

Walnut Street Bridge.—The piers for the river span of the bridge are nearing completion ; the post and plate girder construction of the west approach, under contract with the Pottsville Bridge Co., and the iron work of the east approach, under contract with A. & P. Roberts & Co., will be completed on time. Contracts have been awarded for the masonry, filling and paving of the approaches—the west approach to I. H. Hathaway & Co., and the east approach to R. B. Malone & Co. The contract for the bridge trusses in three spans over the river has been awarded to A. & P. Roberts & Co. If Councils make the additional appropriations necessary for the completion of the road bed of the river spans, the railings, and general finish, this bridge should be open for travel the latter part of the year 1892.

In this connection permit me to again call attention to the condition of the bridge continuing Girard avenue over the Philadelphia and Reading R. R., and of the timber bridge across the Schuylkill river at the Falls. These bridges have been previously referred to, under the head of the Bureau of Highways, as being very much out of repair.

Their condition is such that repairs are practically impossible, and the question of their reconstruction should receive the early attention of Councils, and appropriations should be made therefor.

The Philadelphia & Reading Railroad Company, under Ordinance of December 26th, 1890, authorizing the revision of street grades and the construction of the Philadelphia & Reading Terminal Railroad. from Twelfth and Market streets

to Ninth and Green streets, is progressing with the work rapidly and in a satisfactory manner.

Comparative statement of work upon bridges during the years 1890 and 1891.

	1890.	1891.
Finished.....	10	4
Began.....	2	3
Authorized.....	1	3
Planned.....		4

Inlets.—In regrading and repaving streets, the requisite inlets to prevent surface water remaining on the streets are being located and connected with the sewers as such works progress, and in the building of new sewers, a sufficient number of inlets are located to secure a prompt and complete drainage of the surface water of the streets.

During the year, 337 inlets of all kinds were constructed at a cost of \$20,890.86. Notwithstanding the great number of inlets that were constructed, the demand for them far exceeded the appropriation for this class of work.

The welfare of the City in the future depends very much upon the intelligent direction of the business of this Bureau; in the revision of grades, the locating and rebuilding of sewers made necessary by changes and business development in the City; and in new sections, the lay out of roads and streets to conform with the natural topography of the ground, to secure the best gradients for streets and the best system of drainage, with the minimum amount of grading and the least damage to contiguous property; to avoid railroad crossings and provide necessary bridges for those that must be crossed. These are considerations all important to study and determine upon, in deciding upon plans for works devolving upon this Department.

District Surveyors.—The entire thirteen survey districts now come under the provisions of the law, which requires that all moneys received by District Surveyors be paid into the City Treasury, and that these officials and their assistants be paid fixed salaries. As the Surveyors and Regulators of the several districts are now responsible to the Chief Engineer of the Bureau of Surveys, the public has a right to expect more prompt and better service in the future.

All plans for improvements in the several districts will be approved by the Chief Engineer, that works in adjoining districts may be under one general supervision; it is expected that with this system the municipal engineering will be improved.

The net profits to the City for the year 1891 were \$28,145.57.

The following is a summary of the receipts and expenses of the District Surveyors paid fixed salaries during the years 1890 and 1891 :

Summary of Receipts and Expenses of District Surveyors.

District.	Surveyor.	Cash Receipts.	Credit for Work done for the City.	Total Credit.	EXPENSES.				Balance profit to the City.	Profit to the City in 1890.	Increase.	Decrease.
					Salary.	Pay of Assistants.	Miscellaneous.	Total.				
First.....	Thomas Daly, 1 year.....	\$6,641 77	\$1,077 97	\$7,719 74	\$3,000 00	\$1,791 08	\$929 79	\$5,720 87	\$1,998 87	\$1,908 53	\$90 84	
Second.....	Charles W. Close, 1 year.	6,022 08	1,282 35	7,304 38	3,000 00	1,976 09	1,680 89	6,656 48	647 90	623 09	24 81	
Third.....	Wm. C. Cranmer, 1 " ..	9,016 19	1,585 82	10,602 01	3,000 00	4,240 00	1,446 87	8,686 87	1,915 14	2,444 83		\$529 19
Fourth.....	Wm. W. Thayer, 1 " ..	5,805 50	2,557 20	8,362 70	3,000 00	2,996 93	1,947 76	7,944 69	418 01	383 85	54 16	
Fifth.....	J. H. Webster, Jr., 9 mos.	4,659 82	3,372 08	8,031 85	2,250 00	3,224 97	2,468 44	7,938 41	93 44		98 44	
Sixth.....	Joseph Mercer, 1 year..	12,325 73	2,635 23	14,960 96	3,000 00	3,882 12	1,401 22	8,283 34	6,677 62	4,000 16	2,677 46	
Seventh.....	Wm. K. Carlisle, 1 " ..	9,481 47	3,020 10	12,501 57	3,000 00	3,627 20	2,083 74	8,710 94	3,790 63	885 84	3,425 29	
Eighth.....	C. A. Sundstrom, 1 " ..	4,984 04	2,890 63	7,874 67	3,000 00	3,174 00	1,570 90	7,744 90	79 77	62 96	16 81	
Ninth.....	Walter Jones, 9 mos.	4,314 39	2,984 47	7,248 86	2,250 00	4,145 00	754 45	7,149 45	99 41		99 41	
Tenth.....	Geo. S. Webster, 9 " ..	5,548 05	3,598 24	9,146 29	2,250 00	4,082 50	2,507 93	8,840 43	305 86		305 86	
Eleventh...	Joseph Johnson, 1 year..	3,962 35	2,620 81	11,583 16	3,000 00	3,480 00	1,619 99	8,099 99	3,483 17	4,709 87		1,226 70
Twelfth.....	Wm. H. Jones, 9 mos.	4,281 13	1,970 18	6,251 31	2,250 00	1,890 00	885 47	5,025 47	1,225 84		1,225 84	
Thirteenth	H. M. Fuller, 1 year..	16,162 83	4,298 52	20,456 35	3,000 00	7,633 96	2,412 43	13,046 44	7,409 91	6,732 70	677 21	
	Total 1891, 18 Districts...	98,155 30	33,838 55	131,993 85	36,000 00	46,143 85	21,704 43	103,848 28	28,145 57	21,210 83	*8,690 63	1,755 89
	" 1890, 9 " ..	65,177 63	13,016 95	78,194 58	22,375 00	24,119 79	10,488 96	56,983 75	21,210 83	14,807 98	9,124 21	2,721 36

* Net increase, \$8,934 74.

The receipts and expenditures of this Bureau were largely in excess of any previous year.

The following is a comparative summary for the years 1890 and 1891 :

Comparative Statement of Receipts.

Year.	Receipts of Bureau.	Receipts of District Surveyors.	Total.	Increase.
1890.....	\$30,018 49	\$65,177 68	\$95,196 12	
1891.....	45,246 96	98,155 80	143,402 26	\$48,206 14

Comparative Statement of Expenditures.

	1890.	1891.
Current expenses.....	\$101,540 33	\$146,668 60
For extensions.....	949,568 31	1,061,409 95
Total.....	\$1,051,108 64	\$1,208,078 55

Bureau of Water.

During the past year the service has been improved by the introduction of 41 miles of additional distributing mains, making an aggregate of over 1,000 miles of water-pipes now in use by the city.

The following is a comparative statement of the total pipe laid, and of other work done during the years 1890 and 1891:

YEAR.	PIPE LAID.			* PIPE RELAID.	FIRE HYDRANTS PLACED IN POSITION.			SUBSTITUTED FOR DEFECTIVE HYDRANTS.			Fire Hydrants in use.	Water Attach- ments.	
	Feet.	EQUAL TO.			Feet.	New Style	Old Style.	Total.	New Style	Old Style.			Total.
		Miles.	Feet.										
1890.....	159,176	30	776	33,242	619	3	622	243	25	268	7,749	10,081	
1891.....	221,336	41	4,856	32,081	626	5	631	221	23	244	8,105	8,178	

Total pipe laid, 1,001 miles 2398 feet.

* Adds nothing to feet in ground.

A new boiler house, stack and equipment of five new boilers have been completed at the Spring Garden Station ; at Mt. Airy, a one million gallon pump taken from Roxborough, and a new steel boiler have been placed ; at Frankford, the broken pump in connection with the Corliss engine was replaced and the engine strengthened.

The necessary repairs to the pumping engines and machinery at the several stations have been made, but there has been no increase in the pumping capacity ; a 20,000,000 gallon engine, under contract with the Southwark Foundry and Machine Company, will be finished and in operation before the first of July ; this increase in the pumping capacity will more effectively utilize the East Park reservoir.

The following statement gives the number and type of engines, and their several aggregate capacities at the various stations :

PUMPING STATION.	Designated No. of Engine or Turbine	TYPE OF ENGINE.	Designed Capacity in Million Gallons per day.	Total.
SPRING GARDEN.	Old Station.....	6 Simpson Compound Rotary.....	10,000,000	
	"	7 Marine Compound Rotary.....	20,000,000	
	"	8 Worthington Duplex.....	10,000,000	
	"	11 Gaskill.....	20,000,000	
	"	12 Worthington Duplex.....	6,000,000	
	New Station.....	9 " "	15,000,000	
"	10 " "	15,000,000	96,000,000	
Belmont.....	1 Worthington Duplex.....	5,000,000		
"	2 " "	5,000,000		
"	3 " "	8,000,000	18,000,000	
Roxborough.....	1 Worthington Duplex.....	5,000,000		
"	2 " "	7,500,000	12,500,000	
Roxborough Auxiliary	1 Knowles' Pump.....	500,000		
"	2 " "	250,000		
"	3 " "	250,000	1,000,000	
Mt. Airy.....	1 Davidson Pump.....	1,000,000		
"	2 " "	1,000,000		
"	3 Knowles' "	1,000,000	3,000,000	
Chestnut Hill.....	1 Knowles' Pump.....	250,000		
"	2 Worthington Duplex.....	500,000	750,000	
Frankford.....	1 Marine Compound Rotary.....	10,000,000		
"	2 Corliss Compound Rotary.....	10,000,000	20,000,000	
FAIRMOUNT.	New House.....	1 Turbine Wheels.....	2,000,000	
	"	3 " "	5,340,000	
	"	4 " "	5,380,000	
	"	5 " "	5,380,000	
	Old House.....	7 " "	5,100,000	
	"	8 " "	5,100,000	
"	9 " "	5,100,000	33,200,000	
Total.....				184,540,000

The following is a comparative summary of the operations for the years 1890 and 1891 :

	1890.	1891.
Receipts from water rents.....	\$1,958,551 95	\$2,057,417 39
“ “ fractional rents.. ..	171,901 15	200,968 36
“ “ water-pipes.....	141,884 27	183,160 98
“ “ City Solicitor's office.....	38,367 73	34,394 49
“ “ penalties.....	26,270 94	29,672 21
“ “ delinquent rents.....	25,472 39	25,183 85
“ “ Chief Engineer's office.....	9,730 83	6,503 70
“ “ searches.....	5,235 75	5,046 75
“ “ delinquent penalties.....	3,622 69	3,495 00
Total.....	\$2,381,037 70	\$2,500,762 73

	Gallons.	Gallons.
Pumped to reservoirs.....	51,698,508,699	55,665,648,000
Equal to gallons pumped 100 feet high.....	84,501,451,686	93,490,106,725

NOTE.—The “pumped to reservoirs,” etc., includes 986,731,592 gallons of repumpage to higher levels at Mount Alry, Roxborough, and East Park Reservoirs.

This deducted from the total pumped gives 54,678,916,408 gallons as the total consumption.

The cost of pumpage is calculated on the total pumpage and the consumption per capita on the smaller quantity.

	1890. Gallons.	1891. Gallons.
Pumped by water power.....	12,362,987,130	11,880,824,570
Pumped by steam power.....	39,335,521,569	44,284,823,430
Largest quantity pumped in 24 hours.....	170,600,577	183,421,163
Smallest quantity pumped in 24 hours.....	61,956,522	73,057,433

Year.	Average consumption in gallons per capita per day estimating the population at*	Increase of	Increase per capita per day.	Cost per 1,000,000 gallons pumped 100 ft. high.	Reduction in cost of pumpage per 1,000,000 gallons.
	Gallons.	Gallons.	Gallons.		
1890	131	9,179,588,918	21	\$3 05	82 cents.
1891	140	4,405,019,930	9	2 99	6 cents.

* 1890—1,046,964, U. S. Census.
1891—1,071,672.

Expenditures.

	1890.	1891.
Current expenses.....	\$712,497 87	\$781,237 88
For extensions.....	280,866 92	749,066 21
Total.....	\$993,364 29	\$1,530,294 04

The cost of pumping one million gallons lifted 100 feet high was \$2.99, or 6 cents less than in the previous year, and \$2.52 less than in 1880.

Twenty per cent. of the total pumpage was by
water power, the turbine wheels using..... 341,424,737,100 gallons
To pump..... 11,380,824,570 “

In a message to Councils, September 3d, 1891, the necessity for additional pumping engines at the several stations was presented, and under the annual appropriation made by Councils for the year 1892, the Department expects to contract for an additional 20,000,000 gallon engine for the Spring Garden station, for a 10,000,000 gallon engine for the station at Belmont, for a 10,000,000 gallon engine at Roxborough pumping station, for a 15,000,000 gallon engine for Frankford pumping station at Lardner's Point on the Delaware river; these additions will materially benefit the service.

The Water Committee, under direction of the Honorable Bodies of Councils, has prepared an exhaustive report of sta-

tistics of the Water Department of the City, which contains information of the necessities of the Department.

The important matter of adopting a plan for the future water supply to the City should receive the prompt consideration and action of Councils, and the Department will investigate and report upon such plans as Councils may direct.

While an ample and full supply of water is a necessity for the health and comfort of the people, and for the prosperity of the business interests of the City, the consumption per capita, 140 gallons per day, is so largely in excess of other cities that the excess is largely chargeable to waste or misuse.

To ascertain the relative consumption of water in manufacturing and in residence districts, and to determine if there was loss by leakage, meters were placed on the City mains in circuits controlled by stops, and the amount of water passing was registered; the average quantity per day from 14 days trial in the district bounded by Broad and Thirteenth, Walnut and Spruce streets, was 113 gallons per capita; between the hours of 6 A. M. and 6 P. M. 66.2 gallons, and between the hours of 6 P. M. and 6 A. M. 46.8 gallons. Upon investigation the cause of the consumption of water in the district mentioned, between the hours of 6 P. M. and 6 A. M., was found to be principally from the constant running water in urinals through the night.

In a manufacturing district the amount of water registered was at the rate of 1,552 gallons per day per capita.

The report of the Chief of the Bureau of Water gives the detail of the population and the properties supplied; in the latter district the charges as per present schedule of rates per annum is \$1,792.00, and the price if paid for by meter measure would be \$17,520.00.

No doubt there are throughout the city many cases where water left running through the night is wasted, which additional legislation would not stop. While the introduction of meters would be an expense, they would tend to check the waste, and Councils should direct that meters be placed upon

the water supply to all manufacturing establishments, commercial houses, hotels, apartment houses, public buildings, theatres, libraries, and office buildings, and the charge for water be by meter measurement at a rate to be fixed by ordinance.

For two years the Water Committee of Councils has had under consideration the selection of a site for a reservoir to supply the northwestern district of the City, which has a population approaching 300,000 people, whose supply is from direct pumpage, and they are required to use the water with the discoloration and any impurities put into the river by freshets.

The Department has continuously during this time recommended the Queen Lane site as having superior advantages in location for supply and distribution, of proper elevation for the immediate district, and capable of distributing a supply to 19 square miles of territory. The matter has been postponed from time to time by the application of a few protesters, who claim that their property adjacent to the site will be damaged, notwithstanding the fact that no injustice can be done them, as the Courts will secure to them, and the City will pay, whatever damages they are entitled to. This matter is still before the Water Committee.

The necessary repairs have been made to the reservoirs, and the walks and driveways to them improved. The first portion of the contract with John B. Reilly, for the construction of the Roxborough reservoir, is about finished, and the contract for the completion has been executed by him; during the present year it is expected that the reservoir will be in service, and provide at all times subsided water for the districts it is to supply.

The following is a statement of the location, date of completion, elevation and capacity of the City's reservoirs :

Name of Reservoir.	Location.	Date of completion.	Height above City datum.	Capacity in Gallons.
Lehigh. Fairmount.	Reservoir No. 1.....	East Fairmount Park.....	94	26,350,800
	" " 2.....			
	" " 3.....			
	" " 4, Section 1.....			
	" " 4 " 2.....			
" " 4 " 3.....	" " 4 " 3.....	Sixth and Lehigh avenue.....	114	26,394,000
Section 1.....	" " 2.....			
" " 2.....	" " 3.....			
Spring Garden.....	Twenty-sixth and Master streets.....	1844	120	12,000,000
Corinthian.....	Corinthian avenue and Poplar street.....	1852	120	37,341,400
East Park.	Section 1.....	East Fairmount Park.....	183	62,737,632 306,400,622 304,788,860
	" " 2.....			
	" " 3.....			
Frankford.....	Oxford Turnpike and Comly street.....	1877	167	36,046,000
Belmont.....	West Fairmount Park.....	1870	212	39,768,000
Mount Airy.....	Allen's lane and Mower street, Germantown.....	1851	363	4,546,000
Roxborough.....	Ridge and Shawmont avenues.....	1866	366	12,888,000
Manatawna tanks—2.....	Manatawna and Ridge avenues.....	1878	442	100,000
Chestnut Hill tank.....	Hartwell avenue and Chestnut Hill Railroad, Chestnut Hill.....	1880	481	40,000
Total.....				869,238,514

The City should have reservoirs to contain ten days supply; accident to the pumping engines, of which there is no relay at either station, causes the City to be largely dependent upon its reservoirs for water supply in its many homes, its manufacturing industries, and for protection from fire; prudence in management would require the additions to be made at the earliest time.

The reservoirs have been located at heights to supply specific districts of the City according to their elevations; for the supply south of South street and between the Delaware and Schuylkill rivers, the reservoir capacity is 75,692,200 gallons, two and one-half days storage supply at present.

The East Park reservoir, capacity 673,874,614 gallons, fourteen days storage supply for the City between South and Vine streets, between the rivers, also for the north of Vine street east of Broad street to Jefferson street, east of Ninth street to Lehigh avenue, south of Lehigh avenue to Kensington avenue. This reservoir is also utilized for below South street when the Schuylkill river continues muddy for several days.

Wentz Farm reservoir, capacity 36,046,000 gallons, two and one-half days storage supply for Frankford, Bridesburg, and below Lehigh avenue to the connection of the supply from the East Park reservoir. By laying a distributing main from the East Park reservoir along Lehigh avenue to Frankford avenue, a portion of the district now depending upon Wentz Farm reservoir would be supplied from East Park; while this would reduce the storage capacity of the East Park reservoir to twelve days for its district, the reserve storage in the Wentz Farm reservoir would then be increased from two and one-half days to seven days for its district.

Roxborough reservoir, capacity 12,838,000 gallons, to be increased by the new reservoir 148,000,000 gallons, making a total capacity of 160,838,000 gallons, supplies the Twenty-first and Twenty-second Wards, the Twenty-eighth Ward above Westmoreland street, including Tioga, while the high

service station at the reservoir, by tanks, supplies the high district of Roxborough and the adjoining country.

Mt. Airy supplies a portion of Germantown, with a high service station for Chestnut Hill; the Roxborough and the Mt. Airy reservoirs jointly will provide twelve days supply for the above districts.

Belmont reservoir, capacity 40,000,000 gallons, less than three days supply. The higher districts of West Philadelphia should be supplied by a standpipe with a high service station.

Direct Pumpage.—The Fifteenth, Twenty-eighth, Twenty-ninth, and Thirty-second Wards, and one-half of the Twentieth Ward, are supplied with water by direct pumpage.

These facts show that when the additional pumping engines and mains are provided, there is sufficient storage of water for all districts, except three—south of South street, the direct pumpage district, and West Philadelphia.

As there is at present two and one-half days supply for the southern section of the City by reservoirs, it may be desirable to retain the Cambria site for the construction of a reservoir for additional storage for the lower portion of the City, to meet the demand that the improvements of the southern section, along the river front and toward League Island, will necessitate.

Filtering.—A filtering plant may be established with advantage for West Philadelphia or Frankford. The lower, central and northeastern parts of the City are now supplied with subsided water from the East Park reservoir. The Twenty-first and Twenty-second Wards may be provided from the New Roxborough reservoir. West Philadelphia, supplied from the basin at George's Hill, has the benefit of only three days subsidence, and when the water in the river continues muddy for a longer period it is supplied muddy. The same condition applies to Frankford.

The subject of filtration on a large scale is a matter of experiment, both as to cost and maintenance. As the quality

of water is improved by filtration, it is desirable that a system be tried. It is recommended that proposals be invited, by advertisement, for an experimental filtering plant at Belmont or at the Frankford station.

Distribution.—It should be here stated that the growth of the Water Department, from the construction of the first large reservoir to the present, the additions and increases have been made with skill and to the interest of the City, as the following history will show, although in public argument it has been implied otherwise.

In 1815 the first reservoir for the supply of the City was built upon Fairmount Hill, immediately adjacent to the steam pumping plant on the Schuylkill river. This basin was admirably located, the pumping mains being very short, and the elevation of the basin, 94 feet C. D., was more than adequate for the supply of the built-up portion of the City, which was on the lower ground along the Delaware river, and extending, probably, as far west as Tenth street. The appliances for the use of water were almost invariably limited to a hydrant in the yard or public pumps upon the footwalks. A lead pipe conducted the water from the supply pipe in the street to cedar tanks set in the ground near the curb. The flow of the water was regulated by a copper ball, and an ordinary pump lifted the water for domestic use and fire service.

Additions were made to this reservoir until 1836, when it was completed, as at present. It was used for the supply of the City, and the Districts of Moyamensing, Southwark, and, until 1844, for the Districts of Spring Garden, North Penn, Northern Liberties, Kensington and Richmond.

In 1844 the Incorporated Districts north of the City built the Morris City, or Spring Garden reservoir, at Twenty-sixth and Master streets, which was at a proper elevation for efficient service at that time. Owing to a disagreement between these districts, Kensington constructed, in 1852, a reservoir at Sixth and Lehigh avenue for its own use.

About the same time, West Philadelphia began works of its

own, consisting of a pumping plant and a standpipe at Thirty-fifth and Aspen streets, which were completed about the time of consolidation. These have since been abandoned.

The continued improvement to the City proper and the Southern Districts required a further reservoir capacity, and the Corinthian avenue reservoir was constructed in 1852.

About 1851 the Germantown Water Works were built by a company, in which a Queen of Spain held the principal part of the stock as an investment. The water was pumped from a dam on Tulpehocken Creek into a stand-pipe close by, and to a reservoir at Mt. Airy. They were purchased by the City in 1866.

The Chestnut Hill Water Works were built by a company about 1860. At first they consisted of a pump driven by a water wheel, and a stone tower, upon which was a cedar tank for a reservoir. The water required for moving the wheel was taken from a large reservoir filled from springs and surface water, and the supply for use was drawn from springs near the station and at the County line. The water power being inadequate, a steam plant was subsequently constructed. In 1873 these works came into the possession of the City by purchase.

In 1866 works for the supply of Manayunk and Roxborough were built, consisting of a steam pumping station at Flat Rock Dam, on the Schuylkill River, and a reservoir on Shawmont avenue, near Ridge road, and subsequently a high service station was located at the reservoir to pump into tanks at Manatawna.

In 1870 the old West Philadelphia Works being in a dilapidated condition, new works were built at Belmont and a reservoir at George's Hill. These works were suitably located for West Philadelphia at that time.

In 1877 the Frankford Water Works, consisting of a pumping station on the Delaware River, at Lardner's Point, were constructed.

In 1873 the East Park Reservoir was projected for the

supply of all of the lower part of the City, between the two rivers. It was completed in 1889.

A reservoir is now being constructed at Roxborough for additional storage for Germantown, Roxborough and Manayunk.

While this work has been done as necessity required it, it has been judiciously done, and for efficiency could not have been laid out better.

Present Supply:—A map of the City accompanying this communication, marked No. 1, shows the present arrangement of the distribution.

The lowest district comprises all that part of the City that can be supplied from :

Fairmount, with an elevation of 94 feet, C. D.,
 Corinthian Avenue, with an elevation of 120 feet, C. D., and
 Spring Garden, with an elevation of 120 feet, C. D.,

which will supply all that part of the City below South street between the two rivers, comprising the First, Second, Third, Fourth, Twenty-sixth and Thirtieth Wards, with an area of 14 square miles. The population in 1890 was 218,506, confined principally to the upper half of the district. The southern part is of a low elevation, most of it at present below high tide in the rivers. It will, however, be filled up and used for manufacturing establishments, to be located along the river fronts and the several railroads passing through it.

The combined capacity of the reservoirs is 75,692,200 gallons, which is a supply for two-and-one-half days.

The reasons for supplying this section from these reservoirs are as follows :

1. They are of sufficient elevation to supply this low ground, only a small part of the Thirtieth Ward being as high as 40 feet C. D.

2. Fairmount Works are a valuable and cheap pumping plant. The cost of pumping by water power is but 91 cents per million gallons lifted one hundred feet high, as against \$3 by steam. The wheels were not constructed to pump

higher than 120 feet, and to deliver water into the East Park Basin requires more power than they are able to stand.

For the above reasons it is not advisable to abandon the Corinthian Avenue and Spring Garden Basins, but to provide at an early day an additional reservoir.

The East Park Reservoir, with an elevation of 133 feet, in connection with the Lehigh Avenue Basin, with an elevation of 114 feet, supplies the following named wards: Fifth, Sixth, Seventh, Eighth, Ninth, Tenth, Eleventh, Twelfth, Thirteenth, Fourteenth, Sixteenth, Seventeenth, Eighteenth, Thirty-first, and about half of the following: Nineteenth, Twentieth, and Twenty-third, comprising an area of 8.003 square miles, with a population of 335,307. The storage capacity 700,268,614 gallons, or an apparent supply for fifteen days.

During low water in the Schuylkill when the wheels at Fairmount cannot be run, and when the river is objectionably muddy, this reservoir is drawn upon for the supply of the lower wards and the direct pumpage district.

Frankford Reservoir supplies the Twenty-third, Twenty-fifth and Thirty-fifth Wards, with half of the Nineteenth and Thirty-third Wards, the water mingling with the East Park water without any distinct dividing line. As before stated, if Frankford Reservoir be confined to the supply of the Twenty-third and Thirty-fifth Wards, it will have a storage capacity for seven days, and the storage in the East Park Reservoir will be reduced to twelve days.

The Direct Pumpage District, comprising the Fifteenth, Twenty-ninth and Thirty-second, and about half of the Twentieth and Twenty-eighth Wards, with an area of 6 square miles, has a population of 182,949. At present it requires about 30,000,000 gallons for daily supply.

This district, with the addition of about twelve more square miles, will constitute an intermediate service district, intended to be supplied with water from a reservoir located on Queen Lane, with an elevation of 234 feet C. D.

This reservoir is recommended there because of its central position, its elevation in connection with possible future supply, and for the reason that if placed on higher ground very little additional territory can be supplied, while the cost of pumping will be considerably increased.

West Philadelphia is at present supplied from the Belmont Reservoir, which contains less than three days storage. Its population is about 100,000, and the area 21 square miles, 8 of which are below a contour line of 50 feet C. D. 9 between 60 feet and 150 feet C. D., and 4 above 150 feet C. D.

The lower part, eight square miles, now being built up, should in the future be supplied by a reservoir at an elevation of about 125 feet, unless water be obtained by gravity. The 9 square miles should be supplied by a reservoir about 230 feet in height, and the higher district by a standpipe with a high service pumping station.

The upper Distribution District, comprising the Twenty-first, one-half of the Twenty-eighth, and nearly all of the Twenty-second Wards, has an area of about 23 square miles and a population of 82,892. It is at present supplied from the Roxborough and Mt. Airy reservoirs, which have a capacity of 17,389,000 gallons, and a storage of but little over one day.

The new reservoir now being built will have a capacity of 148,000,000 gallons, and will increase the storage to twelve days.

This reservoir can be supplied by pumpage from any conduit properly constructed hereafter from the Perkiomen and Tohickon creeks.

The high service stations pump water from the Roxborough and Mt. Airy reservoirs for the supply of Manatawna, Upper Roxborough, Chestnut Hill, and Upper Germantown, comprising an area of about five square miles, and a population estimated at about 12,532.

Map No. 2 shows the divisions of the City as proposed to be supplied when the necessary reservoirs shall have been

built, and when the increase of population in the now rural districts will require additional and higher service.

The lower district, below South street, now supplied from Fairmount, will be the same territory as at present, but an additional reservoir will be needed as the population increases.

The East Park District is increased and carried farther to the northeast, moving the Wentz Farm or Frankford District north of the Frankford Creek, and continuing it towards the northeast as this section becomes built up.

When the high ground of the Twenty-third and Thirty-fifth Wards shall require a water supply a new reservoir will have to be built.

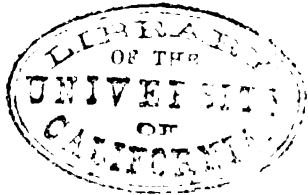
What is now the direct pumpage district will be supplied from the new reservoir at Schuetzen Park, and its territory will be increased by taking from the district now on the Roxborough and Mt. Airy basins, all ground below a contour of 165 feet C. D. This will decrease the territory now supplied from Roxborough, and limit its area between the contours of 165 feet C. D. and 300 feet C. D. Above 300 feet C. D. will be a high service district, which must depend upon direct pumpage from reservoirs and standpipes for its supply. West Philadelphia can be economically divided into three districts, the lowest comprising the low ground in the southern part of the Twenty-seventh Ward, can be supplied from a reservoir located at a height of 125 feet, which will give a good pressure to all parts below the contour of 60 feet.

The central part is to be supplied from a reservoir located at about a height of 230 feet, which will give proper service between the contours of 60 and 150 feet C. D., above which the supply must be by direct pumpage and standpipe.

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Recapitulation of Map No. 2.

District.	Area Sq. Miles.	Population.	Highest Point.	Lowest Point.
Fairmount	14	218,506	41	0
East Park	11	415,000	60	0
Frankford, Low Service.....	13	86,000	90	0
Frankford, High Service.....	29		240	90
Schuetzen	18	208,000	165	60
Roxborough.....	12	70,000	800	165
Roxborough, High Service.....	11		440	300
Belmont, Low Service	8	100,000	60	0
Belmont.....	9		150	60
Belmont, High Service.....	4		292	150

Map No. 1 shows the present distribution.

Map No. 2 shows the distribution as it should be.

Director's Office.

With the increased growth of the City the detail work of the office has increased proportionately in the general correspondence with the public and with each Bureau of the Department.

The following is a statement of the expenditures of the Director's Office for the year 1891:

Item 1. Salaries	\$14,143 62
Item 2. Horse keep, etc	500 00
Item 3. Printing, stationery and incidentals.....	2,097 12
Total.....	\$16,740 74

The suggestions for new work in the several Bureaus have been stated in detail under their respective heads, but I would respectfully ask your especial consideration to the following:

Gas.—The necessity of the City increasing its facilities for the manufacture of gas, its holder capacity, the extension of mains, and that provision be made that the City shall have exclusive ownership of the gas works.

Highways.—That an ordinance should be passed making it conditional that a dressed granite curb shall be set upon all streets hereafter prior to paving or repaving.

The importance of early legislation by Councils requiring that before paving or repaving any street, connections be made with all underground works, said connections to be led to the inside line of the curb by the City, and be paid for thereafter by those applying for attachment thereto.

The importance of more liberal appropriations for the maintenance of macadam roads.

The necessity of further legislation to empower the Department to compel property owners in suburban districts to comply with the ordinance relative to the grading, curbing and paving of sidewalks.

The importance of more liberal appropriations to the Department for repairing and painting bridges.

The propriety of the City adopting concrete foundations for all paving and repaving of the principal business streets.

Lighting.—The important necessity of the City establishing and owning its electric light plant for public lighting.

Street Cleaning.—The consideration of establishing crematories for the burning of garbage, etc., and granting the contractors the privilege of using them as a condition of their contract.

Surveys.—The renewal of the bridge continuing Girard avenue over the P. & R. R. R., and the timber bridge across the Schuylkill River at the Falls.

The additional appropriation required to complete the Walnut Street bridge.

The necessity of additional appropriations to enable the completion of main sewers, and for the construction of those required for the proper drainage of newly-improved portions of the City.

The early consideration of a subway to receive all underground work to be placed in the streets of the City under future ordinances.

Water.—In the matter of substituting larger mains for smaller ones, to secure a better supply of water in the business portion of the City, the Department asked for \$100,000, and the appropriation made was \$25,000; the additional \$75,000 should be provided for this important work.

The demand for a subsiding reservoir for the water supply of the northwestern section of the City, and for additional mains.

The passage of an ordinance providing that meters shall be placed upon the water supply of all manufacturing establishments, hotels, etc., as herein suggested, the charge to be fixed at a lower price and proportionate to the cost of pumpage.

It is recommended that proposals be invited, by advertisement, for a filtering plant at either Belmont or Frankford stations.

Receipts and Expenditures.—The appropriations, expenditures and receipts of the Department for the year 1891, are set out in the following table in detail by Bureaus, and also in totals for the year 1890.

Appropriations, 1892.

The following is an abstract of the ordinance making appropriations to this Department for the year 1892, with a statement of balances available from previous years for work ordered, and for which contracts are executed :

Bureaus.	Annual appropriation for the year 1892.	Balance available from previous years.	Total.
Director's Office.....	\$18,520 00	.....	\$18,520 00
City Ice Boats.....	37,400 00	.....	37,400 00
Bureau of Gas	2,806,268 98	\$54,200 25	2,862,469 18
Bureau of Highways	886,124 00	182,352 48	1,068,476 48
Bureau of Lighting.....	706,929 00	.....	706,929 00
Bureau of Street Cleaning.....	537,678 00	.....	537,678 00
Bureau of Surveys	1,108,326 00	787,330 63	1,895,556 63
Bureau of Water.....	1,348,394 00	108,081 92	1,456,475 92
Total.....	\$7,451,639 98	\$1,181,865 28	\$8,583,505 21

In concluding this report, it is with much satisfaction that I mention the faithful and able assistance of the Chief Clerk and the attention to duty by all the employes in my office; also the hearty co-operation of the Chiefs of the several Bureaus in the conduct of the business devolving upon this Department.

Thanking you, sir, for valuable assistance and the earnest support you have uniformly given me, I have the honor to be.

Very respectfully yours,

JAS. H. WINDRIM,

Director.

ANNUAL REPORT
OF THE
BUREAU OF WATER,
FOR THE YEAR 1891.

OFFICERS

OF THE

BUREAU OF WATER.

Chief,
JOHN L. OGDEN.

Assistants :

ALLEN J. FULLER,

WILLIAM WHITBY.

Draughtsmen :

John E. Codman,

Martin Murphy,
John R. Gorman.

William Samon,

Chief Clerk—Job T. Hickman.

Assistant Clerk—James G. Dixon.

Correspondence Clerk—P. DeHaven.

Search Clerk—H. J. Johnson.

Assistant Search Clerk—William J. Duffy.

Clerk—Thomas Spence.

Assistant Clerk—K. McNeal.

Assistant Clerk—J. J. Barney.

Time Clerk—W. J. Innes.

Pipe Inspector—Theodors S. S. Baker

Pipe Clerk—George G. Whitby.

Messenger—Haines Lewis.

Telephone Operators :

Mattie Whittingham,

Calvin Craner.

General Superintendent,

FRANK L. HAND.

Clerk to General Superintendent—John A. Hayes.

Assistant Clerk to General Superintendent—John B. Wright.

Engineers at Pumping Stations :

FAIRMOUNT—*Engineers*, William H. Cubbler, John W. Bronson.

SPRING GARDEN—*Engineers*, David Pyke, H. A. Gideon,

Abraham Stott, John L. McGinnis.

Telephone Operator—Fannie Shields.

BELMONT—*Engineers*, William Kiner, Thomas Seddon.

ROXBOROUGH—*Engineers*, Joshua Bartley, Archibald Weir.

MOUNT AIRY—*Engineers*, Henry W. Everly, William Fletcher.

CHESTNUT HILL—*Engineer*, Lewis Culp.

FRANKFORD—*Engineers*, Charles Douglas, William Maxwell.

Works—General.

Foreman Carpenter—Henry Guest.
Foreman Bricklayer—Frank A. Mooney.
Foreman Stonemason—Frederick Geiger.
Foreman Rigger—James Forrest.
Foreman Painter—Charles Ravenor.
Foreman Laborer—Matthew J. Richmond.
General Storekeeper—S. C. Buchanan.
Electrician—Henry P. Morgan.
Superintendent of Shop—James H. Dean.
Clerk to Superintendent of Shop—Jonathan Bonsall.

Purveyors :

First District, John H. Holmes.

Clerk, William J. Mackey.

General Foreman, James Humes. *Foreman of Repairs*, W. W. Wellington.
Office, 1120 Wharton street.

Second District, David A. Craig.

Clerk, Charles H. Green.

General Foreman, Michael Young. *Foreman of Repairs*, Edw. Homan.
Office, 918 Cherry street.

Third District, Charles J. Lowry.

Clerk, J. A. Spanagle.

General Foreman, Elias Abrams. *Foreman of Repairs*, Wm. Magee.
Office, 1420 Frankford avenue.

Fourth District, John Montgomery.

Clerk, Arthur B. Cook.

General Foremen, George W. Showaker, James H. Forbes.
Foreman of Repairs, James Hutchinson.
Office, Twenty-sixth and Master streets.

Fifth District, Henry Dawson.

Clerk, F. J. Cornman.

General Foreman, Charles Frank.
Office, Lyceum Building, Roxborough.

Sixth District, George H. Laut.

Clerk, William D. Kinsler.

General Foreman, Samuel Loeb.
Office, Town Hall, Germantown.

ANNUAL REPORT
OF THE
BUREAU OF WATER,

For the year 1891.

Philadelphia, January 30, 1892.

JAMES H. WINDRIM, Esq.,
Director Department of Public Works.

SIR:—The operations of the Bureau of Water for the year 1891 are herewith respectfully submitted.

Receipts.

The following tables furnished by the Receiver of Taxes show in detail the receipts from water rents and other sources.

Total Receipts Bureau of Water for the Year 1891.

MONTHS.	Searches.	Delinquent Rents.	Delinquent Penalties.	Rents 1891.	Penalties. 1891.	Fractional Rents.	Water Pipe.	Bureau of Water Department of Public Works.	TOTALS.
January	\$885 25	1,714 75	\$156 61	\$288,202 91	.....	\$18,758 96	\$6,178 52	\$691 50	\$27,085 59
February	360 25	985 80	112 47	382,864 72	.....	19,238 78	6,058 88	100 58	315,009 67
March	428 50	1,985 00	271 90	1,096,667 20	.....	11,446 80	5,980 63	629 55	403,707 10
April	467 50	3,072 50	409 21	55,009 45	.....	20,603 62	6,958 12	142 59	1,128,310 74
May	471 00	901 75	130 83	77,582 70	\$2,759 78	18,774 89	11,602 83	301 78	190,852 81
June	489 00	8,613 30	1,235 15	15,006 75	.....	12,395 87	9,799 91	40 73	116,117 54
July	421 50	1,979 50	290 31	24,005 50	2,275 12	21,298 25	14,048 84	2,682 23	58,597 50
August	302 75	938 00	140 70	51,843 85	8,690 88	14,135 48	18,409 18	350 70	62,573 19
September	368 75	1,894 00	279 02	28,687 11	7,766 23	9,919 51	18,667 54	100 00	90,888 90
October	471 75	624 25	91 65	22,179 50	4,221 60	30,569 90	14,525 32	302 51	7,494 09
November	450 50	1,423 50	212 65	3,325 40	3,325 40	8,872 73	14,227 19	418 51	51,109 98
December	440 00	1,101 50	164 50	11,167 70	1,672 32	14,858 57	12,724 02	543 02	42,671 63
Totals	\$5,046 75	\$25,133 85	3,485 00	\$2,057,417 39	\$29,672 21	\$200,868 36	\$138,180 98	\$6,503 70	\$2,466,368 24

Receipts through the office of the City Solicitor, 1891.....

Total receipts of the Bureau of Water for the year 1891.....

Receipts as previously estimated.....

\$84,394 49

\$2,500,702 73

2,500,000 00

YEAR.	Rents.	Meter Rents.	Ferrules.	Repairs.	TOTALS.
1891.....	\$62,623 52	\$108,151 34	\$26,019 00	\$4,074 50	\$200,868 36
1890.....	66,224 25	68,296 40	33,407 25	3,973 26	171,901 15
Increase.....	\$3,600 73	\$39,854 94	.....	\$101 25	\$28,967 21
Decrease.....	.....	.....	.....	.....	.....

Revenue for Ten Years, 1882 to 1891, inclusive.

YEARS.	Delinquent Water Rents.	Delinquent Penalties.	Water Rents.	Penalties.	Fractional Rents.	Water Pipe.	Searches.	Chief's Office.	City Solicitor's Office.	Totals.
1882	\$75,543 01	\$11,479 18	\$1,285,419 87	\$18,016 23	\$49,529 90	\$84,979 52	.....	\$7,515 88	\$21,421 05	\$1,516,904 64
1883	69,995 84	10,810 00	1,380,882 17	23,280 44	67,068 10	45,803 09	.....	8,515 11	21,144 41	1,627,069 16
1884	19,837 72	2,492 87	1,566,027 57	22,797 76	77,557 40	71,542 00	461 50	10,670 80	21,098 20	1,792,486 01
1885	11,267 25	1,561 03	1,567,031 94	22,298 78	101,648 98	92,182 18	1,988 75	9,197 00	18,993 23	1,896,164 04
1886	16,049 50	1,964 42	1,637,296 69	21,877 89	97,219 62	122,743 91	2,960 00	10,121 36	24,594 95	1,983,828 84
1887	19,040 87	2,705 79	1,721,488 83	24,453 03	115,939 21	106,602 48	3,412 75	7,287 61	29,504 04	2,050,434 61
1888	18,995 04	1,948 54	1,793,432 38	23,584 86	118,550 16	123,667 85	4,158 25	7,742 45	22,846 97	2,114,826 50
1889	23,407 23	3,332 78	1,846,543 49	24,247 95	143,394 73	149,611 63	5,066 25	11,363 70	33,043 09	2,241,999 85
1890	25,472 39	3,622 69	1,958,551 95	26,270 94	171,901 15	141,884 27	5,236 75	9,730 83	38,867 73	2,381,037 70
1891	25,183 85	3,495 00	2,057,417 39	29,672 21	200,868 36	138,180 98	5,046 75	6,503 70	34,394 49	2,500,762 73
Totals	\$301,792 70	\$42,912 40	\$16,826,091 28	\$236,000 09	\$1,138,692 51	\$1,037,247 91	\$28,320 00	\$89,648 53	\$285,408 16	\$19,965,113 68

Comparative Statement.

1891	\$25,183 85	\$3,495 00	\$2,057,417 39	\$29,672 21	\$200,868 36	\$138,180 98	\$5,046 75	\$6,503 70	\$34,394 49	\$2,500,762 73
1890	25,472 39	3,622 69	1,958,551 95	26,270 94	171,901 15	141,884 27	5,235 75	9,730 83	38,867 73	2,381,037 70
Increase	.....	.....	\$98,865 44	\$3,401 27	\$28,967 21	.....	.....	.....	.....	\$119,725 03
Decrease	\$288 54	\$127 69	.....	.....	.....	.....	.....	.....	.....	.....

Fractional Rents 1891.

Months.	Rent.	Ferrules.	Repairs.	Meters.	Totals.
January.....	4,355 30	249 00	172 00	13,978 66	\$18,758 96
February.....	5,684 18	636 00	72 00	12,446 60	19,238 78
March.....	9,026 64	1,620 00	300 00	500 16	11,446 80
April.....	9,827 59	2,662 00	264 00	7,850 08	20,603 62
May.....	6,988 15	2,771 00	384 00	8,631 74	18,774 89
June.....	6,705 65	2,931 00	352 00	2,407 22	12,395 87
July.....	4,543 89	2,847 00	512 25	13,890 11	21,293 25
August.....	3,169 78	2,494 00	368 25	3,103 45	14,135 48
September.....	4,114 55	2,662 00	300 00	2,842 96	9,919 51
October.....	2,301 15	3,148 00	618 00	24,002 75	30,569 90
November.....	1,915 74	3,855 00	503 00	2,598 99	8,872 73
December.....	3,490 90	644 00	225 00	10,493 67	14,858 57
Totals.....	62,623 52	26,019 00	4,074 50	108,151 34	200,868 36

The revenue from all sources has exceeded two-and-one-half millions of dollars, and shows an increase over the previous year of \$119,725.03.

The greatest increases were in the items of water rents, \$98,865.44, and fractional rents or new permits for the use of water, \$28,967.21.

The receipts from delinquent rents and penalties were less than during the previous year, as were also the items for water-pipe and collections by the Law Department.

Appropriations.

The sum of \$783,603 was appropriated for current expenses, and \$745,000 for extensions. There was available from the previous year the sum of \$352,080.48, the total being \$1,880,683.48.

For extensions the principal items were :

For the new Roxborough reservoir.....	\$515,000
For new supply mains.....	321,729
For new engine at Spring Garden.....	72,500
For new engine at Roxborough.....	75,000
For new boilers at Spring Garden and Mt. Airy.....	20 182
For new boiler house and stack at Spring Garden.....	14,595
For alterations to engine house at Spring Garden.....	6,000

Expenditures.

For current expenses.....	\$781,227 83
For extensions.....	749,066 21
	<hr/>
Total.....	\$1,530,294 04
Amount not merging.....	108,081 92
Amount merging.....	242,307 52
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The amount due on unpaid bills is approximately.... \$20,000 00

Of the amount merging, \$149,000 had been set aside for the completion of the new Roxborough reservoir ; the contract had been executed, but owing to some delay it did not reach the office of the City Controller until after December 31.

The sum of \$75,000 was intended for a new ten million gallon engine at the Roxborough pumping station. The engine had been advertised for, but the bids were not received before the end of the year.

The balance was for engineering expenses connected with the construction of the reservoir and for alterations to the engine house at Spring Garden station.

In the appropriation ordinance for 1892 a provision was made that these items should not merge, but the ordinance was not approved until after January 1, in consequence of which the City Controller merged \$242,307.52 into the City Treasury, and the Bureau of Water was deprived of this amount for the following year.

For expenditures in detail see Appendix B.

Appropriation and Expenditures.

Appropriation, December 29, 1890.	Amount appropriat'd	Amount expended.	Amount merging.	Amount not merging
Item 1. For salaries:				
Office, Chief of Bu- reau, etc.....	\$100,498 00		\$99,292 80	
Pumping Stations.....	83,805 00		83,059 96	
	\$184,303 00			
Transferred to Item 7	\$1,500 00	\$182,803 00	182,352 76	\$450 24
Item 2. For general supplies, in- cluding fuel, oil and small stores.....	\$160,000 00			
Transferred to Item 3.....	\$10,000 00			
Transferred to Item 4.....	15,000 00			
	\$25,000 00	135,000 00	135,000 00	
Item 3. For repairs to machinery, including the conveyance of workmen incident thereto	\$50,000 00			
Transf'ed from Item 2	10,000 00	60,000 00	59,798 57	201 43
Item 4. For maintenance and repairs to building, grounds and reser- voirs.....	\$60,000 00			
Transf'ed from Item 2	15,000 00	75,000 00	74,708 24	291 76
Item 5. For repairs and improvement of distribution, including the purchase of material and cost of labor in connection therewith and expenses incident there- to	\$90,000 00			
Transferred from De- partment of Public Safety.....	10,000 00	100,000 00	99,218 02	781 98
Item 6. For supplies and labor at City shops.....		75,000 00	75,000 00	
Item 7. For general, incidental and contingent expenses, including keep of horse for chief, general superintendent and assist- ant	\$14,000 00			
Transf'ed from Item 1	1,500 00	15,500 00	15,497 56	2 44

Appropriation and Expenditures—Continued.

Appropriation, December 29, 1890.	Amount appropria'd	Amount expended.	Amount merging.	Amount not merging
Item 8. For purchase of material and cost of labor in connection with laying service pipes and expenses incident thereto.....	\$125,000 00	\$124,967 49	\$32 51	
Item 8½. For refunding to parties money expended in laying water pipes.....	3,300 00	2,705 13	594 87	
Item 8¾. For purchase of material and cost of labor in connection with the laying of service pipes and expenses incident thereto. Appropriated Nov. 12, 1891.....	12,000 00	11,980 06	19 94	
Item 9. Extensions..... \$500,000 00				
Balance from books				
1890..... 1,080 48	501,080 48	464,606 17	11 24	\$36,463 07
Item 9½. Extensions. Balance from books 1890.....	351,000 00	279,381 15		71,618 85
Item 9¾. Extensions. Appropriation June 1, 1891.....	245,000 00	5,078 89	239,921 11	

Pumpage.

The total number of gallons pumped was as follows :

Fairmount Station.....	11,380,824,570	
Spring Garden Station.....	30,874,325,871	
Belmont Station.....	5,278,353,709	
Roxborough Station.....	3,745,192,134	
Chestnut Hill Station.....	30,726,841	
Frankford Station.....	3,369,493,283	
Total.....		54,678,916,408
Supplementary	Roxborough.....	17,125,732
Lift.	Mount Airy.....	524,406,500
	East Park.....	445,199,360
Total.....		986,731,592
Grand total.....		55,665,648,000

Total Gallons Pumped During 1891.

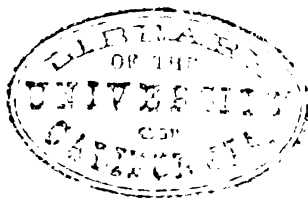
Month.	Water Power.	Steam Power.	Totals.	Average gall'ns per day.
January.....	1,003,436,777	3,258,087,384	4,261,524,161	129,700,386
February.....	1,072,570,157	2,484,162,029	3,506,732,186	125,240,435
March.....	1,102,117,118	3,093,122,066	4,195,239,179	134,171,173
April.....	1,095,652,170	3,048,120,922	4,143,773,092	138,125,769
May.....	1,061,444,558	3,765,962,475	4,827,407,033	155,722,807
June.....	691,273,478	4,011,491,698	4,702,765,176	156,758,589
July.....	811,751,184	4,272,930,266	5,084,681,450	164,021,982
August.....	1,012,777,592	4,194,114,829	5,206,892,421	166,021,543
September.....	986,809,102	4,145,892,302	5,132,701,404	171,090,046
October.....	749,213,467	4,704,118,349	4,953,331,816	159,784,897
November.....	781,996,447	4,126,733,355	4,908,729,802	163,624,326
December.....	1,011,782,525	3,730,087,755	4,741,870,280	149,472,292
Totals.....	11,380,424,570	44,284,823,480	55,665,248,050	162,508,624

The following table shows the gallons pumped, the cost per million gallons, and the daily consumption per capita during the ten years from 1882 to 1891, inclusive:

Pumpage Tables for the years 1882 to 1891, inclusive.

Year.	No. of gallons pumped to Reservoirs.	No. of gallons pumped 100 feet high.	Cost per million gallons pumped 100 ft. high.	Gallons per capita per day.	Estimated population.
1882	24,691,440,430	37,873,303,258	\$6 66	76	890,000
1883	25,234,957,251	37,949,320,701	6 51	75	911,000
1884	25,495,179,353	39,001,865,294	5 54	74	932,000
1885	25,165,020,072	39,908,901,886	4 70	72	953,000
1886	28,658,966,569	46,255,361,203	4 13	80	975,000
1887	32,426,779,765	51,289,948,831	3 99	89	995,000
1888	37,068,763,428	59,483,531,199	4 49	100	1,020,000
1889	42,518,919,781	69,034,118,434	3 87	110	1,050,000
1890	51,698,508,699	84,501,451,686	3 05	131	*1,046,000
1891	55,665,648,000	93,490,106,725	2 99	140	1,071,672

* U. S. Census.



The total gallons pumped, including the high service, were 55,665,648,000, an increase over the previous year of 3,967,139,301, or seven per cent.

There were pumped for the high service supply a total of 986,731,592 gallons, which, deducted from the total pumped, gives 54,678,916,408 the actual consumption.

In the number of gallons consumed there was an increase of 4,405,019,930 over the previous year.

About six per cent. of the water was taken from the Delaware river and the balance from the Schuylkill.

Twenty per cent. was pumped by water power—a decrease of five per cent.

The increase in the quantity pumped by steam, including the high service, was eleven per cent.

The cost of pumping has been slightly reduced, notwithstanding the fact that the wages account of the employees of the several pumping stations was increased \$5,362.85, and the item of repairs was \$8,780.68 greater than during the preceding year.

During 1890 the cost of pumping one million gallons 100 feet high, for coal alone, was \$1.92. During 1891 the cost was \$1.63, making a total saving of \$23,811.61; or in other words, 82,109 millions of gallons were pumped 100 feet high during 1891 for \$134,942.91, against 72,138 millions of gallons during 1890 for \$138,429.25.

This reduction in cost was due to the substitution of washed buckwheat anthracite coal for pea coal, the average price of the former being \$1.80½ per ton, and the latter \$2.05 per ton. During 1892 there will be a still greater reduction, owing to a much lower price bid for buckwheat coal.

This substitution was made without any expense for new grate bars, or for any other change, the smaller coal being as readily burned on the old grates as the larger size.

The following table shows the quantity of water pumped at Fairmount since 1880 :

Year.	Gallons per 100 feet.	Repairs.	Cost per mll. gal.
1881.....	7,575,826,689	\$2,197 72	\$2 21
1882.....	9,377,468,535	2,733 95	1 74
1883.....	9,757,096,729	2,992 62	1 45
1884.....	8,575,107,594	2,795 33	1 35
1885.....	6,847,346,991	7,893 91	2 33
1886.....	7,282,553,795	9,895 87	2 23
1887.....	10,105,736,663	5,582 83	1 18
1888.....	11,241,113,108	6,958 00	1 44
1889.....	11,413,836,469	4,800 44	1 24
1890.....	12,862,987,130	4,900 00	91
1891.....	11,880,824,730	5,900 00	1 14

The increase in the cost of pumping by water power was due to the low water in the river. The total number of hours the wheels were stopped on this account was 8,510, or 4,890 more than during the previous year.

The following table shows the gallons of water pumped by each wheel, the hours stopped, and the cause :

Fairmount Pumping Station, 1891.

Wheels.	Total pumpage.	Hours pumped.	Hours shut down. High water.	Hours shut down. Low water.	Hours shut down. Muddy water.	Hours shut down. Full basin.	Hours shut down. Repairs.
1	840,688,896	8.479	35	65	15	12	154
3	2,270,023,980	8.490	34	79	15	8	189
4	2,244,274,245	8.348	80	128	37	.....	167
5	1,962,256,236	7.702	43	893	39	2	81
7	1,838,753,818	5.740	52	2,478	40	15	440
8	1,447,169,730	6.180	58	2,313	40	32	137
9	1,277,657,875	5.550	56	2,559	18	32	545
	11,380,824,730	50.489	358	8,510	204	96	1,663

Consumption.

The total number of gallons consumed was 54,678,916,408, a daily average of 149,805,250. which is a per capita consumption of 140 gallons on an estimated population of 1,071,672. This is an increase of nine gallons over the year, and forty gallons since 1888.

Some experiments have been made for the purpose of accounting for this increase—one in the centre of the City and two in manufacturing districts.

The first selected was the square between Broad and Thirteenth and Walnut and Spruce streets, which was isolated by closing the necessary stops except at Juniper and Walnut streets, where the water passed through a six-inch meter.

A house to house inspection was first made for leaks. Three spigots were found wasting some water, and they were repaired. No other leaks could be detected. All of the houses were supplied with curb stops to shut off the water.

This district contained one hundred and thirty-one buildings, as follows :

Dwellings.....	104
Dwellings and stores.....	3
Dwellings and stables.....	2
Stables.....	12
Stores	3
Historical Society.....	1
Library	1
College	1
Theatres	2
School	1
Club house.....	1
Total.....	131
Population.....	794

There were no manufacturing establishments, and the appliances for the use of water were as follows :

Hydrants	96
Wash paves.....	71
Spigots, kitchen.....	384

Spigots, bath tubs.....	244
Spigots, wash tubs.....	12
Spigots, wash stands.....	256
Spigots, in cellars.....	38
Spigots, in bar room.....	3
Spigots, fire hose.....	19
Spigots, pantry.....	74
Water closets, with handle...	41
Water closets, in yard.....	16
Water closets, flush tank.....	134
Urinals.....	13
Urinals, stalls.....	5
Motor.....	1
Beer pump.....	1
Ice cooler.....	1
Steam boilers.....	2
The water rents amount to \$2,335.55.	

Readings of the meter made every hour from November 4th to 18th, inclusive, showed an average daily consumption of 89,760 gallons, equal to 113 per capita.

Forty-one and four-tenths per cent. were used between six o'clock P. M. and six A. M., and forty-eight and six-tenths per cent. between six A. M. and six P. M., or

Between 6 P. M. and 12 P. M.....	28.1	gallons per capita.
Between 12 P. M. and 6 A. M.....	18.7	" " "
Between 6 A. M. and 12 M.....	33	" " "
Between 12 M. and 6 P. M....	33.2	" " "

Total 113.

It was at first supposed that on account of the large amount of water passing through the meter between 12 P. M. and 6 A. M. there were some leaky pipes, but none could be discovered.

Three urinals and five urinal stalls were found to be constantly running. It was not practicable to measure the water used by them, but by metering similar appliances, under similar conditions, an approximation was made. It is certain that they use not less than 43,450 gallons daily, one-fourth of

which is within 3,926 gallons of the total used between 12 P. M. and 6 A. M.

In addition to the above there were eight syphon urinals running constantly, but the amount of water they use has not yet been ascertained.

Average consumption.....	794 people, 24 hours,	89,760 gallons.
Three urinals.....	...	3,450 gallons.
Five stalls.....	40,000 gallons.	43,450 gallons.
		<hr/>
		46,310 gallons.

This amount represents a consumption per capita of 58 gallons exclusive of the water used by the urinals. By the constant running of these appliances nearly fifty per cent. of the water used passes through them.

By experiment it was found that the least amount of water that can be used to effectually wash urinals with the water running constantly is 1,150 gallons daily, or 419,750 gallons yearly, which at meter rates amounts to \$33.58. The rent now charged is \$2.00.

Running at full capacity as some do, they would each use annually about \$179.85 worth of water at meter rates.

The examination of this locality will be continued with the assistance of a Deacon waste water meter.

Similar examinations should be made over the entire City. Much waste could be prevented, but this experiment shows that the largest proportion of the waste is legalized through appliances that of necessity use a large amount of water. The only check that can be put upon them is a meter, which will either make payment for the water used, or compel the shutting off of the water when the use of the appliance is not required.

The second experiment was made by placing meters on the mains supplying a large manufacturing establishment in the Twenty-eighth Ward. During the first eight days the water passed through the meters at the rate of 600,000 gallons per

day, or 219,000,000 per annum. The water was delivered under 140 pounds pressure from the Roxborough reservoir.

The water pumped at Roxborough supplies Manayunk, Falls Village, Chestnut Hill, Germantown and Tioga, the total gallons for the entire year being 3,745,192,134.

It will thus be seen that one-seventeenth of all of the water pumped at this station was used by this one establishment, which should pay by meter rate the sum of \$17,520.00 annually. The amount charged by assessment is but \$1,792.00.

The third experiment was made in a manufacturing district in the Thirty-first Ward, which contained :

- 200 Dwelling houses.
- 13 Manufacturing establishments.
- 7 Dye houses.
- 5 Stables.
- 2 Stores.
- 1 Church.
- 1 Slaughter house.
- 2 Offices.
- 1 Saloon.

The resident population was 849, and the transient population employed in the mills and dye houses numbered 1,733.

The water consumed amounted to 1,292,544 gallons daily, or 1,522 gallons per capita of resident population. These investigations were only preliminary and to obtain experimentally some idea of the best manner of conducting further examinations throughout the entire City for the purpose of stopping waste and reducing the per capita consumption, and for increasing the revenue of the City from water rents.

Rain-fall.

Eight years of continuous records of the rain-fall on the Perkiomen, Neshaminy and Tohickon streams have been completed.

The total for the eastern counties of Pennsylvania was 50.07 inches, being 1.50 inches above the average for the past nine years. For report in detail, see Appendix F.

Flow of the Schuylkill.

By adding together the daily flow to waste over the flash boards on Fairmount dam, we have a total of 64 feet 10 inches for the year, which is 23 feet 7 inches less than during the previous year, and 31 feet less than during 1889.

Only 36 per cent. of the rain-fall in the Schuylkill valley can be accounted for at Fairmount, which gives an average daily flow of 1,512,400,000 gallons.

The greatest monthly flow was during January and the least in June.

The greatest daily flow was 38 inches on August 25th.

Quality of the Water.

At times the water has been very objectionable in appearance and the blackish water following a storm remained in the river longer than usual. The quantity of stored water was occasionally insufficient to last until the river became clear. Additional subsiding and storage basins are therefore a necessity.

Several analyses of the water were made by three experts in connection with a purifying plant temporarily placed at the Belmont station, and the following extracts from their reports show the condition of the river water.

Dr. Samuel G. Dixon on two occasions collected water at Belmont and submitted each sample to sixteen bacteriological analyses with the following results :

In 1 c. c. of water 1,678 points of micro-organic life were found.

In 1 c. c. of water 813 points of micro-organic life were found.

Extracts from Dr. Dixon's report: "The number of bacteria was astonishingly small and indicated from a numerical bacteriological point a fairly potable water." "At this stage of the analysis I am inclined to believe that all of the colonies represent non-pathogenic or non-disease producing bacteria."

The following table is taken from a report by Drs. Henry Leffman and William Beam :

Parts in 100,000.

1891.	APPEARANCE	Nitrogen as ammonium.	Nitrogen by permanganate.	NITRITES.	Nitrates.	Oxygen consumed.
July 11...	Turbid.....	0.023	0.054	None	0.44	
Aug. 19...	.....	0.032	0.102	Trace.....	0.57	4.10
Aug. 22...	Turbid.....	0.04	0.08	Trace.		
Aug. 26...	Very turbid.....	0.08	0.16	Trace.....	.....	4.45
Sept. 17...	Very turbid and yellow	0.022	0.058	Marked amount.....		2.85
Sept. 23...	Slightly turbid.....	0.024	0.066	Trace.....		1.700
Oct. 12...	Turbid.....	0.02	0.062	Trace.		

The following is from a report of Dr. N. Wiley Thomas, Professor of Chemistry, at Girard College :

Parts per 1,000,000.

BELMONT WATER WORKS.	SOLIDS.		ODOR.		APPEARANCE.			NITROGEN.				Oxygen consumed.
	Date of collection.	Total.	Fixed.	Hot.	Cold.	Sediment.	Turbidity.	Color.	Albuminoid ammonia.	Free ammonia.	Nitrites.		Nitrates.
November 14.....	194.	102.	Slight	Very slight...	Very little ...	Considerable	Yellow.....	0.130	0.020	0.00032	0.70	1.192
November 19.....	186.	106.	Disagreeable	Disagreeable	Considerable	Very cloudy..	Yellow.....	0.135	0.025	0.0004	0.70	1.263
November 24.....	193.	112.	Very little....	None	None.....	Cloudy	Yellow.....	0.130	0.014	0.0003	0.65	1.052
November 26.....	190.	128.	Slight.....	Very slight...	Very little ...	Cloudy	Yellow.....	0.060	0.012	0.0003	0.45	0.842
December 1.....	204.	180.	Disagreeable	Disagreeable.	Considerable	Very cloudy..	Yellow.....	0.100	0.010	0.0004	0.50	0.925
December 11.....	264.	184.	Disagreeable	Disagreeable.	Considerable	Very turbid.	Light brown	0.140	0.001	0.0006	0.65	1.718

N. WILBY THOMAS.

Pumping Stations.

A new boiler house and stack were built at the Spring Garden station. Five new boilers were placed therein and fired on November 5th, after which five old boilers in an adjoining room were removed and preparations made for the reception of a new twenty million gallon engine, under contract.

The old boilers could not be dispensed with until the new ones were serviceable, and this has caused some delay in beginning the engine foundations. With the new engine the capacity of this station will be one hundred and sixteen millions (116,000,000) of gallons.

At Mount Airy station a small boiler house was added, in which a new steel boiler was placed. A Knowles pump of one million gallons capacity, taken from the Roxborough high service station, was put in, both the engine and boiler being in reserve in case of accident to the original plant.

At the Frankford station a new pump was put on the Corliss engine in place of one broken, and the engine is being strengthened in other parts.

The remaining pumping stations have been kept in good order, the usual repairs to the engines and buildings having been made when required.

Reservoirs.

On January 26th a slide occurred on the inside slope of one section of the East Park reservoir. The bank was repaired and strengthened by means of a concrete wall.

At the Lehigh avenue basin the top of the banks were paved with asphalt, a new fence placed around on the edge of the inner slope, and the driveway paved with slag blocks laid between granite curbing.

At the Corinthian avenue basin a new fence was placed around the top of the bank, and the footway up the slopes paved with slag blocks.

The work on the New Roxborough reservoir has progressed satisfactorily, and the banks are about completed with the exception of the clay lining. The contract for completing the work has been awarded to Mr. John B. Reilly, the present contractor for the excavation, etc.

For report in detail see Appendix C.

Distribution.

The total feet of pipe laid during the year were two hundred and twenty-one thousand three hundred and thirty-six (221,336), or more than forty-one (41) miles, making a total in use of over one thousand and one (1,001) miles.

Six hundred and thirty-one (631) fire hydrants have been set in new locations; two hundred and seventy-five (275) have been removed, adding three hundred and fifty-six (356) to the number in use, which is now eight thousand one hundred and five (8,105).

A thirty (30) inch supply main was laid in Bainbridge street, between Broad and Front streets; a sixteen (16) inch supply main in Snyder avenue, from Moyamensing avenue to west of Fifth street; a thirty-six (36) inch supply main in Fifty-second street, from Walnut street to Baltimore avenue, and a thirty (30) inch from Baltimore avenue to Woodland avenue; a twenty (20) inch supply main in Haverford avenue, from Thirty-fifth street to Lancaster avenue; and in Fortieth street, from Lancaster avenue to Haverford avenue.

A forty-eight (48) inch supply main was laid from Twenty-fifth and Spring Garden streets to Thirty-third and Master streets; a thirty-six (36) inch supply main was laid from Twenty-seventh and Thompson streets to Twenty-ninth and York streets; a twenty (20) inch supply main from Twenty-seventh and Montgomery avenue to Broad and Norris streets; a twenty (20) inch supply main in Wissahickon avenue from Allen's lane to Rittenhouse street, and a twelve (12) inch main in the latter street to Manheim street.

In Rittenhouse street a sixteen (16) inch main was laid from Wissahickon avenue to Pulaski avenue.

All of this work was contracted for except the laying of the pipes.

The laying of these mains has greatly improved the distribution in parts of the City which before received but a short supply, particularly in West Philadelphia and Germantown.

The Cost of Labor for laying the above Supply Mains, not including the 16-inch Main laid in the First District, is shown in the following table,

LOCATION.	Size.	Length.	Excavation, Cubic Yards.	Total Cost of Pipe Trench.	Average Cost per Cubic Yard.	Average Cost per Lineal Foot.	Cost of Labor Laying Pipe.	Cost of Labor per Lineal Foot.	Total Cost of Labor and Excavation.	Cost of Labor and Excavation per Lineal Foot.
Supply main, from Twenty-fifth and Spring Garden streets to Stand-pipe Hill.....	48 in.	6,709 ft.	11,068	\$5,940 10	Cts. 53.7	Cts. 88.5	\$5,892 00	Cts. 77.8	\$11,832 10	\$1 76
*Supply main, from Twenty-seventh street and Montgomery avenue to Broad and Norris streets.....	20 "	7,008 "	3,934	7,499 86	78.	57.8	1,144 95	16.3	11,774 44	Cts. 90.7
†Supply main, from Twenty-seventh and Thompson sta. to Twenty-ninth and York streets.....	36 "	5,967 "	6,354			3,182 63	52.5			
*Supply main, Bainbridge street, from Front to Broad street.....	30 "	6,131 "	6,457	3,680 48	57.	60.	2,421 53	39.5	6,102 01	99.5
Supply main, Fifty-second street, from Walnut street to Woodland avenue.....	30 "	4,655 "	6,417	2,823 48	44.	35.2	1,362 56	29.2	5,567 00	69.4
	36 "	3,360 "					1,380 96	41.4		
Supply main, on Wissahickon avenue and Rittenhouse street.....	16 "	3,415 "	3,162	5,567 00	68.2	44.7	887 26	13.8	8,014 97	64.4
	20 "	9,026 "					1,560 71			
‡Supply main, Haverford street, Thirty-fifth street to Lancaster avenue.....	20 "	2,672 "	1,888	1,208 32	64.	45.2	1,067 54	39.9	2,275 86	85.1

* Car Track part way. † This item does not include 333 feet where the Pennsylvania Railroad is crossed, which cost \$5,927 53 or 17.80 per Lineal Foot, complete. ‡ Car Track all the way.

Pipe Inspection.

Water pipes and special pipe castings were made during the year at the following foundries :

Gloucester Iron Works, Gloucester, New Jersey.
Camden Iron Works, Camden, New Jersey.
Donaldson Iron Co., Emaus, Pennsylvania.
Mellert Foundry and Machine Co., Reading, Pennsylvania.

The inspection of this work was accomplished with one Chief Inspector and two assistants.

The following table shows the extent and result of the work :

Pipes and Specials.	Inspected.	Rejects.	Total Accepted.
3-inch pipes.....	352	52	300
4-inch pipes.....	327	27	300
6-inch pipes.....	16,361	1,361	15,000
8-inch pipes.....	584	84	500
10-inch pipes.....	578	73	500
12-inch pipes.....	831	131	700
16-inch pipes.....	376	26	350
20-inch pipes.....	1,733	83	1,650
30-inch pipes.....	1,016	116*	900
36-inch pipes.....	985	85	850
48-inch pipes.....	896	46	850
Small specials.....	4,985	203	4,782
Large specials.....	516	33	483
Total.....	29,485	2,320	27,165

The pipes were delivered, lined upon the streets ready for laying. The price varied from 1.19 to 1.373 cents per pound. The iron used stood a tensile strain of 25,000 pounds. About eight per cent. of the castings were rejected for various reasons.

Meters.

The total number of meters in use on December 31st was six hundred and ninety-seven.

The use of the meters tends to the checking of waste and they equalize the charges for the use of water. Every consumer pays the same rate, while by assessment it is possible for one party to pay much more and another very much less in proportion to the water used.

The charge by meter, although about as low as in other large cities, can be reduced one-half and yet pay a profit to the city.

All manufacturing establishments should be supplied at as low a rate as possible for manufacturing purposes.

For report on distribution, in detail, see Appendix D.

Construction and Repair Shops.

The principal work done at the shop from the year 1879 to 1891, inclusive, is shown in the following table :

Year.	Fire Hydrants.	Stop Valves.	Frames and Covers.	Ferrules.
1879	276	198	60	715
1880	314	149	212	3,649
1881	435	237	372	3,085
1882	596	336	596	3,596
1883	729	328	423	4,799
1884	198	367	588	4,966
1885	461	667	653	7,155
1886	626	953	927	8,480
1887	606	549	466	8,041
1888	627	701	1,125	10,005
1889	969	844	729	11,747
1890	759	953	800	11,250
1891	754	1,218	2,020	2,251

The principal advantage of this shop is in the facilities which it gives for repairs, especially to the machinery at the pumping stations, the work being done quickly and with much less expense than if taken to a private shop.

The repairs to machinery have amounted to.....	\$4,695 75
“ to boilers.....	610 20
“ for buildings and grounds.....	575 95
Total.....	<u>5,881 90</u>

For the work in detail see Appendix E.

Hydrographic Work.

The stream-flow and rainfall observations have been continued during the year, completing eight years' continuous records.

The tables showing the results and some interesting observations on rain-fall and rain gauges will be found in Appendix F.

The work of the Draughting-room is detailed in Appendix G.

Permits and Inspection.

The total number of permits issued was 16,090, as follows :

For water appliances, First Purveyor's District.....	1,677
“ “ “ Second “ “	1,836
“ “ “ Third “ “	5,309
“ “ “ Fourth “ “	5,234
Building permits.....	740
Shut-off and repair orders	1,105
Special permits	189
Total.....	<u>16,090</u>

The building permits do not represent the number of buildings erected, as it frequently happens that a large number of dwellings is represented by one permit.

The inspectors were kept busy during the year, and the following table will give some idea of the character and extent of their duties. Their discoveries of illegal uses of water have amounted to more than their salaries :

R

21

1

3

1

28

5

205

2

72

14

172

189

1



*Summary of the work done by Inspector's Department
during the year 1891.*

WARD.	Permits.	Insp't'ns.	Declines.	DISCOVERIES.		Pipe bills served.
				Number.	Amount.	
First	1,408	81	47	109	\$915 00	170
Second	85	54	41	67	401 00	17
Third	64	38	20	80	515 00	
Fourth	68	48	29	91	568 00	
Fifth	104	21	35	28	535 00	
Sixth	110	53	28	44	571 00	
Seventh	136	17	23	31	484 00	
Eighth	90	31	9	37	642 00	9
Ninth	108	92	24	34	834 00	24
Tenth	93	65	25	23	606 00	
Eleventh	74	130	25	32	128 00	
Twelfth	77	95	15	25	95 00	9
Thirteenth	109	108	20	16	154 50	
Fourteenth	144	65	33	29	179 00	
Fifteenth	267	85	52	59	589 00	
Sixteenth	71	112	26	35	140 00	
Seventeenth	85	30	21	30	205 00	
Eighteenth	140	40	33	25	206 00	15
Nineteenth	490	85	78	109	386 00	6
Twentieth	499	126	70	36	464 00	
Twenty-first	334	889	40	324	1,024 00	125
Twenty-second	799	74	46	92	1,029 00	381
Twenty-third	254	111	15	74	1,523 00	141
Twenty-fourth	1,214	188	43	173	2,086 00	131
Twenty-fifth	673	281	41	84	1,271 00	142
Twenty-sixth	1,862	156	48	467	3,840 00	124
Twenty-seventh	459	102	21	52	650 00	184
Twenty-eighth	2,950	96	74	255	2,758 50	562
Twenty-ninth	29	95	30	299	1,960 00	82
Thirtieth	192	82	32	84	895 00	4
Thirty-first	261	64	45	32	604 00	28
Thirty-second	827	23	32	75	1,013 00	14
Thirty-third	1,653	108	32	144	764 00	255
Thirty-fourth	326	112	26	78	530 00	138
Thirty-fifth						
Total	1,5848	3,707	1,234	3,173	\$23,550 00	2,570

NOTE.—Quarterly meter bills and delinquent water rent bills were also served by this Department.

Future Water Supply.

The continuation of the present arrangement of pumping from the Schuylkill and Delaware rivers will necessitate the adoption of some method for the improvement of the water, such as filtration, purification by some reliable process, or the construction of large storage reservoirs.

Unless the minimum flow of the Schuylkill can be increased by the construction of storage reservoirs on its tributaries, the city must in time obtain water from some other source; and if dams be built for this purpose it may be more desirable to conduct the water to the city by gravity than to permit it to flow down the river to be pumped by steam machinery into the reservoirs. Steam pumping is expensive, and the cost will increase yearly as the consumption increases.

In order to obtain a better quality of water it has been suggested that an aqueduct be constructed from the Norristown dam, by which water may be brought to the city at a somewhat higher elevation than Fairmount dam. This will decrease the cost of pumping to some extent, and no doubt for some time the water will be better than we now get, being free from the pollution entering the river below Norristown. After a rain the river at that point will be muddy and black, and a similar method of improvement, as now required, must be provided. For an explanation of the proposed plan and cost see Appendix I.

As before stated, the necessity for increasing the flow of the river during the summer by means of storage reservoirs on its tributaries, or by the use of the present navigation dams, suggests another source of future supply which has been advocated by engineers and experts since 1865.

The Perkiomen and Tohickon gravity scheme referred to may be briefly described as follows: A dam can be located in the Tohickon water shed, just below the junction of the Tohickon and Haycock creeks, of sufficient capacity to store the flow necessary to give a daily average supply of 71,000,000 gallons; its height to be 110 feet, extreme length 1,825 feet,

and cost \$1,562,341. From this dam a short aqueduct will convey the water into another dam on the northeast branch of Perkiomen Creek. The length of this aqueduct will be two-and-one-half miles, its diameter ten feet, slope one in six thousand, and with a daily capacity of 120,000,000 gallons, which will be sufficient not only for the Tohickon supply, but also for the available water shed on the north.

The upper dam on the northeast branch of the Perkiomen is to be located at Perkasio. It is to be fifty feet high, 2,240 feet long, and will cost about \$540,000.

Another dam is to be located on the same branch at the Bucks and Montgomery County line, to be forty-five feet high, 1,200 feet long, and to cost about \$365,000. These two dams will be sufficient to give a daily flow of 33,000,000 gallons from the northeast branch.

The main dam on the Perkiomen is to be located at Green lane. It will be ninety-five feet high, six hundred and thirty-four feet long, and cost about \$1,118,295. An aqueduct of sufficient size and six-and-one-half miles long will connect this dam with the main aqueduct, and also tap both the east Swamp and Rich Valley Creeks above Sumneytown, thus collecting all the available flow from the Upper Perkiomen, and delivering it to the main aqueduct at the northeast branch.

This aqueduct is of sufficient capacity to carry also the flow from the Macoby creek if it be deemed advisable at any time to utilize it.

One dam is planned on the Rich Valley creek near Sumneytown, its height to be eighty-five feet, length six hundred and sixteen, and cost \$465,000.

The lower dam on the E. Swamp creek, located just above Sumneytown, has a height of seventy-five (75) feet, extreme length nine hundred and fifty (950) feet, and will cost \$825,000.

The upper dam is located near Millville. It is to be fifty (50) feet high, eight hundred (800) feet long, and cost \$855,321.

A number of small dams are located in the Upper Perkiomen watershed, in order to obtain sufficient storage capacity to utilize the entire flow of the stream above Green lane, which will be 65,000,000 gallons daily, and adding the flow of the E. Swamp and Rich Valley creeks, 105,000,000 gallons, from the Perkiomen valley above the N. E. branch. The total area of these watersheds is 227.2 square miles, and the water-supplying capacity 209,000,000 gallons daily.

The area of the land flooded by the dams will be about ten thousand (10,000) acres. The total capacity of these storage reservoirs is 8,527,185,530 cubic feet, or 63,783,275,764 gallons, and the total cost \$7,839,578, making the average cost per million gallons stored, \$122.91.

The main aqueduct will extend from the lower dam on the N. E. branch to the proposed reservoir on Queen lane, in the Twenty-eighth Ward. It will be twenty-four and one-half ($24\frac{1}{2}$) miles long, fourteen (14) feet in diameter, a slope of one (1) in six thousand (6,000) and a daily capacity of 305,000,000 gallons. It extends in a straight line from the place of beginning to the northern city limits on the Upper Wissahickon creek, partly in tunnel and partly in open cut. From the city limits it follows the right bank of the Wissahickon, almost in a straight line to the proposed reservoir, and crosses the Wissahickon just below Rittenhouse street. This alignment brings the aqueduct within three quarters of a mile of the New Roxborough reservoir.

The total length of the aqueduct from Green lane to the proposed Queen lane reservoir is thirty-one (31) miles, and the elevations along its line are as follows :

At Green lane dam.....	263 feet C. D.
At East Swamp dam.....	261 " "
At Rich Valley dam	260 " "
At N. E. Branch dam.....	257 " "
At Wissahickon creek	236 " "
At Queen lane reservoir.....	234 " "

Total fall in thirty-one miles, 29 feet.

This aqueduct, including the Tohickon branch, is but one mile longer than the low-service aqueduct planned in 1885, and delivers the water at an elevation of 234 feet C. D., instead of at 175 feet C. D., as then proposed.

The total estimated cost of this scheme, including aqueducts, storage reservoirs, etc., is as follows :

Storage reservoirs.....	\$7,839,518 00
Tohickon, N. E. Branch aqueduct.....	600,000 00
Green lane, N. E. Branch.....	1,500,000 00
N. E. Branch, Philadelphia	10,000,000 00
Total.....	<u>\$19,939,518 00</u>

The above scheme is capable of being economically extended, to furnish a daily supply of 276,000,000 gallons by utilizing portions of the Upper Neshaminy, Upper Skippack, Deep creek and Macoby watersheds. The main aqueduct is planned to carry the flow from these additional and other sources, and its estimated cost will not be increased by the extension, the extra cost being for other storage reservoirs and short branch aqueducts, amounting to \$2,837,151.

Nine years' observations of the rainfall and streamflow of the Perkiomen, Tohickon and Neshaminy creeks furnish the data from which these estimates of the available quantities of water were made.

Available Storage Reservoirs.

Water shed.	Location.	Area in acres when full.	Length in miles.	Elevation of water surface above City datum.	Extreme height of dam.	Extreme length of dam in feet.	Capacity in gallons.	Capacity in cubic feet.	Collecting area, sq. miles.	Total cost.	Cost per million gallons capacity.
Tohickon..... Area 73.1 sq. miles; available flow— 71,000,000 gallons per day.	Tohickon creek, below Haycock run.....	2,382	8.5	410	110	1,825	20,132,393,072	2,691,496,400	73.1	\$1,562,341 00	\$77 60
Lower Perkiomen... Area, 38.4 sq. miles; available flow— 33,000,000 gallons per day.	N. E. Branch creek at County line..... N. E. Branch creek at Perkasio.....	502 1,096	5.0 4.8	300 350	45 50	1,200 2,240	2,227,643,708 6,486,656,000	297,813,330 867,200,000	38.4 17.2	\$365,000 00 540,000 00	\$163 85 83 25
Upper Perkiomen... Area, 115.7 sq. miles; available flow— 105,000,000 gallons per day.	Rich Valley creek, near Sumneytown..... E. Swamp creek, near Sumneytown..... E. Swamp creek, near Millville..... Perkiomen creek at Green lane..... W. Branch of Perkiomen at County line..... W. Branch of Perkiomen at Dale Forge..... W. Branch of Perkiomen at Mench's Mill. Perkiomen creek at Palm station..... Perkiomen creek at Treichlersville..... W. Branch of Hossensack creek..... Indian creek above Powder valley.....	90 175 1,648 1,705 1,095 226 281 472 118 105 106	1.0 2.2 4.5 7.7 2.9 1.5 1.5 2.2 0.9 0.6 0.8	330 310 450 300 435 600 765 355 320 500 725	85 70 50 95 72 384 270 40 66 39 45	616 950 800 634 1,103 384 270 668 717 376 725	1,144,140,800 1,446,117,376 8,293,584,640 10,248,786,328 6,875,286,880 1,858,319,040 1,019,733,440 2,029,817,680 933,504,000 603,785,600 483,507,200	152,960,000 193,331,200 1,108,768,000 1,370,158,600 919,156,000 248,448,000 136,328,000 271,366,000 124,800,000 80,720,000 64,640,000	9.0 35.4 31.9 71.3 19.6 12.2 4.5 24.2 5.2 3.6 2.3	\$465,013 00 825,000 00 855,321 00 1,118,295 00 817,173 00 291,591 00 187,188 00 418,935 00 209,354 00 93,290 00 91,017 00	\$406 43 570 49 103 13 109 11 118 86 156 90 183 56 206 39 224 26 154 51 188 25

Total water shed area, 227.2 sq. miles.
Total available flow, 209,000,000 gallons per day.
Total storage capacity, { cubic feet, 8,527,185,530.
{ gallons, 63,783,276,764.

Total cost of reservoirs, \$7,839,518.00.
Average cost per million gallons stored, \$122.91.

The estimates for the dams were taken, as far as possible, from the Reports of 1885 and 1886.

By this proposition the expense of pumping will be limited to the supply for Chestnut Hill, Roxborough and Germantown.

The cost of pumping 276,000,000 gallons as at present from the Schuylkill and Delaware rivers will be about \$400,000 annually, or a four per cent. interest on \$10,000,000.

Mr. Joseph Wharton, of this City, submitted a plan for supplying the City with water from streams in southern New Jersey. He states that "The gathering grounds for his system lie in the great pine forests of southern New Jersey. The population on the Mullica watershed is extremely small—less than on almost any other in this part of the country. On the part which it is proposed to draw from, it ranges from six to nineteen per square mile. The soil is gravel and sand, and water percolates through it so readily that practically all of the rainfall sinks into the earth, whence it is fed out evenly and uniformly to the streams. In this way it undergoes complete filtration, and there is no carrying of effete organic matter into the streams, such as always happens in case of streams having large surface flows during wet seasons. In this respect there is a marked similarity to those gravelly watersheds of Long Island, which have so long furnished an abundant and pure supply to the City of Brooklyn."

"The total area of the watershed of the branches of the Mullica river which are to be drawn upon, is 288.7 square miles, yielding a daily supply of 205,800,000 gallons."

"A series of storage reservoirs are to be constructed on the several streams, connected by a system of canals through the forest, all delivering into a large reservoir on the Batsto river east of Atsion. The water is pumped from this reservoir into one on Atsion river, from which it will be led by a canal to a large reservoir on the head waters of Cooper's

“creek, and delivered from thence to Philadelphia through several lines of 48-inch steel pipes carried across the Delaware under the bed of the river. The water will then be pumped into the distributing mains or reservoirs.”

“This supply can be increased to 238.8, or to 400 millions of gallons daily.”

It is unfortunate that such favorable conditions as these cannot be found in Pennsylvania.

For a detailed report on this plan, see Appendix H.

Respectfully,

JOHN L. OGDEN,
Chief Engineer.

APPENDIX A.

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1891.*

January	8....	Wm. Massey Co.....	Supply connection.....	\$6 72
	7....	W. G. Warden	Supply connection.....	63 50
	7....	Henry Snyder	Rent, Fairmount.....	500 00
	10....	J. C. Hancock & Co.....	Cutting ice	250 00
	15....	Wm. Carter.....	Stone	11 00
	15....	Wm. Donahue.....	Stone	6 00
	24....	P. & R. Railroad Co.....	Repairing supply con.....	6 15
	28....	Overdrawn warrants.....		48 18
February	2....	Warrants drawn in error.....		78 25
	19....	Daniel McMahon.....	Redriving ferrule	5 00
	19....	Daniel McMahon.....	Repairing main.....	11 13
	24....	Bryan, Fox & Sons.....	Removing stop box	6 20
March	8....	Overdrawn warrants.....		55
	9....	H. M. Harris.....	Rent, farm No. 1.....	100 00
	11....	Wm. Root.....	Rent, farm No. 4.....	102 50
	11....	John W. Harris.....	Rent, farm No. 2.....	100 00
	12....	N. Liberty Gas Works.....	Fire connection.....	44 78
	13....	James Deehan.....	Relaying pipe.....	63 10
	13....	James Deehan.....	Relaying pipe.....	70 35
	14....	Sullivan Bros	Watching pipe.....	21 00
	17....	John Nighlinger.....	Rent, farm No. 3.....	76 25
	23....	Overdrawn warrant.....		65
April	26....	Bergdoll Brewing Co.....	Fire hydrant.....	16 36
	26....	Peoples' Pass'g Railway Co..	Moving stop.....	19 54
	25....	Peoples' Pass'g Railway Co..	Moving stop.....	14 47
	4....	Overdrawn warrant.....		5 04
	16....	Overdrawn warrant.....		2 88
18....	Quaker City Croquet Club....	Rent	10 00	
21....	West Jersey Ferry Co.....	Removing fire hydrants, etc.	46 29	
24....	Bergner & Engle Brew'g Co..	Supply connection	78 38	

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1891—Continued.*

May	2.....	W. Philadelphia Market Co.	Supply connection.....	\$26 37	
	7.....	Clarendon Oil Co.	Old oil barrels.....	14 40	
	9.....	Delaware Ave. Market Co.	Repairing fire hydrant.....	5 91	
	9.....	Overdrawn warrants.....		1 00	
	20.....	Peoples & Bros.	For breaking pipe.....	157 79	
	22.....	Howard R. Yocum.....	Stone.....	11 75	
	27.....	D. McMahon.....	Repairing water main.....	82 53	
	28.....	P. & R. Railroad Co.	Repairing standpipe.....	2 03	
	June	2.....	B. Frank & Son.....	Old fencing.....	20 00
		19.....	Geo. W. Rush.....	Relaying pipe.....	20 73
July	6.....	F. G. Belleville.....	Repairing stop.....	6 20	
	7.....	Philadelphia Traction Co.	Moving stop.....	18 81	
	9.....	D. McMahon.....	Repairing main.....	19 25	
	18.....	Electric Light Co.	Supply connection.....	57 01	
	15.....	A. Purves & Son.....	Old boilers.....	255 00	
	21.....	Girard House.....	Supply connection.....	15 53	
	21.....	Henry Snyder.....	Rent, Fairmount.....	500 00	
	21.....	John Bonhage.....	Repairing leak.....	8 27	
	23.....	P. & R. Railroad Co.	Repairing standpipe.....	7 93	
	23.....	Geo. W. Shultz & Co.	Pipe aqueduct bridge.....	1,560 00	
August	24.....	A. Purves & Son.....	Lot old iron.....	170 42	
	25.....	P. W. & B. Railroad Co.	Supply connection.....	8 41	
	27.....	Tracy Worsted Mill Co.	Fire connection.....	55 40	
	5.....	Philadelphia Traction Co.	Supply connection.....	7 22	
	12.....	S. W. Market Co.	Fire Hydrant.....	59 87	
	13.....	P. & R. Railroad Co.	Fire connection.....	108 91	
	14.....	U. S. Arsenal (Schuylkill).....	Supply connection.....	94 28	
	18.....	Clarendon Oil Co.	Old oil barrels.....	22 32	
	20.....	Cramp, E. & S. B. Co.	Fire hydrant.....	38 10	
	21.....	Henry Dawson.....	Stone.....	21 00	
September	24.....	P. & R. Railroad Co.	Repairing standpipe.....	4 00	
	10.....	H. M. Harris.....	Rent, farm No. 1.....	100 00	
October	5.....	Pemberton & Co.	Laying water pipe.....	128 22	
	19.....	Philadelphia Traction Co.	Supply connection.....	12 70	
	19.....	D. McMahon.....	Repairing leak.....	7 68	

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1891—Continued.*

October	21.....	Bromley & Son	Supply connection.....	\$75 30
	22.....	Edward Lyster.....	Motor connection.....	83 61
November	6.....	Quaker City Mo. Co.....	Supply connection.....	97 37
	10.....	Clarendon Oil Co.....	Oil barrels.....	18 72
	13.....	Citizens' Pass. Railway Co....	Moving fire hydrant	35 59
	14.....	Wm. Root.....	Rent, farm No. 4.....	102 50
	17.....	Delaware Market Co.....	Cutting off connection	5 99
	17.....	Southern S. S. Co.....	Repairing fire hydrant.....	6 03
	18.....	Laird, Shobert & Mitchell....	Fire connection.....	58 87
	21.....	Allison Manufacturing Co....	Supply connection.....	72 98
	21.....	J. C. Maurusiat & Co.....	Cutting off main.....	6 83
	24.....	J. J. Ryan	Removing pipe.....	4 94
	24.....	Jas. D. Thompson.....	Supply connection	8 69
December	7.....	John W. Harris.....	Rent, farm No. 2.....	100 00
	11.....	Holmesburg Water Co.....	Fire hydrant.....	29 25
	11.....	Joseph Ladley.....	Stone.....	59 60
	11.....	Wm. Sellers & Co.....	Renewing stop.....	33 56
	15.....	W. F. Reed	Repairing fire hydrant.....	40 66
	16.....	M. & W. H. Nixon.....	Fire connection.....	59 13
	16.....	David McMahon	Repairing main pipe.....	9 19
	17.....	W. G. Warden	Supply connection.....	68 13
	17.....	Twelfth Street Market Co....	Repairing leak.....	1 54
	22.....	Shimmell & Co.....	Fire connection	65 27
	31.....	Penn Hospital.....	Supply connection.....	76 69
			Total.....	\$6,503 70

APPENDIX B.

REPORT OF CHIEF CLERK.

BUREAU OF WATER.

Philadelphia, January 29, 1892.

MR. JOHN L. OGDEN,

Chief of Bureau of Water.

SIR:—I have the honor to submit herewith a detailed statement of the expenditures of this Bureau for the year 1891.

Respectfully,

J. T. HICKMAN,

Chief Clerk.

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd	Amount expended.	Amount merging.	Amount not merging.
An Ordinance to make an appropriation to the Bureau of Water, ap- proved Dec. 29, 1890.....	\$1,261,603 00			
Balance from books of 1889.....	352,080 48			
Increased by transfer....	10,000 00			
Extra appropriations.....	257,000 00			
Net appropriation.....	\$1,880,683 48			
Item 1. Salaries.....	\$184,303 00			
Diminished by transfer to Item 7.....	\$1,500 00			
Net appropriation to Item.....	\$182,803 00			
For salary				
Chief of Bureau.....	6,000 00	6,000 00		
Chief clerk.....	2,000 00	2,000 00		
Assistant clerk.....	1,080 00	1,080 00		
Correspondence clerk.....	900 00	900 00		
Time clerk.....	900 00	900 00		
Messenger.....	650 00	650 00		
Draughtsmen.....	4,500 00	3,921 86		
General superintendent....	3,500 00	3,500 00		
Clerks to general superin- tendent.....	1,950 00	1,950 00		
Assistants to chief.....	3,400 00	3,400 00		
Pipe inspector and clerk...	2,200 00	2,200 00		
Search clerks.....	1,100 00	1,100 00		
Assistant clerks.....	3,650 00	3,645 00		
Chief Inspector.....	1,100 00	1,100 00		
Inspectors.....	17,100 00	17,100 00		
Permit clerks.....	2,080 80	2,080 00		
Purveyors.....	9,000 00	9,000 00		
Clerks to purveyors.....	4,320 00	4,320 00		
General foremen.....	6,573 00	6,085 81		
Foreman of repairs.....	3,900 00	3,900 00		
Superintendent of shop....	1,500 00	1,500 00		
Clerk to superintendent of shop.....	900 00	900 00		
Watchmen, office, reser- voirs and yards.....	9,450 00	9,366 47		
Storekeepers.....	1,400 00	1,400 00		
Foreman, machinists.....	1,500 00	1,500 00		
“ bricklayers.....	1,000 00	1,000 00		
“ carpenters.....	1,000 00	1,000 00		
“ stone-masons.....	900 00	885 00		
“ painters.....	900 00	900 00		
“ riggers.....	900 00	900 00		
“ laborers.....	840 00	840 00		
Janitor main office.....	675 00	675 00		
Lineman.....	720 00	720 00		
Telephone operators.....	960 00	943 33		
Electricians.....	1,050 00	1,050 00		
General storekeeper.....	900 00	900 00		
SALARIES AT PUMPING STATIONS.				
Fairmount engineers, oilers, etc.....	10,500 00	10,467 02		
Spring Garden engineers, oilers, fire- men, coal-passers, etc.....	36,815 00	36,280 83		
Belmont engineers, oilers, firemen, coal-passers, etc.....	11,250 00	11,218 25		
Roxborough engineers, oilers, fire- men, coal-passers, etc.....	10,870 00	10,790 36		

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd	Amount expended.	Amount merging.	Amount not merging
Item 1—continued				
Mt. Airy engineers, coal-passers, etc...	2,970 00	2,970 00		
Chestnut Hill engineer and helper...	1,500 00	1,500 00		
Frankford engineers, oilers, firemen, coal-passers.....	9,900 00	9,888 50		
Totals.....	\$184,303 00	\$182,352 76	450 24	
Item 2 For general sup- plies, including fuel, oil and small stores.....	\$160,000 00			
Diminished by transfer to				
Item 3.....	\$10,000 00			
Item 4.....	15,000 00	25,000 00		
Net appropriation to item.....	135,000 00			
Deficiencies of 1890:				
Coal.....	\$10,130 00			
Oil.....	20 70	10,150 70		
Belting.....			10 36	
Babbitt metal.....			15 60	
Chandlery.....			103 14	
Coke.....			639 80	
COAL AT OFFICES AND SHOP.				
2 tons nut, at \$5.79.....	\$11 58			
10½ tons stove, at \$4.27.....	43 16			
8 tons stove, at \$5.71.....	45 68			
10 tons nut, at \$6.00.....	60 00			
11½ tons nut, at \$5.74.....	63 69			
15 tons stove, at \$4.53.....	67 95			
26 tons stove, at \$4.63.....	120 38			
5 tons Westmorel'd, at \$7.50,	37 50			
52.9 tons bitumin's, at \$3.90,	204 57			
813.8 tons pea, at \$2.79.....	875 72			
		1,580 23		
COAL AT STATIONS.				
102.07 tons egg, Fairmount, at \$4.10.....	\$419 64			
65.11 tons pea Chestnut Hill, at \$2.40.....	157 32			
812.08 tons buck wh't, Chest- nut Hill at \$2.05.....	1,665 42			
4,867.11 tons buckwheat, Frankford, at \$1.80.....	8,401 59			
10,298.16 tons buckwheat, Belmont, at \$1.78.....	18 071 20			
654.03 tons pea, Roxbor- ough, at \$2.03.....	1,327 93			
12,245.18 tons buckwheat, Roxborough, at \$1.78.....	21,798 61			
2,828.13 tons pea, Spring Garden, at \$2.03.....	5,742 16			
32,384.03 tons buckwheat, Spring Garden, at \$1.78...	57,643 77			
Electric supplies.....		115,227 64		
Gum goods.....		551 49		
		198 11		

Detailed Expenditures of the Bureau for 1891.

General appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merg'g.
Item 2—continued.				
Hauling ashes and coal:				
3,264.17 tons ashes, Roxborough, at 20c.....	\$652 97			
59.16 tons coal, Roxborough to Aux, at 40c.....	23 92			
1,069.04 tons coal, Chestnut Hill to Mt. Airy, at 40c.....	427 28			
		1,104 17		
Ice		216 84		
OIL.				
48½ gals linseed, at 57c.....	27 74			
357½ gals. linseed, at 55c....	196 76			
		224 50		
51½ gals. paraffine, at 11½c.	5 92			
264¾ gals. black, at 8½c.....	20 96			
1,901½ gals. headlight, at 9½c.....	180 63			
		207 51		
104 gals castor, at \$1.00.....	104 00			
1,189 gals. lard, at 52c.....	618 28			
2,276½ gals. engine, at 35c....	796 61			
6,708¾ gals. cylinder, at 45c.	3,018 97			
		4,537 86		
Paints		184 48		
Tallow.....		79 62		
Wood.....		48 00		
Totals.....		\$135,000 00		
Item 3. For repairs to machinery, and the conveyance of workmen incident thereto..... \$50,000 00				
Increased by transfer from Item 2	10,000 00			
Net appropriation to Item	\$60,000 00			
Deficiency of 1890—Repairs to boilers.....		\$73 50		
Belting.....		3 83		
Brass fittings.....		1,762 04		
Bolts and nuts.....		274 14		
Chandlery.....		1,100 00		
Condenser.....		886 60		
Donkey pump.....		500 00		
Fire brick.....		552 25		
Grate bars.....		1,339 51		
Ground glasses.....		30 00		
Gum goods.....		1 222 90		
Hardware.....		1,276 12		
Hauling.....		500 00		
Iron castings.....		1,385 42		
" fittings.....		1,685 99		
Machine work.....		469 80		
Oilers.....		36 00		
Repairs to boilers:				
Belmont.....	\$75 45			
Roxborough.....	101 50			
Spring Garden.....	1,122 93			
		1,299 88		

Detailed Expenditures of the Bureau for 1891.

General appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merg'g.
Item 3—continued.				
Repairs to Boiler covering:				
Spring Garden		551 22		
Engine, Frankford.....		1,159 91		
Electric plant		248 72		
Turbines		784 00		
Sand.....		41 10		
Sponge cloths.....		59 50		
Tools		1,775 00		
Transportation		1,417 50		
Tube cleaners.....		136 00		
Water meters.....		900 00		
Wages:				
Painters.....	\$942 00			
Stonemasons.....	1,906 99			
Carpenters.....	5,035 93			
Bricklayers.....	7,216 47			
Laborers.....	8,401 48			
Machinists.....	14,824 77			
		38,327 64		
Totals.....		59,798 57	201 43	
Item 4. Maintenance and repairs to buildings, grounds and reser- voirs	\$60,000 00			
Increased by transfer from Item 2.....	15,000 00			
Net appropriation to Item.....	75,000 00			
Deficiency of 1890:				
Incidentals		15 59		
Belting		20 94		
Bricks		1,439 46		
Cement		3,017 29		
Chandlery		931 96		
Electric supplies.....		504 00		
Forage.....		1,489 67		
Gas fixtures.....		77 00		
Granite curbing.....		2,408 23		
Gum goods		1,117 19		
Hardware		2,155 69		
Harness.....		56 90		
Hauling.....		500 00		
Hire of float.....		10 00		
Horse shoeing		189 30		
Incidentals		85 00		
Iron fittings		57 42		
Lime		93 80		
Lumber		2,988 20		
Paints		1,191 95		
Pavement (asphalt) 4,408 sq. yds. at \$2 30		10,188 40		
Plants.....		172 13		
Repairs to harness.....	\$14 30			
Repairs to pavements.....	361 10			
Repairs to roofs.....	1,191 73			
Repairs to scow.....	233 50			
Repairs to sidings.....	289 10			
Repairs to wagons.....	184 05			
		2,273 78		
Sand		284 70		

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merg'g.
Item 4—continued.				
Slag.....		157 68		
Slag block paving, 2,089 $\frac{1}{8}$ sq. yards at \$2 60.....		5,482 28		
Stop valves, 12 in. x 6 in., 3 way, at \$28 50.....		842 00		
Stone.....		281 25		
Towing.....		449 00		
Wages:				
Bricklayers.....	\$129 60			
Horse, cart and drivers... ..	1,464 50			
Stone masons.....	1,317 50			
Painters.....	3,565 50			
Helpers.....	5,295 14			
Carpenters.....	8,213 47			
Laborers.....	16,841 74			
		36,827 45		
Totals.....		\$74,708 24	\$291 76	
Item 5. For repairs and improve- ment of the distribution, includ- ing the purchase of material and cost of labor in connection there- with and expenses incident there- to..... \$90,000 00				
Increased by transfer from Department of Public Safety.....	10,000 00			
Net appropriation.....	\$100,000 00			
Brass castings:				
2,752 lbs. yellow brass at 11 $\frac{1}{2}$ cents.....	\$319 92			
941 lbs. red brass at 14 $\frac{1}{2}$ c.....	135 27			
2,073 lbs. lead coating at 4 c.....	82 92			
	\$538 11			
Cr.				
2,980 lbs. brass trimmings at 6 cents.....	\$178 80			
3,850 lbs. brass scraps at 7 $\frac{1}{2}$ c.....	288 75			
Castings returned.....	45 99			
	\$513 54	24 57		
Brass fittings.....		890 52		
Bricks.....		505 30		
Cement.....		143 90		
Chandlery.....		200 00		
Corporation cocks, 1094 $\frac{1}{2}$ -in at 63 cts.....		689 22		
Forge.....		501 31		
Freight.....		33 00		
Gum goods.....		1,088 20		
Hardware.....		456 23		
Harness.....		278 50		
Hauling.....		988 77		
Horses.....		446 94		
Horse shoeing.....		24 00		
Incidentals.....		22 45		
Iron fittings.....		958 60		
Iron pipe:				
200—4-in. 66,606 lbs. at 1.306 cts.....	\$869 88			

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merg'g.
Item 5—continued.				
4,956— $\frac{1}{2}$ -in. 1,804,794 lbs. at 1.228	\$22,162 88			
		\$23,082 76		
Lumber.....		418 58		
New roof.....		356 36		
New wagons.....		486 00		
Paints.....		3 00		
Plumbing.....		5 00		
Powder.....		9 00		
Repairs to Drain.....	\$14 75			
" Gauge.....	3 65			
" Roof.....	163 64			
" Wagons.....	22 05			
		204 09		
Sand.....		25 79		
Stop valves:				
2—12-in.—3 way, at \$83 00... \$166 00				
27—6-in.—3 way, at \$28 50... 769 50				
		985 50		
Transportation		83 00		
Wages:				
Improvement	\$11,601 25			
First District	7,580 27			
Second District.....	8,842 52			
Third District.....	14,289 63			
Fourth District	10,020 99			
Fifth District.....	5,348 89			
Sixth District	8,798 88			
		66,482 48		
Totals.....		\$99,218 02	\$781 98	
Item 6. For supplies, including fuel and labor at City construction and repair shop.....	\$75,000 00			
Barrows.....		\$9 75		
Bar iron.....		1,876 46		
Belting.....		44 82		
Brass fittings.....		227 20		
Brass castings, etc.:				
9,886 lbs. lead coating at 4 cts.....	\$395 44			
14,539 $\frac{1}{2}$ lbs. red brass at 14 $\frac{1}{2}$ cts.....	2,090 11			
35,248 $\frac{3}{4}$ lbs. yellow brass at 11 $\frac{1}{2}$ cts.....	4,097 69			
322 lbs. Ajax metal at 22 cts.	70 84			
	\$6,654 08			
Cr.				
3,100 lbs. scrap brass at 7 $\frac{1}{2}$ cts	\$232 50			
6,250 lbs. brass turn- ings at 6 cts.....	375 00	\$607 50		
		6,046 58		
Chandlery.....		969 73		
Copper nails.....		27 50		
Corporation cocks, 800— $\frac{1}{2}$ -in. at 63 cts		504 00		
Gum goods.....		462 10		
Hardware, bolts and nuts.....		3,451 18		
Harness		31 00		

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 6—continued.				
Horses.....		\$200 00		
Horse shoeing.....		12 00		
Incidentals.....		27 85		
Lumber.....		1,984 86		
Paints.....		24 10		
Plug valves:				
83 small at \$2 00.....	\$166 00			
718 large at \$4 00.....	2,872 00			
		3,038 00		
Shop castings:				
148,586 lbs. at 2.70 cts.....	4,011 83			
347,549 " 2.1 ".....	7,298 51			
279,770 " 1.5 ".....	4,196 55			
416,583 " 2.37 ".....	11,779 90			
		27,286 79		
Wages.....		28,826 38		
Totals		\$75,000 00		
Item 7—For general incidental and contingent expenses, including keep of horse for Chief of Bureau, General Superintendent and assistant to Chief, each four hundred (400) dollars..				
	\$14,000 00			
Increase by transfer from Item 1.....	1,500 00			
Net appropriation to item.....		\$15,500 00		
Deficiencies of 1890:				
Tin.....	\$2 00			
Incidental.....	4 25			
Messenger service.....	8 02			
Maps.....	120 00			
		\$184 27		
Advertising.....		172 35		
Analyses of water.....		210 00		
Carriage hire.....		236 10		
Chairs and desk.....		830 75		
Clocks.....		18 00		
Daily papers.....		29 96		
Ground rent, 918 Cherry street.....		26 66		
Incidentals.....		154 00		
Incidentals, hydrographic.....		114 99		
Keep of horse, chief, general superintendent and assistant.....		1,200 00		
Maps.....		805 25		
Messenger service.....		18 84		
Serving dinners—Water Committee, upon visits of inspection.....		217 75		
Services of extra type writer.....		128 00		
Stationery.....		7,062 93		
Subscriptions.....		45 50		
Telephone rentals, etc.....		1,265 00		
Text books.....		16 00		
Transportation.....		45 00		
Type writer supplies.....		7 00		
Washing towels.....		84 00		

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 7. Continued.				
Writing duplicates.....		\$1,633 88		
Wages, contingent..... \$481 38				
" hydrographic..... 1,560 00		2,041 38		
Totals.....	λ.....	\$15,497 56	\$2 44	
Item 8 For the purchase of material and cost of labor in connection with the laying of service pipe and expenses incident thereto.....				
	\$125,000 00			
Deficiencies of 1890:				
Horse shoeing.....	\$8 00			
Dynamite.....	20 00			
Rent of shop.....	25 00			
Forage.....	31 30			
Cement.....	152 28			
		\$236 58		
Brass fittings.....		119 78		
Chandlery.....		1,010 33		
Corporation cocks:				
8,106, 1/2-in. at 63 cts.....	\$5,106 78			
800, 3/4-in. at 70 cts.....	420 00			
250, 3/4-in. at 80 cts.....	200 00			
200, 1-in. at \$1.15.....	230 00			
190, 1 1/2-in. at \$2.90.....	290 00			
100, 2-in. at \$4.35.....	435 00			
		6,681 78		
Flag stone.....		15 68		
Forage.....		1,879 44		
Grade stakes.....		46 00		
Gum goods.....		456 60		
Hardware.....		693 92		
Harness.....		172 28		
Hauling.....		1,000 00		
Horses.....		400 00		
Horse blankets.....		21 65		
Horse shoeing.....		292 25		
Ice.....		86 54		
Iron pipe:				
300, 3 in., 41,080 lbs. at 1 3/4 cts.....	\$563 34			
10,044, 6-in., 3,642,386 lbs. at 1 1/4 cts.....	44,728 44			
500, 8-in., 286,126 lbs. at 1 1/4 cts.....	2,873 65			
500, 10-in., 354,900 lbs. at 1 1/4 cts.....	4,075 72			
700, 12-in., 627,740 lbs. at 1 1/4 cts.....	7,758 85			
		60,000 60		
Lumber.....		\$1,500 38		
Maps.....		27 00		
Measuring over pipe.....		219 30		
Paints.....		15 22		
Powder.....		159 85		
Professional services, V. S.....		98 00		
Repairs to pavement.....	\$363 06			
Repairs to roofs.....	279 10			
Repairs to stoves.....	34 46			
Repairs to tools.....	9 50			

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 8. Continued.				
Repairs to wagons..... 23 65				
Repairs to windows..... 7 47				
		717 24		
Rent of shop		100 00		
Sand		2 50		
Services of assistant pipe inspector		75 00		
Shop castings, 25,315 lbs. at 02.37 cts.		599 96		
Stop valves, 35 6-in., 3 way, at \$28.50.		997 50		
Tin roof		350 12		
Tools		1,501 45		
Traveling expenses—pipe inspectors		320 97		
Wagons		848 00		
Wheels		163 00		
Wages:				
Improvement..... \$2,080 75				
First District..... 6,431 55				
Second District..... 8,186 14				
Third District..... 6,126 76				
Fourth District..... 11,772 51				
Fifth District..... 3,853 71				
Sixth District..... 5,717 82				
		44,169 24		
Totals		\$124,967 49	\$32 51	
Item 8½. For refunding to parties money expended in laying water pipe. Provided, That the amount paid under this item shall in no case exceed the amount paid by the City of Philadelphia for service pipe and laying the same.	\$3,300 00	\$2,705 13	\$594 87	
Item 8¾. For the purchase of material and cost of labor in connection with the laying of water pipe and expenses incident thereto, ordinance June 1st, 1891.	\$12,000 00			
Hauling pipe		\$1,180 59		
Wages:				
Improvement..... \$300 00				
First District..... 524 32				
Second District..... 1,396 79				
Third District..... 3,191 73				
Fourth District..... 2,876 85				
Fifth District..... 768 74				
Sixth District..... 1,741 04				
		10,799 47	\$19 94	
		\$11,980 06		
Item 9. Extensions \$500,000 00				
Balance from books of 1890..... 1,080 48				
Net appropriation to item \$501,080 48				
Analyses of water		\$600 00		
Barrows		163 00		
Bricks		599 54		
Boiler-house and stack, Spring Garden station		14,595 00		

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropria'd.	Amount expended.	Amount merging.	Amount not merg'g.
Item 9. Continued.				
Chandlery.....		137 50		
Excavating pipe trenches.....		26,729 06		
Gravel.....		42 35		
Gum goods.....		549 88		
Hardware.....		22 09		
Hauling.....		1,000 00		
Incidentals.....		177 50		
Iron pipe:				
350-16-in., 475,664 lbs. at 1 ³⁸ / ₁₀₀ cts.....	\$5,898 23			
1626-20-in., 2,868,713 lbs. at 1 ³⁸ / ₁₀₀ cts.....	85,285 15			
303-30-in., 1,098,543 lbs. at 1 ¹⁸ / ₁₀₀ cts.....	12,002 85			
600-30-in., 2,85,649 lbs. at 1 ¹ / ₂ cts.....	27,320 69			
300-36-in., 1,429,258 lbs. at 1 ³⁸ / ₁₀₀ cts.....	17,008 16			
550-36-in., 2,727,979 lbs. at 1 ¹ / ₂ cts.....	34,099 83			
850-48-in., 6,895,310 lbs. at 1 ³⁸ / ₁₀₀ cts.....	82,054 16			
		213,669 07		
Iron specials:				
664,245 lbs. at 2 ¹ / ₂ cts.....	\$14,945 61			
685,848 lbs. at 2 ¹ / ₂ cts.....	17,138 69			
51,693 lbs. at 4 ¹ / ₁₀₀ cts.....	2,191 79			
		\$34,271 09		
Lead, 633,680 lbs. at 4 ¹ / ₁₀₀		29,999 00		
Lime and cement.....		1,058 26		
Lumber.....		8,000 00		
New boilers, Roxborough.....		1,317 00		
New boilers, Spring Garden, part pay- ment.....		15,092 01		
New boilers, pumping engine, part payment.....		40,890 40		
Powder.....		158 25		
Sand.....		172 86		
Serving dinners, Water Commis- sioners, visiting sites for new reser- voirs.....		276 00		
Shop casting:				
86,070 lbs. at 1 ³⁸ / ₁₀₀ cts.....	\$1,291 05			
31,432 lbs. at 2 ¹ / ₁₀₀ cts.....	660 08			
1,810 lbs. at 2 ¹ / ₁₀₀ cts.....	48 87			
		2,000 00		
Spars.....		287 50		
Stone.....		566 48		
Repairs to pavement.....		107 33		
Testing boiler plate.....		112 50		
Towing.....		546 00		
Traveling expense, pipe inspectors...		928 38		
Water meters:				
45, 2-in., at \$49.50.....	\$2,227 50			
25, 3-in., at 99.00.....	2,475 00			
95, 4-in., at 198.00.....	18,810 00			
3, 6-in., at 450.00.....	1,350 00			
		24,862 50		
Wages:				
New Roxborough reservoir engi- neer corps.....	\$5,871 18			
First District.....	2,498 68			

Detailed Expenditures of the Bureau for 1891.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merg'g.
Item 9. Wages continued.				
Second District.....	1,526 88			
Third District.....	5,308 50			
Fourth District.....	15,489 80			
Fifth District.....	1,551 22			
Sixth District.....	6,121 91			
Buildings, grounds, and reservoirs.....	12,367 45			
		50,730 62		
Totals.....		\$464,606 17	\$11 24	\$36,463 07
Item 9½. Extensions, appropriated June 9, 1890.				
Balance Jan. 1, 1891.....	351,000 00			
Construction of new Roxborough res- ervoir.....		279,381 15		71,618 85
Item 9¾. Extensions, appropriated June 1, 1891.	245,000 00			
Wages:				
New Roxborough reservoir engineer corps.....		3,478 89		
Buildings, grounds and reservoirs..		1,600 00		
Totals.....		\$5,078 89	\$139,821 11	

RECAPITULATION.

Balance from books of 1890.....	\$352,080 48			
Transferred from other Bureaus.....	10,000 00			
Special appropriations.....	257,000 00	\$619,080 48		
Annual appropriation.....		1,861,603 00		
Expended for maintenance.....	781,227 83		\$1,880,683 48	
Expended for extensions.....	749,066 21	1,530,294 04		
Amount merging.....	242,307 52			
Amount not merging.....	108,081 92	350,389 44		
			1,880,683 48	

APPENDIX C.

REPORT

OF THE

GENERAL SUPERINTENDENT

OF

WORK DONE DURING 1891 TO BUILDINGS, GROUNDS AND
RESERVOIRS, AND BOILERS AND MACHINERY OF
THE SEVERAL PUMPING STATIONS.

OFFICE OF THE GENERAL SUPERINTENDENT,

BUREAU OF WATER.

Philadelphia, January, 1892.

JOHN L. OGDEN,
Chief, Bureau of Water.

SIR:—The following is a report of the work performed under my direction during the year 1891:

There have been pumped 55,665,648,000 gallons of water, an increase of 3,967,139,301 gallons over the pumpage of the year 1890.

The maximum daily pumpage was 183,421,163 gallons, an increase of 12,820,586 gallons over the maximum daily pumpage of the preceding year.

The average daily pumpage was 152,508,624 gallons, an increase of 10,868,875 gallons over the average of 1890.

There have been pumped from the East Park reservoir to the district supplied by direct pumpage 445,199,360 gallons of water during the year.

At the Spring Garden station a new boiler house and stack were built. The excavations and foundations were made by this Bureau, and all other work by contract, from designs and specifications furnished by the Department under the direction of the Chief of the Bureau.

Five new boilers were put in, the foundations, flues and setting of which were done by the Bureau. The boilers were built by the Southwark Foundry and Machine Company, from designs and specifications furnished by this Bureau, and are of steel, of the corrugated furnace flue tubular type, 20' long, 8' 6" in diameter. They are designed to carry one hundred (100) pounds of steam, and have been tested to one hundred and fifty (150) pounds of water pressure, and found to be tight. They were first fired and put in operation November 5, and have been in constant use since that time.

The old tubular boilers were taken out, the stack and foundations taken down, and excavation is now being made for a 20,000,000 gallon engine to be placed in the room made vacant by the removal of the boilers.

At the Mt. Airy station an addition was built to the engine and boiler house. A new steel boiler 10' long, 6' diameter, to carry 125 pounds of steam, designed by the Bureau, and built by Henry Warden & Co., was put in.

The 1,000,000 gallon "Knowles" pump was taken from Roxborough Auxiliary Works and put up in the new house, and connected to the pumping mains on the high duty service.

At the Roxborough station the old Cornish overhead beam engine was taken out and broken up.

At the Frankford station the north pump on the No. 2 engine was broken and a new one was put in place and started up in December. New pedestals are now being put in place on the same engine.

The work on the new Roxborough reservoir has progressed satisfactorily. The contractor began the excavation January 13, and during the year has taken out 344,915 cubic yards of material. There still remain about 44,000 cubic yards to be moved. The walls on the property line, consisting of 1838 cubic yards of stone masonry, have been completed.

The brick masonry completed includes the foundations for the drains, outlet pipes and pass pipes through the division bank. The outside banks are up to the proper height, except at the opening left for taking out the waste material. The division bank has yet to be raised from the original surface, the average being 14 feet above the bottom of the reservoir.

A ten ton steam roller was used to puddle the banks. Clay from the immediate vicinity and from Spring Mill and Barren Hill, Montgomery County, was used for the puddle trenches and bank foundations. Most of the waste material has been deposited in the hollow at the N. W. corner of the reservoir property.

The Engineer Corps has been engaged in staking out various portions of the work, giving lines and grades for the excavation, measuring up the monthly estimates, and testing samples of the materials used.

At the East Park reservoir on January 26th, 150 feet of the bank at the curve in the N. W. corner of the N. E. section caved in, carrying with it 60,000 bricks, and cutting into the bank fifteen feet. The clay was taken out and the bank strengthened by a concrete wall, and the clay, after being dried, was put back and thoroughly rammed, and the bricks relaid and grouted. The inclines at Diamond street and Columbia avenue were paved with slag blocks.

At the Wentz Farm reservoir the western half of the north bank, from the terrace to the bottom, was taken out and rebuilt.

At the Lehigh basin the roadway on the incline was paved with slag blocks. The top of the banks were graded and paved with asphalt, and a new fence built around the outside bank.

At the Corinthian avenue basin the slopes were graded, new curb put down, and paved with slag blocks, and a new fence built around the entire bank.

The machinery and boilers at the several stations have been kept in good working order, although the engines at all the works have been run above their capacity.

The buildings, grounds and reservoirs have been kept in good condition, and many improvements have been made.

Respectfully submitted,

FRANK L. HAND,
General Superintendent.

Total Capacity—30,000,000 gallons per day.

NEW SPRING GARDEN STATION.

No. 9.—Worthington Duplex.—
Capacity, 15,000,000 gallons per day.

No. 10.—Worthington Duplex.—
Capacity, 15,000,000 gallons per day.

1891.	Running Time of each Engine in Hours.		Gallons Pumped by each Engine.		Total Pumpage of each Month.	Average Pumpage per Day.	Coal.		Percentage of Ashes.	OIL.		Mean Water Pressure and Mean Suction Lift in Pounds per sq. in.	Gallons raised 100 feet per pound of Coal.		
	No. 9.	No. 10.	No. 9.	No. 10.	Gallons.	Gallons.	Tons.	Lbs.		Cylinder.	Engine.			No. 9. No. 10	
														Qts.	Qts.	No. 9.	No. 10
January.....	640	663	386,264,572	398,774,447	785,039,019	25,323,839	1,398	1,300	.20	540	77	70	70	374.2	
February.....	671	598	380,133,682	328,958,832	709,092,514	25,324,732	1,286	2,160	.20	499	70	75	75	392.3	
March.....	562	376	344,529,106	226,063,005	570,592,111	18,406,164	1,056	44	.20	446	68	74	74	384.7	
April.....	720	632	434,223,591	367,456,448	801,680,039	26,722,667	1,370	1,385	.20	511	73	76	76	416.4	
May.....	743	579	475,525,566	362,126,190	837,651,756	27,021,024	1,399	761	.20	583	74	75	75	426.3	
June.....	720	691	477,585,398	453,416,577	931,001,975	31,033,899	1,516	910	.20	534	72	73	73	437.1	
July.....	743	720	518,536,211	508,161,635	1,026,697,846	33,119,285	1,534	1,530	.20	608	78	68	68	476.3	
August.....	692	727	470,490,722	511,018,828	981,509,550	31,661,698	1,471	750	.20	585	74	72	72	475.0	
September.....	720	720	494,675,159	509,263,957	1,003,929,116	33,464,308	1,502	2,170	.20	577	72	69	69	475.6	
October.....	744	742	509,191,860	509,854,527	1,019,046,387	32,872,464	1,459	899	.20	588	84	72	72	465.3	
November.....	709	720	498,977,075	507,554,078	1,006,531,153	33,551,038	1,509	500	.20	590	77	66	66	474.9	
December.....	694	741	481,401,015	510,056,408	991,457,423	31,982,497	1,493	1,540	.20	556	79	65	65	472.0	
Totals and averages.	8,358	7,909	5,471,583,957	5,192,694,932	10,664,228,889	29,217,065	17,099	.....	.20	6,567	898	71	71	444.0

0 gallons
 -5,300,000
 -5,100,000

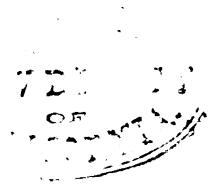
OIL.

18 Castor. Engine.
 Quarts. Quarts.

Janua	23	190
Febru	16	197
March	18	207
April	22	225
May	31	105
June	29	151
July	33	177
Augu	34	198
Septe	46	205
Octob	22	160
Novem	25	160
Decem	19	207
Total	318	2,182

und, Capacity, 8,000,000 gallons per day.
 nd, Capacity, 20,000,000 gallons per day.
 apacity, 10,000,000 gallons per day.
 pacity, 20,000,000 gallons per day.
 Capacity, 6,000,000 gallons per day.

L. Engine.	Mean Water Pressure and Mean Suction Lift, in Lbs., per square inch.					Gallons raised 100 ft. per pound of coal.	
	Qts.	No. 6.	No. 7.	No. 8.	No. 11.		No. 12.
	309	.....	54	70	58	57	693.8
	198	50	54	55	50	57	522.1
	354	50	54	60	50	57	571.1
	259	50	54	56	50	.....	599.4
	134	50	54	55	54	57	567.8
	120	50	54	55	50	57	597.4
	431	50	54	58	50	57	596.5
	431	50	54	67	50	57	477.0
	420	50	55	68	50	57	562.6
	420	50	54	68	50	57	356.7
	412	50	54	67	50	57	531.2
	316	50	54	65	50	57	614.5
	4,440	50	54	62	51	57	572.6



BELMONT PUMPING STATION.

Total capacity—18,000,000 gallons per day.

- No. 1.—Warrington Duplex.—Capacity,
5,000,000 gallons per day.
- No. 2.—Warrington Duplex.—Capacity,
6,000,000 gallons per day.
- No. 3.—Warrington Duplex.—Capacity,
8,000,000 gallons per day.

Total Capacity—18,000,000 gallons per day.

BELMONT PUMPING STATION.

No. 1.—Worthington Duplex.—Capacity,
5,000,000 gallons per day.
No. 2.—Worthington Duplex.—Capacity,
5,000,000 gallons per day.
No. 3.—Worthington Duplex.—Capacity,
8,000,000 gallons per day.

1891.	Running Time of each Engine in Hours.			Gallons Pumped by each Engine.			Total Pumpage of each Month.	Average Pumpage per Day.	Coal.		Percentage of Ashes.	Oil.		Mean Water Pressure and Mean Suction lift in pounds per square inch.			Gallons raised per pound of coal.
												Cylinder.	Engine.				
	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	No. 3.		
January	436	504	372	111,858,300	133,035,552	144,420,390	389,314,242	12,558,523	1,008	1,553	.20	181	84	88	88	88	374.4
February	392	609	216	96,860,400	155,891,424	83,635,340	336,387,164	12,013,827	800	687	.20	117	33	88	88	88	405.6
March	392	673	305	93,352,800	171,214,992	114,807,260	379,375,052	12,237,904	787	1,790	.20	128	84	88	88	88	464.7
April	566	647	298	128,182,800	167,102,520	107,024,650	402,309,970	13,410,332	849	885	.20	141	37	88	88	88	457.1
May	537	558	369	139,753,600	150,063,870	147,357,065	437,164,435	14,102,078	913	111	.20	144	38	88	88	88	462.1
June	403	860	664	101,412,300	95,821,128	264,519,275	461,752,708	15,391,756	926	80	.20	142	37	88	88	88	481.2
July	51	735	701	13,857,500	201,275,232	277,614,970	492,727,702	15,894,442	991	370	.20	147	38	88	88	88	479.6
August	186	723	699	45,127,200	188,335,680	273,595,890	507,058,770	16,356,784	1,031	1,200	.20	154	40	88	88	88	474.4
September	160	651	692	38,186,700	171,858,960	270,691,110	480,786,770	16,024,559	969	2,115	.20	155	40	88	88	88	478.3
October	213	716	654	53,617,800	188,066,736	246,332,955	488,017,491	15,742,499	1,004	1,545	.20	154	41	88	88	88	468.8
November	276	685	538	67,009,200	180,370,944	207,160,475	454,540,619	15,151,353	984	2,230	.20	154	39	88	88	88	445.3
December	199	521	718	47,145,300	130,416,936	271,406,555	448,368,791	14,482,864	942	874	.20	143	39	88	88	88	459.8
Totals and averages....	3,811	7,302	6,226	936,343,800	1,933,444,974	2,408,565,935	5,278,353,709	14,461,243	11,205	.....	.20	1,710	450	88	88	88	454.6

Total Capacity, 12,500,000 gallons
per day.

ROXBOROUGH PUMPING STATION.

No. 2.—Worthington Duplex.—
Capacity, 5,000,000 gallons per
day.

No. 3.—Worthington Duplex.—
Capacity, 7,500,000 gallons per
day.

1891.	Running time of each Engine, in hours.		Gallons pumped by each Engine.		Total Pump- age each Month.	Average Pumpage per Day.	Coal.		Percentage of Ashes.	Oil.		Mean Water Pressure and Mean Suction Lift in lbs. per Square inch.		Gallons raised 100 feet per pound of Coal.
	No. 2.	No. 3.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.			Cylinder.	Engine.	No. 2. No. 3.		
							Tons.	Lbs.				Qts.	Qts.		No. 2.	No. 3.
January	124	723	28,760,730	241,479,762	270,240,492	8,717,435	1,025	1,210	.25	260	102	145	142	432.9
February	55	660	13,314,235	209,707,818	223,022,053	7,965,073	886	2,164	.25	209	94	145	142	414.8
March	166	744	37,242,580	234,810,308	272,052,888	8,775,899	1,043	2,176	.25	266	104	145	142	434.2
April	227	658	63,814,400	205,673,031	269,487,431	8,982,914	1,014	1,682	.25	248	122	145	142	438.1
May	262	744	60,876,495	233,381,418	294,257,913	9,492,190	1,062	309	.25	288	110	145	142	457.1
June	426	714	97,440,030	221,466,483	318,906,513	10,630,217	1,151	1,790	.25	282	122	145	142	456.8
July	497	742	111,927,395	229,697,625	341,625,020	11,020,161	1,199	1,845	.25	334	122	145	142	469.8
August	526	742	118,741,925	232,563,080	351,305,005	11,332,419	1,300	861	.25	319	132	146	142	445.8
September	631	718	141,435,745	218,572,861	360,028,606	12,000,953	1,326	1,832	.25	341	120	145	142	447.7
October	9	736	148,155,785	225,624,615	373,780,400	12,057,432	1,459	2,183	.25	296	104	145	142	422.4
November	471	716	108,692,350	225,180,324	333,872,674	11,120,089	1,343	2,085	.25	238	98	145	142	409.9
December	439	742	99,754,250	236,858,899	336,613,139	10,858,488	1,346	283	.25	195	102	145	142	412.3
Totals & averages	3,833	8,644	1,030,175,920	2,715,016,214	3,745,192,134	10,260,800	14,162	.....	.25	3,276	1,332	145	142	436.3

Total Capacity, 785,000
gallons per day.

ROXBOROUGH AUXILIARY STATION.

No. 1.—Knowles.—Capacity,
285,000 gallons per day.
No. 2.—Knowles.—Capacity,
250,000 gallons per day.
No. 3.—Knowles.—Capacity,
250,000 gallons per day.

1891.	Running time of each Engine, in Hours.			Gallons Pumped by each Engine.			Total Pumpage of each Month.	Average Pumpage per Day.	Coal.		Percentage Ashes.	Cylinder Oil.	Mean Water Pressure.		
	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.			Qts.	No. 1.	No. 2.	No. 3.
	January	16	36	198,300	334,762	528,052	17,033	8	1,596	.20		4	36	36	.....
February	14	41	.....	169,200	394,020	.....	563,220	20,115	8	904	.20	4	36	36	.....
March	14	54	.....	169,200	518,760	.....	687,960	22,192	9	1,606	.20	4	36	36	.....
April	8	99	.....	96,200	945,780	.....	1,041,980	34,732	8	1,113	.20	5	36	36	.....
May	149	23	23	1,442,760	113,040	113,040	1,668,840	53,833	11	848	.20	6	36	36	36
June.....	141	63	63	1,439,460	340,560	340,560	2,120,580	70,686	10	1,656	.20	4	36	36	36
July.....	80	142	142	719,400	765,360	765,360	2,250,120	72,584	9	360	.20	7	36	36	36
August.....	.....	130	130	.....	413,130	413,130	826,260	26,653	7	1,415	.20	6	.....	36	36
September	74	139	139	749,100	810,000	810,000	2,869,100	78,970	8	442	.20	7	36	36	36
October.....	55	130	130	561,000	702,600	702,600	1,966,200	63,425	7	1,710	.20	7	36	36	36
November	51	110	110	515,460	600,480	600,480	1,716,420	57,214	8	658	.20	7	36	36	36
December.....	42	90	90	413,160	486,920	486,920	1,387,000	44,741	7	1,132	.20	6	36	36	36
Totals and averages.....	644	1,057	827	6,468,240	6,425,402	4,232,090	17,125,732	46,919	106	.....	.20	67	36	36	36

Total Capacity, 3,000,000 gallons per day.

MOUNT AIRY PUMPING STATION.

No. 1.—Davidson Rotary—Capacity, 1,000,000 gallons per day.
 No. 2.—Davidson Rotary—Capacity, 1,000,000 gallons per day.
 No. 3.—Knowles—Capacity, 1,000,000 gallons per day.

1891.	Running time of each Engine, in Hours.			Gallons pumped by each Engine.			Total pumpage each Month.	Average pumpage per Day.	Coal.		Percentage of Ashes.	Oil.		Mean Water Pressure and Mean Suction Lift in lbs. per Sq. in.	Gallons raised 100 ft. per pound of coal.		
	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.			Gallons.	Gallons.		Tons.	Lbs.			Cylinder.	Engine.
	Qts.	Qts.	No. 1.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	No. 3.			
January	744	211	.....	27,743,750	5,536,250	.....	33,280,000	1,073,548	80	1,500	.20	50	50	60	70	.....	245.6
February ...	636	132	.....	25,005,000	4,006,250	.....	29,011,250	1,036,116	66	660	.20	37	37	60	70	.....	260.6
March	744	403	.....	27,148,750	10,945,000	.....	38,093,750	1,228,830	88	2,000	.20	64	64	60	65	.....	270.3
April	717	405	.....	27,182,250	11,640,250	.....	38,822,500	1,294,083	84	640	.20	62	61	60	65	.....	274.3
May	730	435	.....	29,946,750	13,647,000	.....	43,593,750	1,406,250	89	2,140	.20	76	76	60	70	.....	288.6
June	711	454	.....	30,367,400	16,580,100	.....	46,897,500	1,563,250	107	20	.20	77	77	60	70	.....	260.9
July	742	370	.....	31,594,250	13,236,750	.....	49,831,000	1,607,451	117	120	.20	77	77	60	70	.....	253.5
August.....	741	400	.....	32,166,000	20,171,500	.....	52,337,500	1,688,306	121	310	.20	77	77	60	70	.....	257.3
September.....	712	519	6	31,320,500	20,722,000	270,000	52,312,500	1,743,750	118	180	.20	76	75	60	70	76	263.8
October.....	743	543	.....	32,828,750	20,700,000	.....	53,528,750	1,726,733	118	1,190	.20	77	77	60	70	.....	268.9
November.....	549	434	84	23,151,250	17,335,000	3,753,000	44,239,250	1,474,641	101	760	.20	71	71	60	70	70	259.9
December	700	363	.....	29,083,250	13,372,500	.....	42,455,750	1,369,637	93	1,680	.20	77	77	60	70	.....	269.7
Totals and averages..	8,469	4,669	90	317,540,900	172,842,600	4,023,900	524,406,500	1,436,730	1,182	.....	.20	821	819	60	68	73	264.2

Total Capacity—750,000
gallons per day.

CHESTNUT HILL PUMPING STATION.

No. 2.—Knowles.—Capacity,
250,000 gallons per day.
No. 3.—Worthington Duplex.—
500,000 gallons per day.

1891.	Running Time of each Engine, in Hours.		Gallons Pumped by each Engine.		Total Pumpage of each Month.	Average Pumpage per Day.	Coal.		Percentage of Ashes.	OIL.		Mean Water Pressure and Mean Suction Lift in Pounds per sq. in.		Gallons raised 100 feet per Pound of Coal.
	No. 2.	No. 3.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.		Cylinder.	Engine.	No. 2	No. 3	
January.....	155	.....	5,116,800	.....	5,116,800	165,058	17	1,964	.22	7	.....	53	.....	158.3
February.....	240	.....	7,439,040	.....	7,439,040	265,680	18	1,051	.22	10	.....	58	.....	222.7
March.....	12	.....	824,720	.....	824,720	10,474	7	1,615	.37	1	.....	58	.....	23.2
April.....	8	.....	275,520	.....	275,520	8,857	6	165	.35	1	.....	58	.....	25.0
May.....	73	.....	2,426,140	.....	2,426,140	78,262	7	275	.33	7	.....	53	.....	188.4
June.....	154	.....	5,289,841	.....	5,289,841	174,661	17	495	.33	14	.....	53	.....	168.3
July.....	55	.....	1,635,900	.....	1,635,900	52,770	10	183	.33	7	.....	53	.....	89.9
August.....	51	.....	1,525,200	.....	1,525,200	49,200	9	2,042	.26	4	.....	58	.....	85.1
September.....	165	.....	3,825,300	.....	3,825,300	127,510	14	1,548	.26	18	.....	58	.....	144.0
October.....	28	.....	890,520	.....	890,520	28,726	8	931	.26	4	.....	58	.....	58.5
November.....	43	.....	1,476,820	.....	1,476,820	49,227	9	2,223	.26	6	.....	53	.....	81.7
December.....	16	.....	551,040	.....	551,040	17,775	8	998	.26	2	.....	58	.....	35.4
Totals and averages.	1,000	.....	30,726,841	.....	30,726,841	84,188	136	.....	.27	76	.....	53	.....	124.9

Total Capacity, 20,000,000
gallons per day.

FRANKFORD PUMPING STATION.

No. 1.—Marine Compound Rotary.—
Capacity, 10,000,000 gals per day.
No. 2.—Corliss Compound Rotary.—
Capacity, 10,000,000 gals. per day.

1891.	Running Time of each Engine, in Hours.		Gallons Pumped by each Engine.		Total Pumpage of each Month.	Average Pumpage per day.	Coal.		Percentage of Ashes.	Oil.		Mean Water Pressure and Mean Suction Lift, in Pounds, per sq. in.		Gallons raised 100 ft. per Pound of Coal.	
	No. 1.	No. 2.	No. 1.	No. 2.	Gallons.	Gallons.	Tons.	Lbs.		Cylinder.	Engine.	No. 1.	No. 2.		
															Qts.	Qts.
January.....	525	149	199,610,510	53,217,781	252,828,291	6,155,751	390	20	.25	148	204	82	83	527.2	
February.....		610		218,168,282	213,168,282	7,613,152	252	825	.25	132	182		80	637.0	
March.....	511	206	190,927,349	71,072,597	261,999,608	8,451,600	420	859	.25	151	211	82	79	506.9	
April.....	128	574	58,685,682	191,844,090	250,529,772	8,350,992	291	1,390	.25	150	210	80	79	698.7	
May.....	588	154	230,774,530	55,971,311	286,745,841	9,249,865	406	1,980	.25	155	217	81	80	573.2	
June.....	530	225	215,265,408	77,718,178	292,983,586	9,766,119	410	920	.25	158	223	81	81	580.6	
July.....	679	284	262,838,022	60,100,223	322,938,245	10,417,362	504	1,490	.25	190	240	83	88	520.4	
August.....	661	397	232,027,755	84,739,874	316,767,629	10,218,310	486	390	.25	246	309	83	83	529.9	
September.....	688	213	262,872,334	40,949,137	303,821,471	10,127,382	483	280	.25	193	268	82	84	511.5	
October.....	671	324	244,641,683	58,096,459	302,738,092	9,765,744	524	2,040	.25	221	322	83	83	469.1	
November.....	676	368	226,022,057	68,534,522	294,556,579	9,818,552	517	1,520	.25	237	327	84	84	462.8	
December.....	654	70	246,090,063	24,325,824	270,415,887	8,723,092	423	1,756	.25	155	217	78	78	519.1	
Totals and averages.....	6,811	3,574	2,369,755,348	999,737,940	3,369,493,283	9,231,488	5,112			.25	2,136	2,930	81	81	537.0

APPENDIX D.

REPORT

ON THE

OPERATIONS IN CONNECTION WITH THE

DISTRIBUTION SYSTEM

DURING 1891.

BUREAU OF WATER.

January 29, 1892.

MR. JOHN L. OGDEN,
Chief, Bureau of Water.

SIR:—During the past year there have been laid one hundred and fifty-seven thousand and sixty-one (157,061) feet of service mains, fifty-two thousand three hundred and fifty-seven (52,357) feet of supply mains, which, in addition to the connections and other new work, make a total of two hundred and twenty-one thousand three hundred and thirty-six (221,336) feet, or forty-one (41) miles and four thousand eight hundred and fifty-six (4,856) feet added to the distribution system, and a total of one thousand and one (1,001) miles and two thousand three hundred and eighty-nine (2,389) feet now in use.

Thirty-two thousand and eighty-one (32,081) feet of pipe have been laid to replace old and defective service mains, of which twenty-one thousand six hundred and seventy-five

(21,675) feet were taken up, and eleven thousand seven hundred and fifty-eight (11,758) feet were disconnected from the water supply and abandoned.

The total quantity used for relays and repairs was thirty-six thousand four hundred and ninety-seven (36,497) feet, and the amount taken up, lowered and raised, twenty-seven thousand and nine hundred and ninety-four (27,994) feet, making the total amount for repairs sixty-four thousand four hundred and ninety-one (64,491) feet.

The total quantity of pipe handled for all purposes was two hundred and eighty-five thousand eight hundred and twenty-seven (285,827) feet, weighing twenty-three million five hundred and forty-four thousand eight hundred and sixty-eight (23,544,868) pounds.

Abandoned Pipes.

Eleven thousand seven hundred and fifty-eight (11,758) feet of pipe have been cut off from the distribution and abandoned, as follows:

2 inch.....	670 feet.
3 inch.....	3,193 feet.
4 inch.....	6,407 feet.
6 inch.....	1,488 feet.

Fire Hydrants.

Six hundred and twenty-six (626) new and five (5) old style fire hydrants have been put in new locations. Two hundred and twenty-one (221) new, and twenty-three (23) old style have been substituted for defective ones of the old pattern, making a total of eight hundred and forty-seven (847) new, and twenty-eight (28) old-style hydrants put in during the year. There were removed two hundred and forty-two (242) old, and thirty-three (33) new style hydrants, making the total number added to the distribution during the year three hundred and fifty-six (356).

The total number of fire hydrants in use December 31, 1891, was eight thousand one hundred and five (8,105), of which three thousand six hundred and ninety-six (3,696) are of the old pattern, and four thousand four hundred and nine (4,409) of the new.

Drills.

Eight thousand one hundred and seventy-eight (8,178) new attachments have been made, as follows :

½-inch	7,607	area of openings.....	1,494	square inches.
¾-inch	243	area of openings.....	75	square inches.
¾-inch	130	area of openings.....	57	square inches.
1-inch	152	area of openings.....	119	square inches.
1½-inch	13	area of openings.....	23	square inches.
2-inch	33	area of openings.....	104	square inches.
Totals....	8,178		1,872	

The total number of shut-offs for repairs, etc., by permit, was one thousand and seventeen (1,017); and the number without permit, six hundred and sixty-three (663).

Supply Mains.

In the First District a thirty (30) inch supply main was laid in Bainbridge street, from Front to Broad street, and a sixteen (16) inch pipe in Snyder avenue, from Moyamensing avenue to west of Fifth street.

The former was laid and completed by June 8, and the latter June 30, 1891.

In the Second District the thirty-six (36) inch supply main in Fifty-second street was extended from Walnut street to Baltimore avenue, and a thirty (30) inch main was laid from Baltimore avenue to Woodland avenue.

In Haverford avenue a twenty (20) inch supply main was laid from Thirty-fifth street to Lancaster avenue, and in Fortieth street, from Lancaster avenue to Haverford avenue.

The Fifty-second street main was completed and put into service June 28, 1891, and the mains in Haverford avenue and in Fortieth street in May, 1891.

In the Fourth District a forty-eight (48) inch supply main was laid from Twenty-fifth and Spring Garden streets to the Stand-pipe Hill, at Master street and the Pennsylvania Railroad. This work was begun March 6th and finished July 6, 1891.

A thirty-six (36) inch supply main was laid from Twenty-seventh and Thompson streets to Twenty-ninth and York streets, passing under the Pennsylvania Railroad tracks at Ridge avenue.

Southeast of the Ridge avenue bridge the pipe was deflected at an angle of 45° to a depth of 27 feet 5 inches, and continued thence nearly level and northwestwardly under the bridge abutments and railroad tracks to a corresponding point northwest of the bridge, where it was deflected to the surface or proper depth for continuing the main.

The difficulty in doing this work was greatly increased by the great number of trains running on the Pennsylvania Railroad, and the large amount of travel on Ridge avenue; also by quick-sands, the latter undermining the walls of the bridge, so that special care had to be used to preserve the same. A brick chamber and iron manhole were built over the pipe at each end of the bridge to facilitate any needed repairs without excavating therefor.

A twenty (20) inch main was also laid from Montgomery avenue and Twenty-seventh street to Broad and Norris streets.

The above two mains were finished and water turned on September 8, 1891.

In the Fifth District provision was made to supply to and from the New Roxborough reservoir by laying the necessary mains through the embankments.

In the Sixth District, Germantown, a twenty (20) inch supply main was laid in Wissahickon avenue, from Allen's

lane to Rittenhouse street, and a twelve (12) inch main was laid from the latter street to Manheim street.

In Rittenhouse street a sixteen (16) inch main was laid from Wissahickon avenue to Pulaski avenue.

Broken Mains.

There have been but few mains of the larger sizes broken this year, and at the Spring Garden Works, where breaks were frequent during 1890, there have been none, and but seven joints that leaked. The following shows the total number of breaks in pipes of all sizes throughout the City :

	3-in.	4-in.	6-in.	10-in.	12-in.	16-in.	20-in.	30-in.	48-in.
First District.....	1	2	11	.....	.....	3	.....	2	..... 19
Second District.....	2	1	20	1	.....	.....	1	.....	..... 25
Third District.....	.....	3	7	.....	.....	.....	.....	.....	..... 10
Fourth District.....	3	9	.....	.....	.....	.....	1	2	1 16
Fifth District.....	.....	.....	6	.....	1	.....	1	1	..... 9
Sixth District.....	1	6	3	.....	1	2	5	.....	..... 18
	4	15	56	1	2	5	8	5	1 97

The above does not include leaks, but only cases where the pipe-casting actually broke.

Distribution.

The water supply of the several districts remains substantially as stated in the Report for the year 1890, although much improved by the laying of the supply mains above stated, particularly in the eastern part of the First District, the southern part of West Philadelphia, and the lower end of Germantown.

While much has been done to improve these sections, it will be found during the coming year that additional supply

mains will be needed, particularly in the old city proper and the Twenty-fourth Ward, also in the southern part of the First District.

District Offices and Yards.

The First, Second, Third and Fourth Districts are fairly well equipped with offices and yards, and the Fifth and Sixth Districts should be provided for in a similar manner.

In the First District an addition has been made to the shed, and a new storehouse built. A wide strip in front of the stable, shed and store-rooms has been paved with cubical blocks.

The Third District office was moved from No. 1420 Frankford avenue to the old Kensington pumping station, at Beach and Susquehanna avenue, March 17, 1891. It has been fitted up with offices, store-rooms, blacksmith shop and stable, and a new fence has been built to enclose that portion of the wharf property to be used by the Bureau of Water. With more storage room for pipes, castings, etc., it would be a model district office and yard.

In the Fourth District an extension has been made in order to provide shed room for sheer-poles and capstans, and a room for the storage of ropes, blocking, etc.

The paths in the yard are made of oyster shells and present a good, as well as serviceable, appearance.

An additional year's experience in owning horses and wagons instead of hiring them for the uses of the several districts of the Bureau, as was formerly the case, has proven not only satisfactory, but the best for efficiency and economy.

The Fifth and Sixth Districts should be provided in like manner.

Meters.

One hundred and seventy (170) meters have been set in new locations; one hundred and thirty-five (135) that were

defective or where a different size or style was required, have been renewed, and twenty-five (25) taken out where the use of water by meter was discontinued.

The total number of meters in use December 31, 1891, was six hundred and ninety-seven (697); the number in stock, one hundred and fifty-three (153), making a total of eight hundred and fifty (850) in use and on hand, including two (2) private meters and six (6) received on trial.

Paving Materials.

Mr. George A. Bullock, Chief of the Bureau of Highways, furnished to the Bureau of Water the following material free of charge:

First District :

818 square yards of cubical blocks.
208 square yards of Belgian blocks.
45 square yards of flagstone.

Third District :

329 square yards of cubical blocks.

Fourth District :

252 square yards of Belgian blocks.
150 square yards of cobble stones.
447 feet of curb stones.
50 feet of 6-inch best granite stone.

Respectfully,

ALLEN J. FULLER,
Assistant Engineer in charge of Distribution.

IRON SERVICE AND SUPPLY MAINS LAID IN 1891.

FIRST DISTRICT.

Comprising the First, Second, Third, Fourth, Twenty-sixth and Thirtieth Wards.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Bancroft street, from south house line of Mifflin, north to connect dead end.....		6	140
Beulah street, from 5 feet south of centre of Tasker, north.		6	5
Bonsall street, from 12 feet south of south house line of Oakford to Federal.....		6	328
Broad street, east side, from 2 feet south of south house line of Mifflin to Moore.....		6	477
Burd street, from Queen to Catharine.....		6	253
Cantrell street, from centre of Old Second street to 12 feet west of east house line of Fourth.....		6	622
Cross street, from Long lane to 12 feet west of east house line of Twenty-third.....		6	458
Dickinson street, from 10 feet west of southeast curb line of Long lane to Twenty-second.....		6	156
Dudley street, from 5 feet west of east house line of Otsego, west.....		6	45
Durfor street, from 5 feet east of west house line of Fourth to Fifth.....		6	430
East Second street, from north curb line of Snyder avenue to centre of McKean.....		6	400
Eighteenth street, from 13 feet south of centre of Moore to Fernon.....		6	758
Emily street, from centre of Otsego, west.....		6	13
Emily street, from 17 feet east of centre of East Second street, west.....		6	17
Federal street, from 9 feet west of southeast curb line of Moyamensing avenue to dead end, 97 feet west of west house line of Fourth.....		8	303
Fifth street, from dead end 5 feet north of south curb line of Snyder avenue, north to connect.....		10	17
Fifth street, from 1 foot north of south house line of Durfor to dead end 12 feet south of north house line of Wolf..		6	194
Fifteenth street, east side, from Mifflin to Moore.....		6	458
Fourth street, from 2 feet south of south house line of Snyder avenue, north.....		6	26
Fourth street, from 10 feet north of south curb line of Snyder avenue, north.....		10	31
Front street, from 2 feet south of south curb line of Snyder avenue to centre of Emily.....		6	315
Harmony street, from 201 feet south of south house line of Wharton, north.....		6	556

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Hill street, from 174 feet east of east house line of Fifteenth, west.....		6	199
Jackson street, from centre of Twelfth, west.....		6	21
Juniper street, from dead end 2 feet north of north house line of Millin to dead end south house line of Canal....		6	124
Latona street, from east house line of Twenty-eighth, west.		6	25
Latona street, from centre of Thirty-second, west.....		6	12
Letitia street, from 2 feet south of south curb line of Snyder avenue, north.....		6	13
Lingo street, from 4 feet north of south curb line of Passyunk avenue, north.....		6	241
McClellan street, from west curb line of Eighteenth to dead end 3 feet west of east curb line of Nineteenth.....		6	423
McClellan street, from Eleventh to Gerhart		6	296
McKean street, from east house line of Otsego to centre of Front.....		6	287
Mercy street, from centre of Otsego, west.....		6	13
Mercy street, from Front to east Second.....		6	444
Millin street from east to west house line of Bancroft.....		6	50
Millin street, from west curb line of Nineteenth to east house line of Twentieth.....		6	410
Millin street, from west house line of Twentieth, west.....		6	86
Millin street, from dead end 88 feet east of east house line to dead end 45 feet west of east house line of Broad....		6	133
Moore street, from dead end 5 feet west of east house line of Seventeenth to 12 feet west of west house line of Eighteenth		6	503
Morris street, from dead end 155 feet west of west house line of Seventeenth to dead end 38 feet west of east house line of Eighteenth.....		6	279
Mountain street, from Eighteenth, west.....		6	21
Moyamensing avenue, southeast side, from 9 feet southwest of north curb line of Snyder avenue north to connect dead end.....		6	14
Moyamensing avenue, northwest side, from 9 feet southwest of north curb line of Snyder avenue north to connect dead end.....		6	14
Oakford street, from Twenty-eighth, west.....		6	25
Otsego street, from north curb line of Snyder avenue to dead end south house line of Millin.....		6	834
Parke street, from south house line of Carpenter, north ...		6	25
Pierce street, from dead end 12 feet east of Eighteenth, west, to connect dead end.....		6	12
Reed street, from dead end 183 feet west of west house line of Twenty-second to east curb line of Twenty-third...		6	245
Reed street, from east to west house line of Twenty-eighth		6	50
Ritchie street, from south house line of Fitzwater, north...		6	25
Ritner street, from east to west house line of Sixth.....		6	50

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Seventeenth street, from 13 feet south of centre of Moore, north to connect dead end.....		6	96
Siegel street, from west curb line of Eighteenth to dead end 2 feet east of east curb line of Nineteenth.....		6	418
Sixth street, from dead end 323 feet south of south house line of Shunk to Ritner.....		6	1,290
Snyder avenue, south side, from 2 feet west of east curb line of Front, west.....		8	225
Snyder avenue, north side, from 13 feet east of centre of Front, west.....		8	26
Snyder avenue, south side, from 2 feet east of east house line of Old Second to 27 feet west of east house line of Fifth.....		8	1,151
Snyder avenue, north side, from 4 feet east of east house line of Old Second to 31 feet west of east house line of Fourth.....		8	724
Taylor street, from Twenty-second to 12 feet west of east house line of Twenty-third.....		6	464
Thirty-fifth street, from 145 feet south of south house line of Wharton, north to dead end.....		6	145
Thirty-fifth street, from north house line of Wharton, north.....		6	305
Thirty-fourth street, from north house line of Reed to Wharton.....		6	428
Thirty-second street, from centre of Wharton to 6 feet north of south curb line of Gray's Ferry Road.....		6	516
Thurlow street, from dead end 225 feet west of west house line of Twelfth, west.....		6	107
Titan street, from west house line of Twenty-sixth to 25 feet west of east house line of Twenty-eighth.....		6	867
Tree street, from west curb line of Eleventh to dead end 8 feet west of west curb line of Twelfth.....		6	454
Twelfth street, from centre of Jackson north to connect dead end.....		6	110
Twenty-eighth street, from 1 foot north of south house line of Reed, north to connect dead end.....		6	278
Twenty-seventh street, from south curb line of Wharton, north.....		6	35
Watkins street, from dead end, east house line of Eighteenth, west to connect dead end.....		6	25
Watkins street, from west curb line of Twenty-second to Long lane.....		6	357
Wharton street, from east curb line of Twenty-seventh to west house line of Twenty-eighth.....		6	484
Winton street, from centre of Old Second to 12 feet west of east house line of Fourth.....		6	613
Wolf street, from west curb line of Fourth to Fifth.....		6	445
Total.....			20,934

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Mains.</i>			
Bainbridge street, from west house line of Front to east house line of Broad.....		30	6,131
Moyamensing avenue, southeast side. from 16 feet north-east of south curb line of Snyder avenue, northeast to connect dead end.....		16	51
Snyder avenue, south side, from southeast curb line of Moyamensing avenue to 16 feet west of west house line of Fifth.....		16	618
Total			6,800
<i>Supply Main Connections.</i>			
Bainbridge and Front streets, between 30-inch main on Bainbridge and 8-inch main on Front.....		10	37
Bainbridge and Second streets, between 30-inch main on Bainbridge and 6-inch main on Second.....		10	19
Bainbridge and Third streets, between 30-inch main on Bainbridge and 6-inch main on Third.....		10	18
Bainbridge and Fourth streets, between 30-inch main on Bainbridge and 6-inch main on Fourth.....		10	30
Bainbridge street and Passyunk avenue, between 30-inch main on Bainbridge and 10-inch main on Passyunk avenue.....		12	32
Bainbridge and Sixth streets, between 30-inch main on Bainbridge and 6-inch main on Sixth.....		10	21
Bainbridge and Seventh streets, between 30-inch main on Bainbridge and 6-inch main on Seventh.....		10	28
Bainbridge and Eighth streets, between 30-inch main on Bainbridge and 10-inch main on Eighth.....		12	17
Bainbridge and Ninth streets, between 30-inch main on Bainbridge and 6-inch main on Ninth.....		10	27
Bainbridge and Tenth streets, between 30-inch main on Bainbridge and 6-inch main on Tenth.....		10	27
Bainbridge and Eleventh streets, between 30-inch main on Bainbridge and 10-inch main on Eleventh.....		12	34
Bainbridge and Twelfth streets, between 30-inch main on Bainbridge and 6-inch main on Twelfth.....		10	25
Bainbridge and Thirteenth streets, between 30-inch main on Bainbridge and 6-inch main on Thirteenth.....		10	18
Fourth street and Snyder avenue, between 6-inch main on Fourth street and 16-inch main on Snyder avenue.....		12	19
			352
<i>Fire hydrant connections</i>		6	1,252

Street.	Location.	Sizes in inches.	Distance in feet.
<i>Supply Connections (private).</i>			
Eighth street, west side, 118 feet south of south house line of Mifflin, for public bath-house.....		4	16
Gray's Ferry road, from 20-inch main 18 feet north of north curb line of Washington avenue, west, for U. S. Arsenal.....		6	30
Reed street, north side, 43 feet west of west house line of Huhn, for Philadelphia Traction Co.....		3	
Thirty-fifth street, 300 feet north of north house line of Gray's Ferry road, for Harrison Chemical Works.....		3	
Total.....			46
<i>Pipe relaid.</i>			
Atherton street, from centre of Carpenter north.....		6	26
Bainbridge street, from Ninth to 63 feet west of east house line of Eleventh.....		6	911
Barlow street, from centre of Reed north.....		6	25
Carbon street, from 9 feet south of south house line of Bainbridge, north.....		6	62
Diamond street, from centre of Fitzwater, north.....		6	12
Erie street, from 9 feet south of south house line of Bainbridge, north.....		6	23
Espey street, from 1 foot south of south house line of Fitzwater, north.....		6	25
Fitzwater street, from Eleventh to 8 feet west of east curb line of Broad.....		10	1,450
Florida street, from 5 feet south of south house line of Fitzwater, north.....		6	55
Hepburn street, from 3 feet north of north house line of Fitzwater to Bainbridge.....		6	329
Jane street, from southeast house line of Passyunk avenue, west.....		6	21
Jessup street, from 4 feet south of south house line of Fitzwater, north.....		6	29
Juniper street, from 1 foot south of south house line of Fitzwater, north.....		6	51
Lingo street, from 2 feet south of south house line of Carpenter, north.....		6	27
Milton street, from centre of Tenth to Twelfth.....		6	875
Park street, from centre of Catharine to 3 feet south of south house line of Fitzwater.....		6	345
Park street, from 2 feet east of east house line of Twenty-eighth, west.....		6	27
Passyunk avenue, southeast side, from 49 feet northeast of north house line of Queen to Catharine.....		6	212
Pharo street, from centre of Catharine to 3 feet south of south house line of Fitzwater.....		6	345

Street.	Location.	Sizes in inches.	Distance in feet.
<i>Pipe relaid—Continued.</i>			
Reed street, from centre of Fifth to east house line of Seventh.....		6	867
Stocker street, from 4 feet south of south house line of Carpenter, north.....		6	29
Tudor street, from centre of Tasker, north.....		6	16
Ward street, from 2 feet south of south house line of Carpenter, north.....		6	27
Webb street, from centre of Catharine to 6 feet south of north house line of Fitzwater.....		6	341
Total.....			6,130
<hr/>			
Fire hydrant connections relaid.....		6	431
<hr/>			
Repairs, general.....		4	33
“ “.....		6	778
“ “.....		8	40
“ “.....		10	25
“ “.....		12	14
Total.....			890
<hr/>			
<i>Pipe taken up.</i>			
Atherton street, from centre of Carpenter, north.....		3	26
Barlow street, from centre of Reed, north.....		4	25
Carbon street, from 6 feet north of south curb line of Bainbridge, north.....		6	35
Diamond street, from centre of Fitzwater, north.....		4	12
Erie street, from 9 feet south of south house line of Bainbridge, north.....		4	30
Espey street, from south house line of Fitzwater, north....		3	25
Fitzwater street, from 28 feet east of west house line of Eleventh to 8 feet west of east curb line of Broad.....		6	1,448
Florida street, from south house line of Fitzwater, north....		3	55
Jessup street, from south house line of Fitzwater, north....		3	28
Juniper street, from south house line of Fitzwater, north..		4	51
Lingo street, from 2 feet south of south house line of Carpenter, north.....		4	26
Milton street, from centre of Tenth, west.....		2	350
Milton street, from 350 feet west of centre of Tenth, west..		3	125
Park street, from Catharine to Fitzwater.....		4	345

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe taken up—Continued.</i>			
Park street, from 2 feet east of east house line of Twenty-eighth, west.....		4	27
Pharo street, from Catharine to Fitzwater.....		4	345
Reed street, from centre of Fifth to east house line of Seventh.....		4	866
Stocker street, from 4 feet south of south house line of Carpenter, north.....		4	28
Ward street, from 2 feet south of south house line of Carpenter, north.....		4	27
Webb street, from Catharine to Fitzwater.....		3	341
Total.....			4,215
<hr/>			
Fire hydrant connections taken up.....		4	310
Fire hydrant connections taken up.....		6	19
			329
<hr/>			
<i>Pipes cut off and abandoned.</i>			
Carbon street, from 9 feet south of south house line of Bainbridge, north.....		3	22
			22
<hr/>			
Fire hydrant connections cut off and abandoned.....		4	464
Fire hydrant connections cut off and abandoned.....		6	25
Total.....			489

Recapitulation of First District.

Purposes for which Used.	Size—Inches.									Total in feet and pounds.		
	2	3	4	6	8	10	12	16	30			
New pipe or feet added.	Service mains.....				17,957	2,929	48				20,934	
	Supply mains.....							669	6,131		6,800	
	Supply main connections.....						250	102			352	
	Fire hydrant connections.....				1,252						1,252	
	Supply connections (private).....			16	30						46	
	Total { Feet			16	19,239	2,929	298	102	669	6,131		29,384
{ Pounds			304	634,887	123,018	16,390	7,344	73,590	2,035,492		2,891,025	
Pipe used but adding nothing to feet in the ground.	Pipe relaid.....				5,111		1,450				6,561	
	Repairs general.....			33	778	40	25	14			890	
	Pipe taken up.....	350	600	2,092	1,502						4,544	
	Total { Feet	350	600	2,125	7,391	40	1,475	14				11,995
	{ Pounds.....	3,500	9,000	40,375	243,903	1,680	81,125	1,008				380,591
	Total handled { Feet.....	350	600	2,141	26,630	2,969	1,773	116	669	6,131		41,379
{ Pounds.....	3,500	9,000	40,679	878,790	124,698	97,515	8,352	73,590	2,035,492		3,271,616	
Pipe cut off and abandoned		22	464	25							511	

SECOND DISTRICT.

Comprising the Fifth, Sixth, Seventh, Eighth, Ninth, Tenth, Twenty-fourth, Twenty-seventh and Thirty-fourth Wards.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Ashland avenue, from centre of Fifty-eighth, southwest....		6	278
Barker street, from 6 feet west of centre of Sixteenth to Seventeenth		6	440
Cathedral avenue, from Fiftieth to dead end 17 feet west of east house line of Fifty-second.....		6	908
Chester avenue, from 21 feet east of centre of Fifty-second to Fifty-fourth		6	1,061
Conestoga street, from south house line of Hunter's lane, north.....		6	20
Conestoga street, from south house line of Thompson, north to connect dead end.....		6	66
Elmwood avenue, from Fifty-ninth to Sixtieth.....		6	577
Fairmount avenue, from Lancaster avenue to Mount Vernon.....		6	236
Fiftieth street, from centre of Greenway avenue, northwest.		6	533
Fiftieth street, from south house line of Florence avenue to Pentridge.....		6	241
Fifty-fifth street, from Lansdowne avenue to dead end 11 feet 2 inches north of centre of Hunter's lane.....		6	320
Fifty-fourth street, from Chester avenue to Springfield.....		6	498
Fifty-fourth street, from Wyalusing avenue to Supplee.....		6	363
Fifty-second street, from Market to Filbert.....		6	311
Filbert street, from centre of Fifty-second, west.....		6	196
Florence avenue, from northeast house line of Fiftieth to Fifty-first		6	506
Forty-eighth street, from 6 feet southeast of centre of Glenmore to Paschall.....		6	189
Forty-eighth street, from Springfield avenue to 37 feet 3 inches northwest of centre of Warrington.....		6	617
Forty-eighth-and-one-half street, from centre of Paschall avenue northwest to dead end.....		6	8
Forty-fourth street, from Chestnut to Market.....		6	551
Forty-second street, from dead end 3 feet south of centre of Mantua avenue, north.....		6	3
Forty-seventh street, from dead end 417 feet 8 inches northwest of centre of Gray's Ferry road to Woodland avenue		6	627
Forty-third street, from dead end 14 feet south of centre of Mantua avenue, north.....		6	14
Forty-third-and-one-half street, from centre of Ogden north to connect dead end..		6	149
Forty-third-and-one-half street, from dead end 6 feet 2 inches south of centre of Mantua avenue, north.....		6	6
Glenmore avenue, from Forty-eighth to Hanson.....		6	320

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Greenway avenue, from dead end 305 feet 6½ inches north-east of northeast house line of Forty-ninth, northeast..		6	82
Greenway avenue, from Forty-ninth to Fiftieth.....		6	483
Grubb street, from 15 feet 1 inch east of east house line of Sycamore, west.....		6	24
Hamilton street, from dead end 142 feet 4½ inches west of west house line of Sixty-third to east curb line of Sixty-fourth.....		6	372
Hanson street, from Glenmore to Paschall avenue.....		6	186
Holly street, from Westminster to Mantua avenue.....		6	415
Hunter's lane, from Fifty-fourth to 126 feet 10 inches west of centre of Fifty-fifth		6	656
Hutton street, from Parrish to Ogden.....		6	381
Island road, from southeast house line of Paschall avenue to dead end 3 feet 6 inches northwest of southeast house line of Woodland avenue.....		6	530
Jefferson street, from centre of Fifty-fifth, west.....		6	237
Kent street, from centre of Fifty-fifth, west.....		6	13
Lansdowne avenue, from Lancaster avenue to Fifty-fourth.		6	748
Lloyd street, from southeast to northwest house line of North.....		6	50
Ludlow street, from dead end 12 feet west of west house line of Forty-third to Forty-fourth.....		6	327
Mantua avenue, from Forty-first to Forty-fourth.....		6	1,771
North street, from Island road to 13 feet northeast of centre of Seventy-second or Mud lane		6	1,058
Paschall avenue, from centre of Island road, northeast.....		6	35
Paschall avenue, from southwest house line of Sixty-ninth northeast to dead end.....		6	157
Paschall avenue from Hanson to Gray's Ferry road.....		6	580
Peach street, from 30 feet south of centre of Lansdowne, north		6	55
Pennsgrove street, from Mantua avenue to dead end east house line of Forty-second.....		6	522
Race street, from Sixty-third to 4 feet west of east curb line of Sixty-fourth.....		6	569
Rockland street, from centre of Thirty-ninth to Lancaster avenue.....		6	390
Saybrook street, from Fiftieth, northeast to dead end.....		6	129
Saybrook street, from Forty-ninth to Hanson.....		6	174
Seventy-second street, or Mud lane, from southeast house line of North, northwest.....		6	56
Sixty-fourth street, from Vine to Callowhill.....		6	564
Sixty-third-and-one-half street, from south to north house line of Race.....		6	60
Sloan street, from Fairmount avenue to Aspen		6	412
South street, from dead end 21 feet east of east house line of Sixty-first, west.....		6	99

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Springfield avenue, from Forty-ninth to 2 feet west of west house line of St. Bernard place.....		6	294
Springfield avenue, from Fifty-fourth, to 170 feet 7 inches west of centre of Fifty-fifth		6	694
St. Bernard place, from dead end 51 feet 5 inches southeast of centre of Springfield avenue, northwest.....		6	51
Sycamore street, from Spruce to Locust.....		6	452
Thirtieth street, from south house line of Marston to dead end south house line of Locust.....		6	943
Thirth-first street, from Baring to Hamilton		6	268
Thirty-fourth street, from Filbert to Lancaster avenue.....		6	261
Thompson street, from dead end 4 feet east of west house line of Fifty-fourth to west house line of Conestoga.....		6	284
Thompson street, north side, from Sixty-first street, west....		6	126
Warren street, from 30 feet south of centre of Lansdowne avenue, north		6	30
Warrington avenue, from dead end west house line of Forty-seventh to 37 feet 4 inches west of centre of Forty-eighth		6	497
Wyalusing avenue, from Mantua avenue to Forty-third.....		6	471
Total.....			24,544
<i>Supply Mains.</i>			
Fifty-second, from Woodland avenue to Baltimore.....		30	4,655
Fifty-second street, from Baltimore avenue to dead end south curb line of Walnut.....		36	3,360
Haverford avenue, from Thirty-fifth street to Lancaster avenue		20	2,510
Fortleth street, from Haverford to Lancaster avenue.....		20	127
Total.....			10,652
<i>Supply Main Connections.</i>			
Fifty-second street and Woodland avenue, between 30-inch main on Fifty-second and 12-inch main on Woodland avenue		16	30
		20	8
Fifty-second street, 16 feet southeast of northwest curb line of Greenway avenue, from northeast side of 30-inch main, southeast		10	7
Fifty-second street, 13 feet 5 inches southeast of northwest curb line of Kingsessing avenue, from northeast side of 30-inch main, southeast		10	7

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main Connections—Continued.</i>			
Fifty-second street and Chester avenue, between 30-inch main on Fifty-second street and 6-inch main on Chester avenue.....		10	15
Fifty-second street, 13 feet 3 inches southeast of northwest curb line of Springfield avenue, from northeast side of 30-inch main, southeast.....		10	7
Fifty-second street, 13 feet southeast of northwest curb line of Warrington, from northeast side of 30-inch main, southeast.....		10	7
Fifty-second street, 12 feet 4 inches southeast of northwest curb line of Florence, from northeast side of 30-inch main, southeast.....		10	7
Fifty-second street, 15 feet southeast of northwest curb line of Whitby avenue, from northeast side of 30-inch main, southeast.....		10	7
Fifty-second street and Baltimore avenue, between 36 inch main on Fifty-second and 12-inch main on Baltimore avenue.....		16	32
Fifty-second street, 9 feet south of north curb line of Catharine, from east side of 36-inch main, east.....		10	7
Fifty-second street, 16 feet south of north curb line of South, from east side of 36-inch main, east.....		10	7
Fifty-second street, 9 feet south of north curb line of Lombard, from east side 36-inch main, east.....		10	7
Fifty-second street, 10 feet south of north curb line of Pine, from east side of 36-inch main, east.....		10	7
Fifty-second street, 15 feet south of north curb line of Spruce, from east side of 36-inch main, east.....		10	7
Fifty-second street, 8 feet 6 inches north of north curb line of Locust, from east side of 36-inch main, southeast.....		20	28
Total.....			190
Fire hydrant connections.....		6	1,499
<i>Fire Connections (private).</i>			
Chestnut street, north side, 143 feet east of east house line of Thirty-second, for Drexel Institute.....		6	26
Delaware avenue, east side, 25 feet south of south house line of Market (connected to old 4-inch fire hydrant connection), for West Jersey Ferry Co.....		4	5
Twenty-fifth street, west side, 181 feet south of south house line of Spruce, for Tracy Worsted Mills.....		4	18
Total.....			49

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Connections (private).</i>			
Chestnut street, north side, 100 feet east of east house line of Thirty-second, for Drexel Institute.....		3	
Eleventh street, east side, 11 feet north of north house line of Marble alley, for Bingham House Hotel.....		4	16
Gray's Ferry road, south side, 224 feet east of southeast house line of Paschall avenue, for Baltimore and W. R. R. Co.....		3	29
Jayne street, south side, 93 feet east of east house line of Ninth, for Girard House Hotel.....		3	7
Market street, south side, 491 feet east of east house line of Thirtieth, for West Philadelphia Market Company..		3	86
Ninth street, east side, 249 feet north of north house line of Pine, for Pennsylvania Hospital.....		4	24
Pine street, south side, 9 feet west of east house line of Guardian avenue, for Philadelphia Almshouse.....		6	30
Sycamore street, west side, 123 feet 9 inches south of south house line of Locust, for J. M. Sharp, hotel and theatre.....		4	6
Total.....			198
<i>Motor Connections.</i>			
Ludlow street, south side, 173 feet east of east house line of Thirty-second, for Drexel Institute.....		3	15
Market street, south side, 41 feet east of east house line of Thirty-seventh, for Edward Lyster.....		6	18
Total.....			33
<i>Drains.</i>			
Fifty-second street, 129 feet north of north house line of Willow avenue from 30 inch main.....		6	7
<i>Pipe Relaid.</i>			
Barclay street, from Sixth to Eighth.....		6	878
Barker street, from Seventeenth to Twentieth.....		6	1,343
Clinton street, from Ninth to Tenth.....		6	435
Delancey Place, from Eighteenth to Nineteenth.....		6	448
Factory street from 28 feet east of centre of Twenty-fifth, west.....		6	56
Ludlow street, from centre of Forty-third, west.....		6	42
Quince street, from Lombard to Spruce.....		6	878

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Relaid—Continued.</i>			
Silver street, from Twelfth to Juniper.....		6	704
Thirty-second street, from 482 feet 6 inches south of south house line of Chestnut (private supply connection)....		6	20
Twenty-fifth street, from 3 feet north of north house line of Spruce to Pine.....		6	555
Twenty-third street, from dead end 14 feet north of north house line of Market to Arch.....		12	701
Union street, from Front to Fourth.....		6	1,457
Total.....			7,517
<hr/>			
Fire hydrant connections relaid.....		6	722
<hr/>			
Repairs, general.....		4	13
“ “		6	642
“ “		8	24
“ “		10	67
“ “		12	92
“ “		16	19
“ “		20	42
Total.....			899
<hr/>			
<i>Pipe Taken Up.</i>			
Barclay street, from Sixth to Eighth.....		3	878
Barker street, from Seventeenth to Twentieth.....		3	1,354
Clinton street, from Ninth to Tenth.....		3	435
Cuthbert street, from 268 feet east of east house line of Twelfth, west.....		6	293
Delancey Place, from Eighteenth to Nineteenth.....		4	448
Factory street, from 28 feet east of centre of Twenty-fifth, west.....		3	56
Grubb street, from 15 feet 1 inch east of east house line of Sycamore, west.....		4	24
Ludlow street, from centre of Forty-third, west.....		4	42
Quince street, from Lombard to 173 feet north of centre of Pine.....		3	518
Quince street, from 278 feet south of south house line of Spruce, north.....		3	310
Silver street, from centre of Twelfth, west.....		3	194
Silver street, from 244 feet west of west house line of Twelfth to 164 feet west of west house line of Thirteenth.....		3	287

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Taken Up—Continued.</i>			
Silver street, from 125 feet west of west house line of Thirteenth to Juniper.....		3	125
Thirty-second street, from 432 feet 6 inches south of south house line of Chestnut (private supply connection)....		6	20
Timothy street, from 132 feet south of south house line of Graff, north.....		3	15
Twenty-fifth street, from 3 feet north of north house line of Spruce to Pine		3	555
Twenty-third street, from 18 feet south of south house line of Filbert street, north.....		4	36
Twenty-third street, from 11 feet south of north curb line of Arch, north.		4	5
Union street, from Front to Fourth.....		4	1,457
Urbana street, 104 feet north of north house line of Urbana.....		6	3
Total.....			7,055
<i>Pipe Lowered.</i>			
Fire hydrant connections taken up.....		3	150
“ “ “		4	625
“ “ “		6	159
Total.....			934
<i>Pipe Raised.</i>			
Lansdowne avenue, intersection of Fifty-fifth-and-one-half street (over sewer).....		6	12
<i>Pipe Out Off and Abandoned.</i>			
Graff street, from 81 feet east of east curb line of Madison, west.....		6	81
Quince street, from 148 feet north of north house line of Pine, north.....		3	50
Sheaff street, from 131 feet east of east curb line Madison, west.....		4	131
Silver street, from 169 feet west of west house line of Twelfth, west.....		3	75

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Cut Off and Abandoned—Continued.</i>			
Silver street, from 104 feet west of west house line of Thirteenth, west.....		3	21
Timothy street, from 81 feet east of east curb line of Madison avenue, west.....		6	81
Twenty-third street, from 134 feet south of south house line of Filbert street, north.....		4	116
Twenty-third street, from Filbert to Arch.....		4	370
Total.....			925
Fire hydrant connections cut off and abandoned.....		3	44
“ “ “ “ “		4	279
Total.....			323

Recapitulation of Second District.

Purposes for which Used.	Size—Inches.										Total in feet and pounds.	
	3	4	6	8	10	12	16	20	30	36		
New pipe or feet added.	Service mains.....			24,544								24,544
	Supply mains.....							2,637	4,655	3,360		10,652
	Supply main connections.....					92		62	36			190
	Fire hydrant connections.....			1,499								1,499
	Fire connections (private).....		23	26								49
	Supply connections (private).....		46	50								198
	Motor connections (private).....	122		18								38
Drains.....	15		7								7	
Total.....	{ Feet.....	137	69	26,124		92		62	2,673	4,655	3,360	37,172
	{ Pounds.....	2,055	1,311	862,092		5,060		6,820	425,007	1,545,460	1,417,920	4,266,725
Pipe used but adding nothing to feet in the ground.	Pipe relaid.....			7,538			701					8,239
	Repairs, general.....		13	642	24	67	92	19	42			899
	Pipe taken up.....	4,877	2,637	475								7,989
	Pipe lowered.....			300								300
	Pipe raised.....			12								12
Total.....	{ Feet.....	4,877	2,650	8,967	24	67	793	19	42			17,439
	{ Pounds.....	75,155	50,350	295,911	1,008	3,685	57,096	2,090	6,678			489,973
Total handled.....	{ Feet.....	5,014	2,719	35,091	24	159	793	81	2,715	4,655	3,360	54,611
	{ Pounds.....	75,210	51,661	1,158,003	1,008	8,745	57,096	8,910	431,685	1,545,460	1,417,920	4,755,698
Pipe cut off and abandoned.....	190	896	162									1,248

THIRD DISTRICT.

Comprising the Eleventh, Twelfth, Sixteenth, Seventeenth, Eighteenth, Nineteenth, Twenty-third, Twenty-fifth, and part of the Thirty-third Ward.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Abigail street, from centre of Amber to dead end south-east house line of Coral.....		6	375
Allegheny avenue, south side, from 241 feet east of east house line of Front, west.....		6	271
Allegheny avenue, south side, from east to west house line of Second.....		6	60
Allegheny avenue, north side, from 63 feet west of west house line of B to Front.....		6	1,008
Allegheny avenue, east to west house line of Second.....		6	60
Altmaier street, from east house line of Mascher, west.....		6	25
Amber street, from 12 feet northeast of southwest house line of Ann, northeast.....		6	13
American street, east side, from 305 feet south of south house line of Diamond street, north to dead end.....		6	195
American street, east side, from south house line of Cambria, north.....		6	38
American street, west side, from 12 feet north of south house line of Cambria, north.....		6	26
American street, from south house line of Ontario, north..		6	50
Ann street, from Belgrade to Gaul.....		6	354
Ann street, from 12 feet southeast of northwest house line of Trenton avenue to Amber.....		6	540
Artisan street, from south house line of Ball, north.....		6	25
Athol street, from Clearfield to south curb line of Allegheny avenue.....		6	555
Beach street, from dead end, south house line of Fairmount avenue, north.....		6	87
Bermuda street, from Orthodox to Margareta.....		6	564
Birch street, from Amber street to Frankford avenue.....		6	425
Cambria street, from Front to Howard.....		6	301
Cambria street, from dead end east house line of Philip to dead end, 14 feet east of west house line of American.		6	280
Cedar street, from southwest to northeast house line of Howarth.....		6	50
Cedar street, from southwest curb line of Wakeling, north-east.....		6	39
Cemetery avenue, from Emerald to Malvern.....		6	217
Church street, from Seventh to Eighth.....		6	368
Clarion street, from dead end 77 feet 3 inches south of south house line of Clearfield, north.....		6	107
Clearfield street, from 12 feet east of centre of Second, west.....		6	24
Clearfield street, from Kensington to west house line of F..		12	574

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Cooper street, from 12 feet north of south house line of Tioga, north.....		6	24
Custer street, from centre of Clearfield, north.....		6	13
Darien street, from Somerset to Cambria.....		6	550
Eighth street, from Somerset to dead end, south house line of Cambria.....		6	525
Ella street, from Cambria to Indiana.....		6	552
Emerald street, from Somerset, northeast.....		6	35
Eyre street, from dead end 302 feet northwest of northwest house line of Thompson to Belgrade.....		6	254
"F" street, from south to north house line of Clearfield...		6	50
Fairhill street, from Glenwood avenue, north.....		6	230
Fillmore street, from 2 feet southeast of northwest house line of Cedar northwest to dead end.....		6	32
Foulkrod street, from Leiper to "P".....		6	2,375
Fox street, from Ontario to Tioga.....		6	555
Franklin street, from Church, northeast.....		6	20
Geisler street, from southeast house line of Almond to Belgrade.....		6	346
Glenwood avenue, from Fairhill street, southwest.....		6	49
Gurney street, from 4 feet 6 inches southeast of east house line of Front to 3 feet northwest of west house line of Mascher.....		6	720
Hancock street, from Somerset to Indiana.....		6	1,050
Harrison (or Godfrey) street from centre of Jefferson, north.....		6	26
Haworth street, from Willow to 12 feet northwest of southeast house line of Frankford avenue.....		6	907
Helen street, from 41 feet southwest of southwest house line of Sterner to Somerset.....		6	539
Hope street, from 28 feet south of centre of Gurney, north.....		6	28
Horrocks street, from southwest house line of Unity, northeast.....		6	50
Horrocks street, from southwest house line of Foulkrod, northeast.....		6	50
Howard street, from 12 feet north of south house line of Tioga, north.....		6	38
Howard street, 22 feet 4 inches north of southwest house line of Gurney, north.....		6	3
Hutchinson street, from Richfield to Cambria.....		6	807
Indiana avenue, from 13 feet east of west house line of Rosehill to dead end 84 feet west of centre of Ormes.....		6	279
Indiana avenue, from east house line of Hancock, west.....		6	52
Indiana avenue, from west house line of Second to dead end 33 feet west of west house line of American.....		6	427
Jasper street, from centre of Sterner, northeast to connect dead end.....		6	202

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Jasper street, from dead end 13 feet southwest of northeast house line of Hilton, northeast.....		6	150
Joyce street, from 3 feet southwest of northeast house line of Kettlewell to 13 feet northeast of centre of Tioga..		6	315
Judge street, from Edgemont to Thompson.....		6	241
Kensington avenue, southeast side, from Adams to Frankford avenue.....		12	614
Kensington avenue, northwest side, from Adams to Frankford avenue.....		6	665
Large street, from southwest house line of Foulkrod, northeast.....		6	50
Lee street, from centre of Tioga, north.....		6	26
Lippincott street, from east to west house line of Second...		6	60
Livingstone street, from south to north house line of Geisler.....		6	30
Malvern street, from centre of Cemetery avenue, northeast.		6	19
Mascher street, from dead end 12 feet 6 inches north of southwest house line of Gurney, north.....		6	18
Mascher street, from south to north house line of Tioga....		6	50
Mutter street, from centre of Somerset to dead end south house line of Cambria.....		6	525
Ninth street, from dead end 12 feet, south of north house line of Cambria to south line of Indiana avenue.....		6	525
Oakland street, from southwest house line of Foulkrod, northeast.....		6	50
Ontario street, from 3 feet 4 inches east of east house line of Second to dead end east house line of Third.....		6	692
Orianna street, from dead end 329 feet 6 inches north of north house line of Indiana to dead end southwest house line of Gurney.....		6	126
Ormes street, from 12 feet north of south house line of Indiana avenue, north.....		6	26
Orthodox street, from dead end 100 feet northwest of northwest house line of Belgrade, northwest.....		6	105
Orthodox street, from 2 feet southeast of southeast house line of Frankford avenue, northwest.....		6	22
"P" street, from southwest house line of Foulkrod, northeast.....		6	50
Philip street, from 8 feet north of south house line of Cambria to north house line of Indiana.....		6	592
Philip street, from 140 feet south of south house line of Ontario, north.....		6	190
Pink street, from 27 feet south of centre of Jefferson, north.....		6	27
Potter street, from 12 feet west of east house line of "F" to centre of Clearfield.....		6	423
Ruan street, from Frankford avenue, northwest.....		6	20
Salmon street, from Lefevre to Buckius.....		6	646

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Second street, from end northwest house line of Indiana to dead end 141 feet 6 inches south of south house line of Ontario.....		6	2,123
Second street, from Glenwood, north.....		6	226
Seltzer street, from Helen to Jasper.....		6	215
Seventh street, from Cambria to 275 feet north of north house line of Indiana avenue.....		6	850
Silver street, from Helen to Jasper.....		6	213
Somerset street, from Garnet to Kensington avenue.....		6	242
Sterner street, from Helen to Jasper.....		6	213
Thomas street, from southwest to northeast house line of Bridge.....		6	50
Tioga street, from Frankford avenue to 2 feet east of west house line of Joyce.....		6	226
Tioga street, from Fox to Second.....		6	1,433
Tioga street, from 78 feet 2 inches east of centre of Turner to Sixth.....		6	356
Trenton avenue, southeast side, from Norris to dead end southwest house line of Susquehanna avenue.....		6	560
Trenton avenue, southeast line, from dead end 10 feet southwest of northeast house line of Susquehanna avenue, northeast to connect.....		6	50
Turner street, from Glenwood avenue, north.....		6	236
Turner street, from Tioga street, north.....		6	52
Ulrick street, from Fairmount avenue to Maria.....		6	193
Unity street, from Wingohocking to Adam.....		6	480
Wakeling street, from Willow to Frankford avenue.....		6	912
Waterloo street, from dead end 12 feet 6 inches north of southwest house line of Gurney, north.....		6	18
Westmoreland street, from 2 feet east of northwest house line of Trenton avenue, west.....		6	84
Westmoreland street, from centre of Frankford avenue, west.....		6	43
Westmoreland street, from east to west house line of Second.....		6	60
Windrim street, from centre of Clearfield, north.....		6	13
Worth street, from centre of Bridge, west.....		6	23
Wrecken street, from west house line of Commerce to Cedar.....		6	373
Wyoming street, from centre of Ann, northeast.....		6	20
Total.....			32,440

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main Connections.</i>			
Emerald street, 13 feet 10 inches southwest of southwest house line of Lehigh avenue between 12 and 6-inch mains on Emerald.....		10	9
Emerald street, southwest house line of Lehigh avenue between 12 and 6-inch mains on Emerald.....		6	10
Total.....			19
<i>Fire Connections (Private).</i>			
Beach street, northwest side, 359 feet southwest of southwest house line of Laurel, for Shimmel & Co.....		4	8
<i>Supply Connections (Private).</i>			
Lehigh avenue, north side, 205 feet west of west house line of Leamy, for Bromley Sons.....		4	11
Orianna street, east side, 125 feet north of north house line of Cumberland, for Joseph P. Murphy.....		4	9
Philip street, west side, 181 feet south of south house line of Somerset, for Electric Light Company.....		4	14
Second street, east side, 45 feet south of south house line of Oxford, for Quaker City Morocco Company.....		4	22
Susquehanna avenue wharf, north side, in cartway to old Pump Station, 16 feet southeast of southeast house line of Beach street, for new yard of Third District Bureau of Water.....		4	76
		6	17
Total.....			149
<i>Pipe Relaid.</i>			
Amber street, from centre of Westmoreland, northeast.....		6	12
Ball street, from Beach to Richmond.....		6	471
Beach street, from north house line of Noble to 28 feet north of south house line of Green.....		6	359
Beaver street, from Second to Canal.....		6	418
Beaver street, from Charlotte to Fourth.....		6	212
Bridge street, from Thomas to southeast house line of Edmund.....		6	714

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Relaid—Continued.</i>			
Brinton street, from 2 feet 6 inches south of south house line of Jefferson, north.....		6	29
Charlotte street, from 27 feet south of north house line of Girard avenue to 10 feet north of south house line of Thompson		6	425
Clairbourne street, from 2 feet south of south house line of Ball, north.....		6	27
Darien street, from 12 feet south of centre of Norris, north.....		6	12
Frankford avenue, from 20 feet northeast of southwest house line of Westmoreland, northeast.....		10	28
Gordon street, from southeast house line of Tulip, northwest.....		6	15
Gordon street, from 24 feet northwest of southeast house line of Tulip, northwest.....		6	27
Green street, from east house line of Beach, west.....		6	28
Hope street, from 13 feet north of south house line of Norris, north.....		6	24
Howard street, from 13 feet 8 inches north of south house line of Norris, north.....		6	14
Kressley street, from Norris, north.....		6	25
Manakin street, from 14 feet 6 inches southeast of centre of Norris, north.....		6	15
Manakin street, from centre of Norris, north.....		6	14
Norris street, from east house line of Hope to west house line of Howard.....		6	184
Norris street, from west house line of Fifth to 24 feet west of west house line of Kressler.....		6	256
Norris street, from east house line of Darien to Ninth.....		6	155
Orianna street, from Cumberland to Huntingdon.....		6	555
Penn alley, from centre of St. John, west.....		6	23
Sixth street, from south house line of Jefferson, north.....		6	54
Sixth street, west side, from south curb of Columbia avenue, north.....		6	17
Steam Mill alley, from 1 foot 9 inches east of east house line of St. John, west.....		6	22
Trenton avenue, southeast side, from 40 feet northeast of northeast house line of Susquehanna avenue to 2 feet 6 inches northeast of centre of Dauphin.....		6	346
Vienna street, from Beach to Richmond.....		6	296
Waterloo street, from centre of Westmoreland, northeast..		6	13
Westmoreland street, from 121 feet 2 inches southeast of southeast house line of Waterloo to Frankford avenue..		6	591
Wood street, from east to west house line of St. John.....		6	41
Total.....			5,422

Street.	Location.	Size in inches.	Distance in feet.
Fire hydrant connections relaid.....		6	479
Repairs, general.....		4	3
“ “		6	797
“ “		10	16
“ “		12	34
Total.....			850
<i>Pipe Taken Up.</i>			
Amber street, from centre of Westmoreland, northeast.....		6	12
Ball street, from Beach to Richmond.....		4	471
Beach street, from north house line of Noble to 28 feet north of south house line of Green.....		4	359
Beach street and Susquehanna avenue in cartway to old Pumping Station.....		4	187
Beaver street, from Second to east house line of St. John....		4	218
Beaver street, from 40 feet east of east house line of Canal, west.....		4	60
Beaver street, from Charlotte to Fourth.....		4	212
Bridge street, from Thomas to southeast house line of Edmund.....		6	714
Brinton street, from 2 feet 6 inches south of south house line of Jefferson, north.....		4	29
Charlotte street, from Girard avenue to Thompson.....		4	425
Clairbourne street, from 2 feet south of south house line of Ball, north.....		4	27
Fisher street, from 18 feet south of centre of Westmoreland, north.....		6	18
Frankford avenue, from 20 feet northeast of southwest house line of Westmoreland, northeast.....	10		28
Gordon street, from southeast house line of Tulip, northwest.....		4	15
Gordon street, from 24 feet northwest of southeast house line of Tulip, northwest.....		4	27
Green street, from east house line of Beach, west.....		6	28
Hope street, from 13 feet north of south house line of Norris, north.....		4	24
Howard street, from 13 feet 8 inches north of south house line of Norris, north.....		6	14
Kressler street, from Norris, north.....		4	25
Manakin street, from 14 feet 6 inches southeast of centre of Norris, northwest.....		4	15
Manakin street, from centre of Norris, north.....		4	14
Norris street, from east house line of Hope to west house line of Howard.....		6	184
Norris street, from west house line of Fifth to 24 feet west of west house line of Kressler.....		6	256

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Taken Up—Continued.</i>			
Norris street, from east house line of Darien to Ninth.....		6	155
Orianna street, from centre of Cumberland, north.....		4	53
Orianna street, from 52 feet south of south house line of Huntingdon, north.....		4	77
Penn alley, from centre of St. John, west.....		3	23
Sixth street, from south house line of Jefferson, north.....		4	54
Sixth street, west side, from south curb line of Columbia avenue, north.....		6	17
Steam Mill alley, from 1 foot 9 inches east of east house line of St. John, west.....		3	22
Trenton avenue, southeast side, from 78 feet southwest of centre of Dauphin, northeast.....		4	78
Vienna street, from east house line of Richmond, west.....		4	27
Waterloo street, from centre of Westmoreland, northeast..		6	13
Westmoreland street, from 121 feet 2 inches southeast of southeast house line of Waterloo to Frankford avenue.		6	591
Wood street, from east to west house line of St. John.....		4	41
Total			4,513
Fire hydrant connections taken up.....		4	517
Fire hydrant connections taken up.....		6	16
<i>Pipe lowered.</i>			
James Street, from centre of Orthodox, northeast.....		6	231
Orthodox street, from 131 feet southeast of southeast house line of James, northwest.....		6	269
Orthodox street, from 192 feet southeast of southeast house line of Worth, northwest.....		6	242
Second street, west side, from Ontario to south curb line of Tioga.....		6	519
Worth street, from 54 feet southwest of southwest house line of Orthodox, northeast.....		6	189
Total			1,450
<i>Pipe cut off and abandoned.</i>			
Beaver street, from east house line of St. John, west.....		4	145
Orianna street, from 28 feet north of north house line of Cumberland, north.....		4	425
Trenton avenue, southeast side, from 310 feet southwest of southwest house line of Dauphin, northeast.....		4	257
Vienna street, from Beach to east house line of Richmond.		4	261
Total.....			1,088
Fire hydrant connections cut off and abandoned.....		4	611
Fire hydrant connections cut off and abandoned.....		6	46

Recapitulation of Third District.

	Size—Inches.					Total in feet and pounds.
	3	4	6	10	12	
Purposes for which used.						
New pipe or feet added.	Service mains.....		31,252	9	1,188	32,440
	Supply main connections.....		10	9		19
	Fire hydrant connections.....		2,318			2,318
	Fire connections (private).....		8			8
	Supply connections (private).....		132	17		149
	Total { Feet.....		140	33,597	9	1,188	34,934
{ Pounds.....		2,660	1,108,701	495	85,536	1,197,392
Pipe used but adding nothing to feet in the ground.	Pipe relaid.....		5,873	28		5,901
	Repairs, general.....		3	16	34	850
	Pipe taken up.....	45	2,955	2,018	28	5,046
	Pipe lowered.....			1,450		1,450
	Total { Feet.....	45	2,958	10,138	72	34	13,247
{ Pounds.....	675	56,202	334,554	3,960	2,448	397,839
Total handled { Feet.....	45	3,098	43,735	81	1,222	48,181
{ Pounds.....	675	58,862	1,443,255	4,455	87,984	1,595,231
Pipe cut off and abandoned.....		1,699	46			1,745

FOURTH DISTRICT.

Comprising the Thirteenth, Fourteenth, Fifteenth, Twentieth, Twenty-ninth, Thirty-second, and part of the Twenty-eighth Ward.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Allegheny avenue, south side, from Germantown avenue to dead end east house line of Broad.....		6	1,297
Allegheny avenue, south side, from dead end west house line of Broad, west to connect dead end laid in 1890...		6	387
Allegheny avenue, south side, from dead end east house line of Little Park street to Twenty-second.....		6	1,876
Allegheny avenue, north side, from dead end east house line of Twentieth, west.....		6	433
Allegheny avenue, north side, from 458 feet west of west house line of Twentieth to 2 feet east of west house line of Twenty-second.....		6	543
Arizona street, from 240 feet east of east house line of Thirty-first to Thirty-second.....		6	716
Berks street, from east house line of Thirty-third, west.....		6	19
Bishop street, from 19 feet west of east house line of Thirteenth, west to connect dead end.....		6	32
Bouvier street, from York to 6 feet 3 inches north of south house line of Cumberland.....		6	531
Camac street, from south house line of Allegheny avenue, north.....		6	28
Carlisle street, from Clearfield to Allegheny avenue.....		6	553
Clarence street, from east house line of Twenty-second to Twenty-fourth.....		6	924
Clarence street, from 336 feet east of east house line of Twenty-sixth, west.....		6	360
Clarion street, from centre of York street north to connect dead end.....		6	12
Clearfield street, from west curb line of Thirteenth to dead end east house line of Broad.....		6	559
Clearfield street, from 1 foot east of east house line of Twenty-seventh to dead end, 311 feet 6 inches west of centre of Thirty-first.....		6	2,117
Clifford street, from dead end east curb line of Thirty-first, northeast.....		6	358
Coffman street, from 19 feet west of east house line of Thirteenth, west to connect dead end.....		6	23
Coffman street, from Park avenue, west.....		6	30
Colorado street, from York to 13 feet north of south house line of Cumberland.....		6	540
Cumberland street, from Sedgeley avenue, west.....		6	51
Dauphin street, from dead end east house line of Nineteenth, west to connect.....		6	51
Delhi street, from Edgely to French.....		6	119

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Diamond street, north side, from east to west house line of Thirty-first.....		6	67
Diamond street, south side, from east to west house line of Thirty-first.....		6	81
Dover street, from Columbia to Montgomery avenue.....		6	541
Edgeley street, from Delhi to Tenth.....		6	221
Edgeley street, from centre of Twenty-seventh, west.....		6	13
Eighteenth street, from York to south curb line of Cumberland.....		6	534
Eleventh street, from dead end, 12 feet 6 inches south of south house line of Indiana avenue, north.....		6	63
Eleventh street, from 32 feet south of centre of Glenwood avenue, north.....		6	71
Fifteenth street, west side, from dead end 6 inches north of south house line of Lehigh avenue to north house line of Mundell.....		6	567
Firth street, from 12 feet east of west house line of Fifteenth to Philadelphia.....		6	207
Fontaine street, from centre of Thirty-first, west.....		6	25
Fox street, from 7 feet west of east house line of Philadelphia, west.....		6	13
Fremont street, from dead end east house line of Park avenue, west.....		6	30
French street, from 12 feet east of west house line of Delhi to Tenth.....		6	220
French street, from Ridge avenue to Thirty-second.....		6	395
Garnet street, from dead end north house line of Dauphin to York.....		6	531
Glenwood avenue, from Germantown avenue to west house line of Eleventh.....		6	209
Harlan street, from Eighteenth to Nineteenth.....		6	450
Harold street, from 15 feet east of west house line of Twenty-third to west house line of Twenty-fifth.....		6	918
Herman street, from Thirty-first to Thirty-second.....		6	452
Hicks street, from Lehigh avenue to Mundell.....		6	406
Hollingsworth street, from west house line of Thirty-first to 17 feet west of east house line of Thirty-second.....		6	409
Humboldt street, from 30 feet east of west house line of Twenty-second, west.....		6	16
Huntingdon street, from Fifteenth to 53 feet west of east house line of Seventeenth.....		6	917
Huntingdon street, from east house line of Twenty-second, west.....		6	28
Indiana avenue, from east house line of Eleventh to east curb line of Twelfth.....		6	461
Lehigh avenue, south side, from Fifteenth, west.....		6	15
Lehigh avenue, north side, from Fifteenth to 12 feet west of west house line of Hicks.....		6	184

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Lehigh avenue, south side, from 37 feet east of centre of Twenty-second, west.....		6	74
Lehigh avenue, north side, from 35 feet east of centre of Twenty-second, west.....		6	65
Lehigh avenue, north side, from 13 feet east of east house line of Twenty-sixth to west house line of Twenty-seventh.....		6	513
Logan avenue, from dead end east house line of Park avenue, west.....		6	30
Maple street, from Firth to Huntingdon.....		6	393
Marston street, from dead end 3 feet 6 inches north of north house line of Montgomery avenue to dead end south house line of Berks.....		6	498
Mundell street, from Fifteenth to Sixteenth.....		6	498
Newkirk street, from Master to Jefferson.....		6	503
Newkirk street, from Columbia avenue to 3 feet north of south line of Montgomery avenue.....		6	546
Newkirk street, from York to 13 feet north of south house line of Cumberland.....		6	538
Nineteenth street, from north house line of Dauphin, north.....		6	460
Nineteenth street, from south to north house line of York..		6	52
Norris street, from east house line of Thirty-second, west..		6	21
Oakdale street, from Fifteenth to Sixteenth.....		6	448
Opal street, from dead end north house line of Dauphin to York.....		6	528
Oxford street, from east house line of Thirty-third, west....		6	20
Page street, from centre of Thirty-first, west.....		6	25
Park avenue, from south house line of York, north.....		6	39
Park avenue, from 3 feet south of north house line of Coffman to Cambria.....		6	693
Park avenue, from Clearfield to south curb line of Allegheny avenue.....		6	560
Philadelphia street, from Cumberland to Huntingdon.....		6	552
Richfield street, from Thirteenth to Park avenue.....		6	364
Sedgely avenue, from 71 feet southwest of centre of Tweny-second, northeast.....		8	109
Sergeant street, from 12 feet east of west house line of Fifteenth to Philadelphia.....		6	207
Seventeenth street, from 226 feet north of north house line of Huntingdon, north.....		6	174
Showaker street, from dead end east house line of Twenty-eighth, west.....		6	37
Sixteenth street, from Oakdale, north.....		6	15
Sixteenth street, from south house line of Pearl, north.....		6	16
Sixteenth street, from 13 feet south of centre of Huntingdon, north.....		6	38
Somerset street, from 5 feet east of east house line of Twenty-second, west.....		6	61

Street.	Location.	Size in inches,	Distance in feet.
<i>Service Mains—Continued.</i>			
Susquehanna avenue, from east house line of Thirty-second, west.....		6	50
Sydenham street, from 12 feet south of north house line of Lehigh avenue to Mundell.....		6	284
Thirteenth street, east side, from Susquehanna avenue to connect dead end.....		6	262
Thirteenth street, from south house line of York, north....		6	28
Thirteenth street, from Lehigh avenue to Somerset.....		6	566
Thirteenth street, from south house line of Allegheny avenue, north.....		6	28
Thirtieth street, west side, from 30-inch main in Master street, north.....		12	19
Thirtieth street, from south house line of Columbia avenue, north.....		6	49
Thirtieth street, east side, from 12 feet north of south house line of Clearfield, north.....		6	38
Thirtieth street, west side, from 12 feet north of south house line of Clearfield, north.....		6	38
Thirty-first street, from 30-inch main in Master, north.....		10	28
Thirty-first street, from north house line of Norris to dead end 23 feet south of southwest house line of Ridge avenue.....		6	815
Thirty-first street, from Herman to York.....		6	286
Thirty-first street, from 13 feet south of centre of Clearfield, north.....		6	38
Thirty-second street, from south house line of Thomazine to dead end south house line of Columbia avenue.....		6	266
Thirty-second street, from 3 feet south of north house line of Diamond to north house line of Susquehanna avenue.....		6	577
Thirty-second street, from Herman to York.....		6	272
Thirty-third street, east side, from south house line of Oxford to north house line of Montgomery ave.....		12	1,143
Thirty-third street, east side, from south house line of Berks, north.....		12	50
Thirty-third street, east side, from south house line of Norris, north.....		6	51
Thomas avenue, from 13 feet south of centre of Huntingdon, north.....		6	26
Thomazine street, from 13 feet 3 inches east of centre of Thirty-second to Thirty-third.....		6	517
Twenty-eighth street, from 45 feet south of south house line of Showaker to 13 feet north of south house line of Lehigh avenue.....		6	205
Twenty-eighth street, from 13 feet south of centre of Clearfield north.....		6	26
Twenty-first street, from dead end north house line of Dauphin to York.....		6	528

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Twenty-first street, from south house line of Allegheny avenue, north.....		6	91
Twenty-fourth street, from dead end 186 feet south of south house line of York, north.....		6	453
Twenty-fourth street, from south house line of Huntingdon, north.....		6	49
Twenty-fourth street, from south to north house line of Harold		6	48
Twenty-fifth street, from 13 feet south of centre of Harold, north		6	26
Twenty-ninth street, from south house line of Clearfield, north		6	50
Twenty-second street, from York to dead end south house line of Huntingdon.....		6	1,077
Twenty-second street, from dead end 6 feet south of south house line of Lehigh avenue to 300 feet north of north house line of Somerset.....		6	968
Twenty-seventh street, from dead end of north house line of Sedgeley avenue.....		6	263
Twenty-seventh street, from 50 feet south of south house line of Lehigh avenue, north.....		6	36
Twenty-seventh street, from 13 feet south of centre of Clearfield, north.....		6	26
Uber street, from north house line of Susquehanna avenue to dead end 2 feet north of south house line of Dauphin.....		6	530
Van Pelt street, from Dauphin to York.....		6	556
Westmont street, from Thirty-first to Thirty-second.....		6	450
Whitehall street, from dead end 6 feet east of centre of Thirteenth, west to connect.....		6	6
Willington street, from dead end south house line of Montgomery avenue, north.....		6	26
Willington street, from 13 feet south of centre of Huntingdon, north.....		6	26
York street, from Thirteenth to 8 feet west of east house line of Broad.....		12	560
York street, from dead end west house line of Thirtieth to Thirty-second		6	876
Total.....			39,521

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main.</i>			
<i>Supply main, from East Park Reservoir to Twenty-fifth and Spring Garden streets.</i>			
<p>Twenty-fifth street, from Spring Garden street to dead end laid 1887, 47 feet 2 inches south of south curb line of Green street; thence through Fairmount Park, from dead end laid 1887 on Twenty-fifth street, 2 feet 7 inches south of north house line of Green street; to west side of Twenty-fifth street, 85 feet north of north house line of Green street; to west side of Twenty-sixth street, 37 feet south of south house line of Fairmount avenue; to north side of Brown street, 152 feet west of west house line of Twenty-ninth street; to south side of Girard avenue, 175 feet west of west side of Pennsylvania avenue; thence to 42 feet west of main track of Philadelphia and Reading Railroad on Pennsylvania avenue and the centre of Thirty-second street; thence along southwest side of Pennsylvania avenue to 44 feet west of west house line of Thirty-third street, south side of Reading Railroad; thence to dead end laid 1889, 231 feet west of east house line of Thirty-third street, New York Division of Pennsylvania Railroad; thence on Thirty-third street, from dead end laid 1890, 314 feet 6 inches north of north house line of Columbia avenue to East Park Reservoir.....</p>		48	6,709
<i>Supply Main, from Twenty-seventh and Thompson streets to Twenty-ninth and York streets.</i>			
<p>Twenty-seventh street, from Thompson to Ridge avenue; thence on Ridge avenue from Twenty-seventh street to Twenty-ninth street: thence on Twenty-ninth from Ridge avenue to York.....</p>		36	6,300
<i>Supply Main, from Broad and Norris street to Twenty-seventh street and Montgomery avenue.</i>			
<p>Norris street, south side, from Broad to Eighteenth; thence on Eighteenth, east side, from Norris to Berks; thence on Berks, north side, from Eighteenth to Twenty-third; thence on Twenty-third, east side, from Berks to Montgomery avenue; thence on Montgomery avenue, south side, from Twenty-third to Twenty-seventh.....</p>		20	7,008

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main, between Montgomery avenue and Norris street Stop House, East Park Reservoir.</i>			
Thirty-third street, from 46 feet 4 inches north of north house line of Montgomery avenue, north (a continuation of Poplar street 48-inch main).....		48	42
Total.....			20,059
<i>Service Main Connections.</i>			
Tenth and Brown streets, between 6-inch main on Tenth and 6-inch main on Brown.....		6	15
Thirteenth and Brown streets, between 6-inch main on Thirteenth and 6-inch main on Brown.....		6	13
Thirtieth and Master streets, between 12-inch main on Thirtieth and 6-inch main on Master.....		10	20
Thirty-third street and Montgomery avenue, between 12-inch main on Thirty-third and 6-inch main on Montgomery avenue.....		6	4
		12	5
Twenty-fifth street, from south house line of Jefferson, between 12-inch and 6-inch mains on Twenty-fifth.....		12	5
Total.....			62
<i>Supply Main Connections.</i>			
Berks street, west house line of Eighteenth, between 20 and 6-inch mains on Berks.....		6	9
Berks and Nineteenth streets, between 20-inch main on Berks street and 6-inch main on Nineteenth.....		6	10
Berks and Twentieth streets, between 20-inch main on Berks and 6-inch main on Twentieth.....		6	11
Berks and Twenty-first streets, between 20-inch main on Berks and 6-inch main on Twenty-first.....		6	11
Berks and Twenty-second streets, between 20-inch main on Berks and 6-inch main on Twenty-second.....		6	10
Broad and Wood streets, between 20-inch main on Broad and 4-inch main on Wood.....		10	11
Eighteenth street, south house line of Norris, between 20 and 6-inch mains on Eighteenth.....		6	6
Montgomery avenue and Twenty-third street, between 20-inch main on Montgomery avenue and 6-inch main on Twenty-third.....		6	11
Montgomery avenue and Twenty-fourth street, between 20-inch main on Montgomery avenue and 6-inch main on Twenty-fourth.....		6	11

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main Connections—Continued.</i>			
Montgomery avenue and Twenty-fifth street, between 20-inch main on Montgomery avenue and 10-inch main on Twenty-fifth		10	13
Montgomery avenue and Twenty-sixth street, between 20-inch main on Montgomery avenue and 6-inch main on Twenty-sixth		6	16
Norris street, east house line of Fifteenth, between 20 and 6-inch mains on Norris.....		6	7
Norris street, west house line of Sixteenth, between 20 and 6-inch mains on Norris.....		6	7
Norris street, 10 feet 9 inches west of west house line of Seventeenth, between 20 and 6-inch mains on Norris.....		6	8
Ridge avenue, 48 feet northwest of northwest house line of Glenwood, between 36 and 12-inch mains on Ridge avenue		12	19
Thirty-second and Thompson streets, between 10-inch main on Thirty-second and 6 and 8-inch mains on Thompson		10	19
Thirty-third street and Montgomery avenue, between Stop House, East Park Reservoir and 48-inch main to Twenty-fifth and Spring Garden.....		36	102
Thirty-third street and Montgomery avenue, between 48 inch main to Twenty-fifth and Spring Garden streets and 48 inch main on Montgomery avenue.....		48	51
Thirty-third street, 84 feet 6 inches north of north house line of Montgomery avenue, between 48-inch main to connect with Poplar street and 48-inch main to Twenty-fifth and Spring Garden.....		48	12
Twenty-ninth street, 19 feet northeast of northeast house line of Ridge avenue, between 36 and 6-inch mains on Twenty-ninth		10	15
Twenty-ninth street north house line of Diamond, between 36 and 6 inch mains on Twenty-ninth.....		6	7
Twenty-ninth street, north house line of Susquehanna avenue, between 36 and 6-inch mains on Twenty-ninth		10	11
Twenty-ninth street, 2 feet 6 inches north of north house line of Dauphin, between 36 and 6-inch mains on Twenty-ninth		10	10
Twenty-seventh and Master streets, between 36-inch main on Twenty-seventh and 36-inch main on Master		36	15
Twenty-seventh and Jefferson streets, between 36-inch main on Twenty-seventh and 30-inch main on Jefferson		30	46
Twenty-seventh street, north house line of Oxford, between 36 and 6-inch mains on Twenty-seventh.....		10	8
Twenty-seventh street, 3 feet south of north house line of Columbia avenue, between 36 and 6-inch mains on Twenty-seventh		10	9
Twenty seventh street, 4 feet north of north house line of Montgomery avenue, between 36 and 6-inch mains on Twenty-seventh		10	6

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Main Connections—Continued.</i>			
Twenty-seventh street, north house line of Berks, between 36 and 6-inch mains on Twenty-seventh.....		10	8
Twenty-third street, 4 feet 6 inches south of south house line of Berks, between 20 and 6-inch mains on Twenty-third		6	9
Total			488
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Fire hydrant connection.....		6	1,699
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<i>Fire Connections (Private).</i>			
Nineteenth street, east side, 32 feet 6 inches south of south of south house line of Buttonwood, for Laird, Schober and Mitchell		6	6
		10	2
Total			8
<hr/>			
<i>Supply Connections (Private).</i>			
Thirty-second street, east side, 102 feet 6 inches south of north house line of Master, for Bergner and Engle....		6	14
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<i>Drains.</i>			
Berks street, intersection of Twentieth, from supply main connection.....		6	2
Berks street, 2 feet east of east house line of Twentieth, from 20-inch main.....		6	6
Eighteenth street, south house line of Norris, from supply main connection.....		6	16
Fairmount Pumping Station, south side, to drain grounds..		6	66
		10	23
Ridge avenue bridge over Pennsylvania Railroad, southeast side, 61 feet northwest of northwest house line of Connecticut avenue.....		30	26
Southeast side under road-bed, 4 feet 5 inches northwest of southeast pier.....		20	3
Northwest side under road-bed, 5 feet 4 inches southeast of northwest pier		20	3
Northwest side, 212 feet southeast of southeast house line of Sedgely avenue.....		30	27

Street.	Location.	Size in inches.	Distance in feet.
<i>Drains—Continued.</i>			
Spring Garden street, north side, east house line of Twenty-fifth, from 48-inch main		6	19
Spring Garden Pumping Station, south side, from new boiler house.....		6	12
Spring Garden Pumping Station, south side, from inlet.....		6	31
Spring Garden Pumping Station, north side, 117 feet west of west house line of Thirty-third street, from inlet....		6	11
Twenty-fifth street, 42 feet south of north house line of Spring Garden, from 48-inch main.....		6	8
		12	4
Twenty-fifth street, 10 feet north of north house line of Fairmount avenue, from 6-inch main.....		6	15
Thirty-first street, 18 feet 6 inches south of north house line of Master, from 10-inch main		6	10
Twenty-ninth street intersection of Susquehanna avenue, from 36-inch main.....		6	6
Twenty-seventh street, 212 feet south of south house line of Columbia avenue, from 36-inch main.....		6	8
Total.....			296
<i>Pipe Relaid.</i>			
Canton street, from Callowhill to Buttonwood.....		6	784
Columbia avenue, south side, from Eighth to 18 feet 2 inches west of east house line of Ninth		6	278
Columbia avenue, south side, from 7 feet east of west house line of Ninth, west.....		6	114
Columbia avenue, north side, from Eighth to 112 feet 6 inches west of west house line of Ninth.....		6	432
Columbia avenue, south side, from Twenty-eighth to Thirtieth.....		6	920
Columbia avenue, north side, from Twenty-eighth to Thirtieth		6	923
Darien street, from 26 feet south of north house line of Brown, north.....		6	26
Hamilton street, from centre of Canton, west.....		6	21
Hutchinson street, from centre of Master, north.....		6	466
Indiana avenue, intersection of Broad, between 6 and 10-inch mains.....		10	12
Meredith street, from Twenty-fourth to Twenty-fifth		6	460
Mervine street, from Columbia avenue to Montgomery avenue.....		10	567
Montgomery avenue, from Mervine to Twelfth.....		10	223
Montgomery avenue, from east house line of Thirty-third, west.....		6	18
Newkirk street, from 20 feet north of south house line of Columbia avenue, north.....		6	7

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Relaid—Continued.</i>			
Noble street, from centre of Canton, west.....		6	20
Sydenham street, from Oxford to Columbia avenue.....		6	533
Thomazine street, from east house line of Thirty-third, west.....		6	19
Thirty-ninth street, from south house line of Columbia avenue, north.....		6	62
Total.....			5,885
Fire hydrant connections relaid.....		6	219
Repairs, general.....		4	17
“ “		6	958
“ “		8	192
“ “		10	118
“ “		12	48
“ “		20	12
“ “		30	36
“ “		36	15
“ “		48	16
Total.....			1,412
<i>Pipe Taken Up.</i>			
Canton street, from Callowhill to Buttonwood.....		3	784
Darien street, from 26 feet south of north house line of Brown, north		6	26
Hamilton street, from centre of Canton, west.....		4	21
Hollingsworth street, from west house line of Thirty-first to 17 feet west of east house line of Thirty-second.....		6	409
Hutchinson street, from Master, north.....		4	466
Meredith street, from Twenty-fourth to Twenty-fifth.....		4	460
Mervine street, from Columbia avenue to Montgomery avenue.....		6	567
Montgomery avenue, from Mervine to Twelfth.....		6	223
Montgomery avenue, from east house line of Thirty-third, west.....		6	18
Newkirk street, from 20 feet south of north house line of Columbia avenue, north.....		4	7
Noble street, from centre of Canton, west.....		4	20
Sydenham street, from Oxford to Columbia avenue.....		4	593
Thomazine street, from east house line of Thirty-third, west.....		6	19
York street, from 13 feet 6 inches east of east house line of Broad, west.....		6	10
Total.....			3,623

Street.	Location.	Size in inches.	Distance in feet.
Fire hydrant connections taken up.....		4	198
" " " "		6	4
Total.....			202
<i>Pipe Lowered.</i>			
Broad street, east side, from 141 feet north of north house line of Cambria to Indiana.....		12	408
Fairmount avenue, from centre of Sixteenth, west.....		10	18
Thirty-third street, west side, between Thomazine and Columbia avenue.....		3	180
Thompson street, from 41 feet 6 inches east of east house line of Twenty-seventh, west.....		18	160
Twenty-second street, from 162 feet south of south house line of Lehigh avenue, north.....		6	156
Total.....			922
<i>Pipe Raised.</i>			
Biddle and Twenty-fifth streets, across tunnel of Baltimore and Ohio Railroad.....		6	24
Sixteenth street, intersection of Fairmount avenue.....		6	16
Total.....			40
<i>Pipe Cut Off and Abandoned.</i>			
Columbia avenue, from Twenty-eighth to Thirtieth.....		6	920
Thirty-third street, west side, from Columbia avenue to Berks.....		3	1,250
Thomazine street, from east curb line of Thirty-third, west.....		6	56
Twenty-ninth street, from south house line of Columbia avenue, north.....		6	62
Total.....			2,288
Fire hydrant connections cut off and abandoned.....		4	395
" " " "		6	125
Total.....			520

Recapitulation of Fourth District.

Purposes for which used.	Size—Inches.											Total in feet and pounds.	
	3	4	6	8	10	12	18	20	30	36	48		
New pipe or feet added.	Service mains.....			37,561	109	28	1,823						39,521
	Supply mains.....							7,008		6,300	6,751		20,059
	Service main connections.....			32		20	10						62
	Supply main connections.....			133		110	19			46	117	63	488
	Fire hydrant connections.....			1,699									1,699
	Fire connections (private).....			6		2							8
	Supply connections (private).....			14									14
	Drains.....			210		23	4		6	53			296
Total... { Feet.....			39,655	109	183	1,856		7,014	99	6,417	6,814		62,147
{ Pounds.....			1,308,615	4,578	10,065	133,632		1,115,226	32,868	2,707,974	3,986,190		9,299,148
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....			5,302		802							6,104
	Repairs general.....		17	958	192	118	48		12	36	15	16	1,412
	Pipe taken up.....	784	1,765	1,276									3,825
	Pipe lowered.....	180		156		18	408	160					922
	Pipe raised.....			40									40
	Total { Feet.....	964	1,782	7,732	192	988	456	160	12	36	15	16		12,303
{ Pounds.....	14,460	33,858	255,156	8,064	51,590	32,832	22,400	1,908	11,952	6,330	9,360		447,910
Total handled... { Feet.....	964	1,782	47,387	301	1,121	2,312	160	7,026	135	6,432	6,830		74,450
{ Pounds.....	14,460	33,858	1,563,771	12,642	61,655	166,464	22,400	1,117,134	44,820	2,714,304	3,995,560		9,747,058
Pipe cut off and abandoned...	1,250	395	1,163										2,808

FIFTH DISTRICT.

Comprising the Twenty-first and part of the Twenty-eighth Wards.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Adams court, from 101 feet southeast of southeast house line of Cedar, northwest.....		6	126
Cedar street, from 16 feet southwest of centre of Tower, northeast.....		6	16
Charles street, from dead end, 196 feet northeast of northeast house line of Pechin to Ridge avenue.....		6	791
Centre street, from 127 feet 6 inches southwest of southwest house line of Clay, northeast to dead end.....		6	131
Clay street, from southwest house line of Centre, northwest.....		6	17
Cotton street, from 15 feet southwest of centre of Manayunk avenue, northeast.....		6	15
Grape street, from 15 feet southwest of centre of Manayunk avenue, northeast.....		6	15
Gerhart street, from 21 feet southwest of northeast house line of Ridge avenue, northeast.....		6	21
Houghton avenue, from southeast to northwest house line of James avenue.....		6	65
James avenue, from dead end 299 feet northeast of northeast house line of Houghton avenue to southwest curb line of Jeannette.....		6	213
Jefferson street, from dead end southwest curb line of Wood, northeast.....		6	13
Leverington avenue, from dead end 309 feet northeast of northeast house line of Selig to 62 feet northeast of southwest curb line of Jeannette.....		6	331
Levering street, from southwest house line of Manayunk avenue, northeast.....		6	43
Manayunk avenue, from dead end northwest house line of Kalos to northwest house line of Osborne.....		6	230
Manayunk avenue, from southeast house line of Ridge avenue, northwest.....		6	50
Manayunk avenue, from Penn to dead end 10 feet northwest of Levering.....		10	1,169
Mitchell street, from southeast house line of Roxborough avenue, northwest.....		6	30
Osborne street, from Ridge avenue, northeast.....		6	27
Penn street, from dead end 11 feet southwest of southwest house line of Tower, northeast.....		6	36
Penn street, from southwest house line of Manayunk avenue, northeast.....		6	21
Penn street, from centre of Terrace, northeast.....		6	25
Pechin street, from centre of Roxborough avenue, northwest.....		6	30

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Port Royal avenue, 10 feet southwest of southwest house line of Ann, northeast to dead end.....		6	600
Ridge avenue, from dead end 26 feet northwest of northwest house line of Gerhart to Monastery avenue.....		6	386
Roxborough avenue, from centre of Mitchell, northeast....		12	25
Rector street, from southwest to northeast curb line of Manayunk avenue.....		6	26
Rector street, from 20 feet southwest of Ridge avenue, northeast.....		6	20
Rector street, from southwest house line of Terrace, northeast.....		6	25
Rittenhouse street, from 19 feet southwest of northeast house line of Ridge avenue, northeast.....		6	19
Selig street, from southeast house line of Leverington to northwest house line of Jefferson.....		6	578
Tower street, from dead end 175 feet northwest of centre of Cedar to Penn.....		6	185
Tibben street, from Fleeson to 7 feet 6 inches northwest of southeast house line of Prospect.....		6	233
Terrace street, from dead end 171 feet northwest of northwest house line of Grape, northwest.....		6	24
Terrace street, from Shur's lane northwest to dead end.....		6	352
Terrace street, from southeast house line of Penn to Lofty..		6	471
Thirty-fifth street, from Lower New Queen to 45 feet northwest of northwest house line of Upper New Queen.....		6	213
Webster street, from dead end northwest house line of Centre to 12 feet 6 inches northwest of southeast house line of Church.....		6	239
Wendover street, from 300 feet 6 inches southwest of southwest house line of Manayunk avenue, northeast....		6	326
Wood street, from Jefferson to 209 feet northwest of Gates		6	662
Total.....			7,799
<i>Supply Main Connections.</i>			
Ridge avenue, 419 feet southeast of Wissahickon avenue drive, between 6 and 12-inch mains.....		6	58
		12	24
		10	20
Ridge avenue, 435 feet northwest of Scott's lane, between 12-inch main on Ridge avenue and 4-inch connection to Dobson's mill.....		4	28
Ridge avenue, 195 feet southeast of Crawford, between 12-inch main on Ridge avenue and 4-inch connection to Dobson's mill.....		4	31

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main Connections—Continued.</i>			
Roxborough Reservoir (new), southwest bank, 192 feet southeast of southeast house line of Port Royal avenue.....		36	110
Roxborough Reservoir (new), southwest bank, 336 feet southeast of southeast house line of Port Royal avenue.....		36	110
Roxborough Reservoir (new), southwest bank, 624 feet southeast of southeast house line of Port Royal avenue.....		36	110
Roxborough Reservoir (new), southwest bank, 768 feet southeast of southeast house line of Port Royal avenue.....		36	110
Roxborough Reservoir (new), in division bank, 621 feet, northeast of northeast house line of Ann street between southeast and northwest sections.....		36	73
Total.....			674
Fire hydrant connections.....		6	269
<i>Drains.</i>			
Roxborough Reservoir (new), south corner of southeast section.....		12	146
Roxborough Reservoir (new), west corner of northwest section.....		12	176
Total.....			322
Fire hydrant connections relaid.....		6	63
Repairs, general.....		4	37
“ “		6	91
“ “		10	2
“ “		12	14
“ “		20	14
“ “		30	14
Total.....			172
<i>Pipe Taken Up.</i>			
Cresson street, from southeast house line of Warner to Shur's lane.....		6	172

Street.	Location.	Size in inches.	Distance in feet.
Fire hydrant connections taken up.....		4	42
<i>Pipe Lowered.</i>			
James avenue, from 100 feet northeast of northeast house line of Houghton avenue, northeast.....		6	150
Ridge avenue, from 72 feet southeast of centre of Charles, northwest.....		10	72
Ridge avenue, from 665 feet southeast of northwest house line of Rittenhouse, northwest.....		6	665
Ridge avenue, from 369 feet southeast of southeast house line of Shur's lane, northwest.....		10	140
Ridge avenue, from 229 feet southeast of southeast house line of Shur's lane, northwest.....		12	191
Ridge avenue, from centre of Shur's lane, northwest.....		6	6
		12	72
Ridge avenue, from northwest house line of Roxborough avenue, northwest.....		6	216
Total.....			1,512
<i>Pipe Raised.</i>			
Centre street, from 9 feet northeast of northeast house line of High street, northeast.....		6	60
Fire hydrant connections cut off and abandoned.....		6	12

Recapitulation of Fifth District.

Purposes for which used.	Size—Inches.						Total in feet and pounds.	
	4	6	10	12	20	30		36
New pipe or feet added.	Service mains.....		6,605	1,169	25			7,799
	Supply main connections.....	59	58	20	24		513	674
	Fire hydrant connections.....		269					269
	Drains.....				322			322
	Total..... { Feet.....	59	6,932	1,189	371			513	9,064
{ Pounds.....	1,121	228,756	65,396	26,712			216,486	538,470
Pipe used, but adding nothing to feet in ground.	Pipe relaid.....		63					63
	Repairs general.....	37	91	2	14	14	14	172
	Pipe taken up.....	42	172					214
	Pipe lowered.....		1,087	212	263			1,512
	Pipe raised.....		60					60
Total..... { Feet.....	79	1,423	214	277	14	14		2,021
{ Pounds.....	1,501	46,959	11,770	19,944	2,226	4,648		87,048
Total handled..... { Feet.....	138	8,355	1,403	648	14	14	513	11,085
{ Pounds.....	2,622	275,715	77,165	46,656	2,226	4,648	216,486	625,518
Pipe cut off and abandoned.....		12						12

SIXTH DISTRICT.

Comprising the Twenty-second and part of the Twenty-eighth and Thirty-third Wards.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Apsley street, from Pulaski to Wayne.....		6	718
Boyer street, from dead end 235 feet southeast of southeast house line of Gowen avenue, northwest.....		6	271
Bristol street, from east to west house line of Broad.....		6	113
Broad street, west side, from south house line of Juniata to 25 feet north of south house line of Cayuga.....		12	1,175
Brunner street, from 240 feet southwest of southwest house line of Wayne, northeast.....		6	240
Camac street, from south house line of Louden to Rockland.....		6	575
Carlisle street, from Tioga, north.....		6	22
Carpenter street, from 28 feet southwest of northeast house line of Wissahickon, northeast.....		6	9
Carpenter street, from southwest house line of Wayne to dead end 68 feet northeast of Sherman.....		6	921
Cayuga street, from northeast house line of Clarissa to Germantown avenue.....		6	953
Cedar lane, from southeast house line of Walnut lane, northwest.....		6	30
Chew street, from Mount Pleasant to Mount Airy avenue...		12	819
Chew street, from Dorsett to Russell.....		12	250
Coulter street, from 6 feet northeast of southwest house line of Wissahickon avenue, northeast.....		6	49
Cresheim road, from southeast house line of Mount Pleasant avenue, northwest.....		6	50
Darwin street, from east house line of Sixteenth, west.....		6	25
Dennie street, from northeast house line of Clarissa to Germantown avenue.....		6	987
Dorsett street, from Chew to Boyer.....		6	673
Durham street, from 40 feet southwest of northeast house line of Chew, northeast to connect dead end.....		6	5
Ellet street, from 28 feet southwest of northeast house line of Wissahickon, northeast.....		6	9
Emlen street, from Johnson to dead end southeast house line of Upsal.....		6	748
Franklin street, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	9
Good street, from 668 feet southwest of southwest house line of Germantown avenue, northeast.....		6	715
Green street, from dead end northwest house line of Washington lane to southeast house line of Johnson...		6	850
Hancock street, from dead end northwest house line of Pastorius to Washington.....		6	651
Hansberry street, from southwest house line of Wissahickon avenue, northeast.....		6	50

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Hansberry street, from southwest house line of Morris, northeast.....		6	25
Henry street, from southeast house line of Seymour, northwest.....		6	25
Itchner street, from 182 feet east of east house line of Nineteenth, west.....		6	207
Jefferson street, from Johnson to dead end southeast house line of Upsal.....		6	749
Johnson street, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	9
Juniata street, from east to west house line of Broad.....		6	113
Knox street, from southeast house line of Seymour, northwest.....		6	25
Kenderton street, from dead end 1 foot north of south house line of Venango, north.....		6	24
Little Wayne street, from 296 feet southeast of southeast house line of Lehman, northwest to dead end.....		6	296
Linc'o'n drive, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	10
Logan street, from 75 feet southeast of northwest house line of Hunting Park avenue to northwest house line of Ruffner.....		6	411
Louden street, from east to west house line of Camac.....		6	50
Mill street, from southwest house line of Chew to Bloyd....		6	417
Morris street, from Lehman to Rittenhouse.....		6	304
Morris street, from southeast to dead end northwest house line of Winona.....		6	50
Mower street (Lower), from southeast house line of Mount Pleasant, northwest.....		6	25
Mower street (Upper), from 25 feet southeast of northwest house line of Mount Pleasant, northwest.....		6	25
Mount Airy avenue, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	9
Mount Airy avenue, from Germantown avenue to Chew.....	12		388
Mount Pleasant avenue, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	9
Musgrove street, from Horter to Pleasant.....		6	1,092
Musgrove street, from southeast house line of Walnut lane, northwest.....		6	60
Naomi street, from 33 feet southwest of northeast house line of Wissahickon, northeast.....		6	11
Nash street, from southeast house line of High street, northwest.....		6	242
Newbold street, from 490 feet southeast of southeast house line of Ruscomb, northwest to dead end.....		6	192
Newcomb street, from northeast house line of Clarissa to Wayne.....		6	430
Newhall street, from Manheim to Hansberry.....		6	667

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Nice street, from 33 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	11
Norton street, from southwest house line of Jefferson, northeast.....		6	50
Norton street, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	9
Norton street, from southwest house line of Emlen, northeast.....		6	25
Otto street, from 200 feet southeast of southeast house line of Spencer, northwest.....		6	260
Penn street, southeast side, from southwest house line of Wissahickon, northeast.....		6	6
Penn street, northwest side, from southwest house line of Wissahickon avenue, northeast.....		6	55
Penn street, from southwest house line of Pulaski avenue, northeast.....		6	60
Philellena street, from 28 feet southwest of northeast house line of Wissahickon, northeast.....		6	9
Pulaski avenue, from Hansberry to Penn.....		6	903
Pulaski avenue, from southeast house line of Rittenhouse, northwest.....		12	51
Queen street, from 2 feet southwest of southwest house line of Wissahickon avenue, northeast.....		6	11
Rittenhouse street, from Wissahickon avenue to Pulaski avenue.....		6	1,532
Rockland street, from dead end northeast house line of York to northeast house line of Eleventh.....		6	1,235
Ruffner street, from 25 feet southwest of northeast house line of Logan, northeast.....		6	25
Sedgwick street, from dead end 306 feet southwest of southwest house line of Chew, northeast.....		6	346
Seymour street, from Wayne to Knox.....		6	580
Sherman street, from southeast house line of Carpenter, northwest.....		6	25
Sixteenth street, from St. Mark's square to Cayuga.....		6	265
Slocum street, from southwest house line of Musgrove to Chew.....		6	769
Spencer street, from Stenton avenue to northeast house line of Otto.....		6	465
Springfield avenue, from Twenty-eighth to Thirty-first.....		6	1,735
Stafford street, from dead end 525 feet southwest of southwest house line of Morris, northeast.....		6	132
Stenton avenue, from southeast house line of Willow Grove avenue, northwest to dead end.....		6	12
Stenton avenue, from Chelton avenue to southeast house line of Sixty-fifth avenue.....		6	291
Twelfth street, from Angle to north house line of Venango..		6	394
Twentieth street, from Tioga, north.....		6	23

Street.	Location.	Sizes in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Twenty-ninth street, from 5 feet northwest of southeast house line of Springfield avenue, northwest.....		6	40
Upsal street, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	10
Venango street, from east house line of Eleventh to west house line of Twelfth.....		6	584
Venango street, from Germantown avenue to dead end 5 feet 6 inches east of east house line of Broad.....		6	295
Walnut lane, from 30 feet 6 inches southwest of northeast house line of Wissahickon, northeast.....		6	15
Washington lane, from 23 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	11
Wayne street, from southeast to northwest house line of Carpenter.....		6	50
Wayne avenue, from Dennie to Cayuga.....		6	266
Weiss street, from 300 feet southeast of southeast house line of Spencer, northwest.....		6	360
Westview avenue, from 28 feet southwest of northeast house line of Wissahickon avenue, northeast.....		6	28
Whittier street, from Apsley, northwest.....		6	25
Willow Grove avenue, from dead end 65 feet northeast of northeast house line of Stenton avenue to southwest house line of Ardmore.....		6	1,135
Wingohocking street, from 16 feet northwest of southeast house line of Mill, northwest.....		6	4
Winona avenue, from 403 feet southwest of southwest house line of Morris, northeast.....		6	453
Winona avenue, from southwest house line of Pulaski avenue, northeast.....		6	33
Wissahickon avenue, from 50 feet southeast of northwest house line of Rittenhouse, northwest.....		6	48
Wissahickon avenue, from dead end, 387 feet northwest of northwest house line of Manheim to southeast house line of School lane.....		12	2,405
Total.....			31,823
<i>Supply Mains.</i>			
Allen's lane, from Wissahickon avenue, northeast.....		20	253
Rittenhouse street, from Wissahickon avenue to Pulaski avenue.....		16	1,560
Wissahickon avenue, from dead end 387 feet northwest of northwest house line of Manheim to southeast house line of School lane.....		12	2,405

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Mains—Continued.</i>			
Wissahickon avenue, from southeast house line of School lane, northwest.....		16	1,855
Wissahickon avenue, from 27 feet 6 inches southeast of southeast house line of Rittenhouse to Allen's lane....		20	8,773
Total.....			14,846
<i>Service Main Connections.</i>			
Mount Airy avenue and Chew street from 35 feet northwest of southeast house line of Mount Airy avenue, southeast, between 6 and 12 inch mains on Mount Airy avenue.....		6	8
<i>Supply Main Connections.</i>			
Allen's lane, 228 feet northeast of northeast house line of Wissahickon avenue between 30-inch pumping main and 20-inch supply main on Allen's lane.....		20	10
Allen's lane, 186 feet northeast of northeast house line of Wissahickon avenue between 20-inch pumping main and 20-inch supply main on Allen's lane.....		20	11
School lane and Wissahickon avenue, between 4 and 6-inch mains on School lane and 16-inch main on Wissahickon avenue.....		10	21
Wissahickon avenue and Queen street, between 12-inch main on Wissahickon avenue and 6-inch main on Queen.....		6	60
Wissahickon avenue and Lehman street, between 16 and 6-inch mains on Wissahickon avenue.....		6	5
Wissahickon avenue and Stafford road, between 16 and 6-inch mains on Wissahickon avenue.....		6	19
Wissahickon avenue and Chelten avenue, between 16 and 6-inch mains on Wissahickon avenue.....		6	11
Total.....			137
<i>Pumping Main Connections.</i>			
Mount Airy Pumping Station, between 10-inch pumping mains and new engine.....		10	56
Mount Airy Pumping Station, suction pipe between 20-inch main and new engine.....		12	7
Total.....			63

Street.	Location.	Size in inches.	Distance in feet.
<i>Bye-pass Connections.</i>			
Duval and Green streets, between 6-inch main on Duval and 6-inch main on Green.....		6	19
Washington lane and Green street, between 6-inch main on Washington lane and 6-inch main on Green.....		6	38
Total.....			57
Fire hydrant connections.....		6	1,508
<i>Fire Connections (private).</i>			
Pulaski avenue, southwest side, 1,040 feet northwest of northwest house line of Hunting Park avenue, for Philadelphia and Reading Railroad.....		6	17
<i>Drains.</i>			
Kitchen's lane, 22 feet northeast of southwest house line of Wissahickon avenue.....		6	67
Mount Airy Pumping Station, from roof of engine house...		4	50
Wissahickon avenue, southwest side, 15 feet northwest of southeast house line of Lehman, from 16-inch mains...		6	9
Wissahickon avenue, northeast side, 281 feet southeast of southeast house line of Queen, from 12-inch main.....		6	7
Wissahickon avenue, from 148 feet northwest of Rittenhouse, southwest to creek, from 20-inch main.....		6	43
Total.....		6	176
<i>Pipe Relaid.</i>			
Chestnut Hill Pumping Station, from 7 feet southeast of southeast house line of engine house, northwest, to drain quarry.....		6	108
Coulter street, from Wayne to Green.....		6	1,029
McKean's avenue, from northwest house line of Clapier to Manheim.....		6	670
Mill street, from northeast house line of Cedar lane to southwest house line of Chew.....		6	1,010
Mill street, from 92 feet southwest of northeast house line of Bellfield to 90 feet northeast of Wingohocking.....		6	741
Stenton avenue, from Willow Grove avenue to Abington avenue.....		6	510
Walnut lane, from Morton, northeast.....		6	35

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Relaid—Continued.</i>			
Walnut lane, from 60 feet northeast of northeast house line of Morton to 318 feet northeast of northeast house line of Cedar lane.....		6	911
Willow Grove avenue, from 42 feet southwest of northeast house line of Stenton avenue, northeast.....		6	107
Total.....			5,121
Fire hydrant connections relaid.....		6	92
Repairs, general.....		3	3
Repairs, general.....		4	25
Repairs, general.....		6	107
Repairs, general.....		10	7
Repairs, general.....		12	4
Repairs, general.....		16	7
Repairs, general.....		20	40
Total.....			193
Fire hydrant connections taken up.....		4	43
Fire hydrant connections taken up.....		6	14
Total.....			57
<i>Pipe Lowered.</i>			
Boyer street, from northwest house line of Mount Airy, northwest.....		6	408
Hansberry street, from Morris to 110 feet northeast of northeast house line of Pulaski avenue.....		6	657
Morris street, from 200 feet southeast of southeast house line of Hansberry, northwest.....		6	470
Mount Pleasant avenue, from northeast house line of Mower, northeast.....		6	168
Mount Pleasant avenue, from 320 feet southwest of southwest house line of Crasheim road, northeast.....		6	320
Total.....			2,023

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Cut Off and Abandoned.</i>			
Coulter street, from Wayne to Green.....		4	1,042
McKean's avenue, from northwest house line of Clapier to Manheim		2	670
Mill street, from Cedar lane to Chew.....		3	1,025
Mill street, from 92 feet southwest of northeast house line of Bellfield, to 90 feet northeast of northeast house line of Wingohocking.....		4	741
Stenton avenue, from Willow Grove avenue to Abingdon avenue.....		4	510
Walnut lane, from Morton, northeast.....		3	35
Walnut lane, from 60 feet northeast of northeast house line of Morton to 66 feet northeast of northeast house line of Cedar lane.....		3	659
Walnut lane, from 66 feet northeast of northeast house line of Cedar lane, northeast.....		4	250
Willow Grove avenue, from 42 feet southwest of northeast house line of Stenton avenue, northeast.....		4	107
Total.....			5,039
Fire hydrant connections cut off and abandoned.....		3	12
Fire hydrant connections cut off and abandoned.....		4	303
Fire hydrant connections cut off and abandoned.....		6	80
Total.			395

Recapitulation of Sixth District.

Purposes for which Used.	Size—Inches.								Total in feet and pounds.		
	2	3	4	6	10	12	16	20			
New pipe or feet added.	Service mains.....				26,735		5,088		31,823		
	Supply mains.....						2,405	3,415	14,846		
	Service main connections.....				8				8		
	Supply main connections.....				95	21			137		
	Pumping main connections.....					56	7		63		
	Bye-pass connections.....				57				57		
	Fire hydrant connections.....				1,508				1,508		
	Fire connections (private).....				17				17		
Drains.....			50	125				176			
<hr/>											
Total	{ Feet.....			50	28,546	77	7,500	3,415	9,047	48,635	
	{ Pounds.....			950	942,018	4,235	540,000	375,650	1,488,473	3,301,326	
<hr/>											
Pipe used but adding nothing to feet in the ground.	Pipe relaid.....				5,213					5,213	
	Repairs, general.....		3	25	107	7	4	7	40	193	
	Pipe taken up.....			43	14					57	
	Pipe lowered.....				2,023					2,023	
	Total	{ Feet.....		3	68	7,357	7	4	7	40	7,486
		{ Pounds.....		45	1,292	242,781	385	288	770	6,360	251,921
<hr/>											
Total handled	{ Feet.....		3	118	35,903	84	7,504	3,422	9,087	56,121	
	{ Pounds.....		45	2,242	1,184,799	4,620	540,288	376,420	1,444,833	3,563,247	
<hr/>											
Pipe cut off and abandoned.....	670	1,731	2,953	80						5,434	

Recapitulation of Work on the Water Pipes.

Purposes for which used.	Size—Inches.													Total in feet and pounds.	
	2	3	4	6	8	10	12	16	18	20	30	36	48		
New pipe or feet added.	Service mains.....			144,654	3,088	1,245	8,124							157,061	
	Supply mains.....						2,405	4,084		18,671	10,786	9,660	6,751	52,357	
	Service main connections.....			40			20							70	
	Supply main connections.....			59	296		502	145	62		57	46	630	63	
	Pumping main connections.....						56	7						63	
	Bye-pass connections.....				57										57
	Fire-hydrant connections.....				8,545										8,545
	Fire connections (private).....			31	49		2								82
	Supply connections (private).....		122	194	91										407
	Motor connections (private).....		15		18										33
Drains.....			50	343		23	326			6	53			801	
Total....	{ Feet.....		137	334	154,093	3,038	1,848	11,017	4,146		18,734	10,885	10,290	6,814	221,336
	{ Pounds.....		2,055	6,346	5,085,069	127,596	101,640	793,224	456,060		2,978,706	3,613,820	4,342,380	3,986,190	21,493,086
Pipe used, but adding to feet in ground	{ Pipe relaid.....				29,100		2,280	701							32,081
	{ Repairs, general.....		3	128	3,373	256	235	206	26		108	50	15	16	4,416
	{ Pipe taken up.....	350	6,306	9,534	5,457		28								21,675
	{ Pipe lowered.....		180		4,966		230	671		160					6,207
	{ Pipe raised.....				112										112
Total....	{ Feet.....	350	6,489	9,662	43,008	256	2,773	1,578	26	160	108	50	15	16	64,491
	{ Pounds.....	3,500	97,335	183,578	1,419,264	10,752	152,515	113,616	2,860	22,400	17,172	16,600	6,330	9,360	2,051,782
Total handled....	{ Feet.....	350	6,626	9,996	197,101	3,294	4,621	12,595	4,172	8,160	18,842	10,935	10,305	6,830	285,827
	{ Pounds.....	3,500	99,390	189,924	6,504,333	138,348	254,155	906,840	458,920	22,400	3,995,878	3,630,420	4,348,710	3,995,550	23,544,868
Pipe cut off and abandoned.....	670	3,193	6,407	1,488										11,758	

Recapitulation by Districts.

Districts.		Sizes—Inches.												TOTAL.		
		2	3	4	6	8	10	12	16	18	20	30	36	48	Feet.	Pounds.
New pipe or feet added.	First.....			16	19,239	2,929	298	102	669			6,131			29,384	2,891,025
	Second.....		137	69	26,124		92		62		2,673	4,655	3,360		37,172	4,265,725
	Third.....			140	33,597		9	1,188							34,334	1,197,392
	Fourth.....				39,655	109	183	1,856			7,014	99	6,417	6,814	62,147	9,299,148
	Fifth.....				6,932		1,189	371					513		9,064	538,470
	Sixth.....				28,546		77	7,500	3,415		9,947				48,635	3,301,326
	Total { Feet.....		137	334	154,093	3,038	1,848	11,017	4,146		18,734	10,885	10,290	6,814	221,336	
{ Pounds.....		2,055	6,346	5,085,059	127,596	101,640	793,224	456,060		2,978,706	3,613,820	4,342,380			21,493,086	
Pipe used but adding nothing to feet in the ground.	First.....	350	600	2,125	7,391	40	1,475	14						11,995	380,591	
	Second.....		4,877	2,650	8,967	24	67	793	19		42			17,439	489,973	
	Third.....		45	2,958	10,138		72	34						13,247	397,839	
	Fourth.....		964	1,782	7,732	192	938	456		160	12		15	16	12,303	447,910
	Fifth.....			79	1,423		214	277			14	14			2,021	87,048
	Sixth.....		3	68	7,357		7	4	7		40				7,486	251,921
	Total { Feet.....	350	6,489	9,662	43,008	256	2,773	1,578	26	160	108	50	15	16	64,491	
{ Pounds.....	3,500	97,335	183,578	1,419,264	10,752	132,515	113,616	2,860	22,400	17,172	16,600	6,330	9,360		2,051,782	
Total handled... { Feet.....	350	6,626	9,996	197,101	3,294	4,621	12,595	4,172	160	18,842	10,935	10,305	6,830	293,827		
{ Pounds.....	3,500	99,390	189,924	6,504,333	133,348	254,155	906,840	458,920	22,400	3,995,878	3,630,420	4,348,710	3,995,550		23,544,868	
Pipe cut off and abandoned...	670	3,193	6,407	1,488										11,758		

NEW FIRE HYDRANTS.

FIRST DISTRICT.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Alexander street, east side, 228 feet north of north line of Wharton.....		26	4	8	6	.....	1		
Alter street, north side, west house line of Twenty-ninth.....		30	6	8			.....	1	
Bainbridge street, south side, 162 feet west of west house line of Ninth.....		4	6	7	6				1
Bainbridge street, north side, west house line of Twenty-second.....		30	6	15					1
Bonsall street, east side, 92 feet south of south house line of Federal.....		26	6	8			.....	1	
Broad street, east side, north house line of Mifflin		26	6	7					1
Burd street, west side, 58 feet south of south house line of Catharine.....		3	6	4	6				1
Cantrell street, north side, 254 feet east of east house line of Fourth.....		1	6	8			.....	1	
Carpenter street, north side, 18 feet east of east house line of Fifteenth.....		30	6	15					1
Carpenter street, south side, east house line of Twentieth.....		30	6	16					1
Carpenter street, north side, 260 feet west of west house line of Twentieth.....		30	6	15					1
Carpenter street, north side, west house line of Twenty-first.....		30	6	15					1
Carpenter street, north side, 100 feet west of west house line of Twenty-second.....		30	6	15					1
Castle avenue, north side, east house line of Fifteenth street.....		26	6	16					1

New Fire Hydrants—First District—Continued.

Street	Location.	Ward.	Size of main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Catharine street, north side, east house line of Twenty-fourth.....		30	6	15				1
Christian street, south side, east house line of Twenty-fourth.....		30	6	16	6			1
Clarion street, east side, 176 feet, north of north house line of Federal.....		26	6	8	6		1	
Cross street, north side, 48 feet west of west house line of Twenty-second.....		26	6	8	6		1	
Dickinson street, south side, east house line of Hicks.....		26	6	15				1
Durfor street, north side, 192 feet east of east house line of Fifth.....		1	6	8	6		1	
East Second street, west side, north house line of Snyder avenue.....		1	6	15				1
Eighth street, east side, south house line of Washington avenue.....		2	6	15				1
Ellsworth street, north side, 16 feet 4 inches east of east house line of Twenty-second.....		26	6	14	6		1	
Eighteenth street, east side, south house line of Morris.....		26	6	14	6			1
Federal street, south side, 55 feet east of east house line of Fourth.....		2	8	7			1	
Fifth street, east side, south house line of Mifflin.....		1	6	15				1
Florida street, west side, 3 feet south of south house line of Fitzwater.....		3	6	10			1	
Front street, west side, north house line of Snyder avenue.....		1	6	16				1
Front street, west side, south house line of Wharton.....		1	8	17				1
Fourth street, west side, south house line of German.....		3	6	15				1

New Fire Hydrants—First District—Continued.

Street.	Location.	Ward.	Size of main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Harmony street, west side, 121 feet south of south house line of Wharton.....		28	6	13			1		
Hill street, north side, 174 feet east of east house line of Fifteenth.....		30	6	7	6		1		
Jackson street, south side, east house line of Seventh.....		1	6	16	6			1	
Juniper street, east side, south house line of Bainbridge.....		4	4	10			1		
Leutz street, south side, west house line of Eleventh.....		26	6	9				1	
Lingo street, 117 feet north of north house line of Reed.....		26	4	9			1		
Marion street, 34 feet, east of east house line of Moyamensing avenue.....		2	8	9			1		
McClellan street, north side, 97 feet east of east house line of Nineteenth.....		26	6	10			1		
McKean street, south side, west house line of Sixth.....		1	6	15				1	
McKean street, south side, east house line of Gerhard.....		1	6	15				1	
Mercy street, north side, 155 feet east of east house line of East Second.....		1	6	8			1		
Mifflin street, south side, west house line of Fifteenth.....		26	6	15				1	
Mifflin street, north side, 155 feet east of east house line of Twentieth.....		26	6	15				1	
Milton street, south side, west house line of Tenth.....		2	6	8			1		
Mole street, west side, 164 feet south of south house line of Dickinson.....		26	6	8	6		1		
Monroe street, south side, 200 feet east of east house line of Third.....		4	6	14	6		1		

New Fire Hydrants—First District—Continued.

Street.	Location.	Ward.	Size of main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Montrose street, north side, east house line of Twenty-fourth.....		30	6	9	.....	.....	1		
Moore street, north side, 28 feet east of east house line of Seventh.....		1	6	8	6	.....	.....	1	
Moore street, south side, east house line of Tenth.....		1	6	14	6	.....	.....	1	
Morris street, south side, west house line of Tenth.....		1	6	14	6	.....	.....	1	
Morris street, north side, west house line of Twelfth.....		26	6	12	.....	.....	.....	1	
Morris street, south side, east house line of Thirteenth.....		26	6	15	.....	.....	.....	1	
Morris street, north side, 81 feet east of east house line of Eighteenth.....		26	6	15	.....	.....	.....	1	
Moyamensing avenue, north-west side, 6 feet north-east of north house line of Federal.....		2	8	42	.....	.....	.....	1	
Nineteenth street, west side, north house line of Wharton.....		26	12	15	.....	.....	.....	1	
Nineteenth street, west side, north house line of Federal.....		26	12	15	6	.....	.....	1	
Nineteenth street, east side, south house line of Carpenter.....		30	6	15	.....	.....	.....	1	
Otsego street, east side, 136 feet north of north house line of Snyder avenue.....		1	6	15	.....	.....	.....	1	
Otsego street, east side, north house line of McKean.....		1	6	15	.....	.....	.....	1	
Otsego street, east side, 204 feet south of south house line of Moore.....		1	6	14	.....	.....	.....	1	
Park street, east side, 47 feet south of south house line of Fitzwater.....		30	6	8	.....	.....	1		
Passyunk avenue, 3 feet south-west of south house line of Catherine.....		3	6	8	.....	.....	.....	1	

New Fire Hydrants—First District—Continued.

Street.	Location.	Ward.	Size of main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Passyunk avenue, south-east side, intersection of Fifth.....		4	6	25				1
Patton street, west side, 17 feet south of south house line of Wharton.....		26	6	9				1
Pharo street, west side, 62 feet south of south house line of Fitzwater.....		30	6	8			1	
Queen street, south side, east house line of Front.....		3	6	15				1
Queen street, north side, east house line of Second.....		3	6	14	6			1
Reed street, north side, 182 feet east of east house line of Sixth.....		1	6	14			1	
Reed street, north side, 59 feet east of east house line of Seventh.....		1	6	14			1	
Sixteenth street, east side, south house line of Catharine.....		30	6	15				1
Snyder avenae, south side, east house line of Fourth.....		1	8	10	6			1
Snyder avenue, south side, 110 feet east of east house line of Fifth.....		1	8	11				1
Snyder avenue, north side, 85 feet east of southeast house line of Moyamensing avenue.....		1	8	11				1
St. Alban's place, west house line of Twenty-second.....		30	6	15				1
Tasker street, north side, east house line of Eighth.....		1	6	14				1
Tasker street, south side, west house line of Tenth.....		1	6	14				1
Tasker street, south side, west house line of Twelfth.....		26	6	15				1
Taylor street, north side, 56 feet west of west house line of Twenty-second.....		26	6	8				1

New Fire Hydrants—First District—Continued.

Street.	Location.	Ward.	Size of main.	6-INCH CONNECTION.		SEWER.		
				Feet.	In.	0.5'	No. 1	No. 2	No. 3
Tenth street, east side, south house line of McKean.....		1	6	10				1
Thirteenth street, east side, 20 feet north of north house line of Canal.....		26	6	10				1
Thirteenth street, east side, 6 feet north of north house line of Moore.....		26	6	10				1
Thirteenth street, east side, south house line of Tasker.....		26	6	10	6			1
Thirty-second street, east side, 186 feet south of south house line of Gray's Ferry road.....		26	6	14	6			1
Thirty-third street, west side, south house line of Dickinson.....		26	6	14				1
Thirty-fourth street, west side, south house line of Wharton.....		26	6	22				1
Thurlow street, south side, 381 feet west from west house line of Twelfth.....		3	6	4	0		1	
Tree street, north side, 183 feet east of east house line of Twelfth.....		1	6	8	0		1	
Twelfth street, west side, south house line of Snyder avenue.....		1	6	18				1
Twelfth street, west side, south house line of Washington avenue.....		2	6	10				1
Twenty-eighth street, west side, south house line of Wharton.....		26	6	14	6			1
Twenty-eighth street, west side, north house line of Wharton.....		26	6	14	0			1
Twenty-eighth street, east side, north house line of Oakford.....		26	6	10				1
Twenty-fourth street, west side, south house line of Catharine.....		70	6	10			1	
Washington avenue, north side, east house line of Twentieth.....		26	6	0				1

New Fire Hydrants—First District—Continued.

Street.	Location.	Ward.	Size of main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Watkins street, north side, 147 feet west of west house line of Twenty-second.....		26	6	10	.....	.....	1		
Webb street, east side, 72 feet south of south house line of Fitzwater.....		30	6	8	.....	.....	1		
Winton street, north side, 344 feet west of west house line of Old Second.....		1	6	8	.....	.....	1		
Totals.....				1,252	6	.....	31	66	

**NEW FIRE HYDRANTS.
SECOND DISTRICT.**

Street.	Location.	Wards.	Size of Main.	6-INCH CONNECTION		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Barclay street, north side, 98 feet east of east house line of Eighth.....		7	6	10	2	.....	.....	1	
Baring street, north side, 3 feet east of east house line of Thirty-second.....		24	6	17	10	.....	.....	1	
Barker street, south side, 167 feet west of west house line of Sixteenth.....		9	6	8		.....	1		
Barker street, north side, 133 feet west of west house line of Seventeenth.....		9	6	8		.....	1		
Barker street, north side, 150 feet west of west house line of Eighteenth.....		9	6	8		.....	1		
Barker street, north side, 72 feet east of east house line of Nineteenth.....		9	6	8		.....	1		
Barker street, south side, 121 feet west of west house line of Nineteenth.....		9	6	8		.....	1		
Brooklyn street, west side, south house line of Fairmount avenue.....		24	6	14		.....		1	
Brooklyn street, east side, south house line of Aspen.....		24	6	14		.....		1	
Cathedral avenue, north side, 72 feet west of west house line of Fiftieth.....		34	6	11		.....	1		
Cathedral avenue, 251 feet west of west house line of Fifty-first.....		34	6	11		.....	1		
Chester street, north side, 2 feet west of west house line of Fifty-second.....		27	6	23		.....		1	
Chester street, north side, 2 feet west of west house line of Fifty-third.....		27	6	23		.....		1	
Chestnut street, north side, 4 feet 6 inches east of east house line of Thirty-sixth.....		27	8	22	2	.....		1	
Clinton street, north side, 167 feet east of east house line of Tenth.....		7	6	14			1	

New Fire Hydrants—Second District—Continued.

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Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.
Delancey Place, south side, 154 feet east of east house line of Nineteenth.....		7	6	9			1	
Elmwood avenue, south side, 4 feet east of east line of Fifty-ninth.....		27	6	23	3			1
Elmwood avenue, south side, east house line of Sixtieth.....		27	6	23				1
Fairmount avenue, north side, east house line of Union street.....		24	6	18	4			1
Fairmount avenue, south side, 3 feet east of northeast house line of Lancaster avenue.....		24	6	14				1
Fifty-fifth street, east side, 1 foot south of southwest house line of Lancaster avenue.....		34	6	14				1
Fifty-fourth street, east side, 2 feet northwest of northwest house line of Chester avenue.....		27	6	21				1
Fifty-second street, northeast side, 2 feet northwest of northwest house line of Warrington.....		27	30	18	2			1
Fifty-second street, west side, south house line of Filbert.....		34	6	26				1
Fortieth street, west side, south house line of Fairmount avenue.....		24	6	18	9			1
Fortieth street, east side, south house line of Aspen.....		24	6	17				1
Forty-eighth street, northeast side, southeast house line of Warrington.....		27	6	22	10			1
Forty-fourth street, west side, 2 feet north of north house line of Chestnut.....		27	6	18				1
Forty-second street, west side, north house line of Fairmount avenue.....		24	6	18	7			1
Forty-seventh street, southwest side, 257 feet 6 inches southeast of southeast house line of Woodland ave.		27	6	20	8			1
Glenmore avenue, northwest side, 7 feet northeast of northeast house line of Hanson street.....		27	6	8	10		1	

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New Fire Hydrants—Second District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	Inches.	O. S.	No. 1.	No. 2.	No. 3.
Greenway avenue, northwest side, 31 feet northeast of northeast house line of Fiftieth street.....		27	6	22	.....	.....	1	.....
Grubb street, north side, 6 feet 6 inches east of east house line of Sycamore.....		8	6	3	10	.....	.....	1
Hamilton street, south side, 3 feet east of east house line of Sixty-fourth.....		34	6	18	.....	.....	.....	1
Haverford avenue, north side, west house line of Thirty-seventh street.....		24	20	8	5	.....	.....	1
Holly street, east side, south house line of Pennsgrove.....		24	6	14	.....	.....	.....	1
Hunter's Lane, northwest side, 3 feet southwest of southwest house line of Fifty-fourth street.....		34	6	11	2	.....	.....	1
Hutton street, east side, 177 feet north of north house line of Parrish.....		24	6	8	9	.....	1	.....
Island road, northeast side, two feet northwest house line of Paschall.....		27	6	12	6	.....	.....	1
Lancaster avenue, northeast side, five feet southeast of southeast house line of Forty-first.....		24	6	26	.....	.....	.....	1
Lansdowne avenue, north side, fourteen feet east of east house line of Peach.....		34	6	18	.....	.....	.....	1
Locust street, north side, twelve feet west of west house line of Raspberry.....		8	6	14	.....	.....	.....	1
Lombard street, north side, west house line of Twenty-third.....		7	6	14	.....	.....	.....	1
Lombard street, north side, west house line of Twenty-fifth.....		7	6	14	.....	.....	.....	1
Mantua avenue, north side, opposite centre of Holly.....		24	6	17	10	.....	.....	1
Mantua avenue, south side, east house line of Forty-second.....		24	6	17	8	.....	.....	1
Mantua avenue, south side, east house line of Forty-third.....		24	6	17	9	.....	.....	1

New Fire Hydrants—Second District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Mantua avenue, south side, three feet west of east house line of Forty-fourth.....		24	6	19	2			1
Market street, north side, thirty-one feet east of east house line of Ninth.....		9	6	8	6			1
Market street, south side, two feet six inches west of west house line of Forty-fourth.....		27	10	22	6			1
North street, northwest side, thirteen feet northeast of northeast house line of Island road.....		27	6	13				1
North street, southeast side, two feet northeast of northeast side of Lloyd.....		27	6	14				1
North street, northwest side west house line of Seventy-second or Mud lane.....		27	6	14				1
Paschall avenue, southeast side, northeast house line of Forty-eighth.....		27	6	22	8			1
Paschall avenue, southeast side, northeast house line of Fiftieth.....		27	6	23				1
Pennsgrove street, south side, two feet west of west house line of Mantua avenue.....		24	6	14	4			1
Pine street, south side, east house line of Eighteenth.....		7	6	8				1
Pine street, north side, east house line of Nineteenth.....		7	6	22				1
Pine street, south side, east house line of Twentieth.....		7	6	7	6			1
Pine street, south side, 1 foot 6 inches east of west house line of Twenty-second.....		7	6	7	6			1
Pine street, south side, west house line of Twenty-third.....		7	6	7	6			1
Pine street, north side, 2 feet west of west house line of Twenty-fifth.....		7	6	17				1
Pine street, south side, 13 feet east of east house line of Twenty-sixth.....		7	6	7	6			1

New Fire Hydrants—Second District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Powelton avenue, north side, east house line of Thirty-fourth.....		24	6	18				1
Preston street, west side, 2 feet north of north house line of Spring Garden		24	6	14				1
Quince street, east side, north house line of Barley		7	6	4	2			1
Race street, north side, west house line of Sixty-third-and-a-half.....		34	6	18				1
Rockland street, northwest side, 48 feet northeast of northeast house line of Lancaster avenue.....		24	6	10	7		1	
Sansom street, north side, 6 feet west of west house line of Twenty-second.....		8	6	11				1
Silver street, north side, 129 feet east of east house line of Thirteenth.....		9	6	4	9			1
Sixty-fourth street, west side, south house line of Callowhill.....		34	6	19				1
Sloan street, west side, 148 feet 6 inches south of south house line of Aspen.....		24	6	9			1	
Springfield street, southeast side, southwest house line of St. Bernard.....		27	6	23				1
Springfield street, northwest side, 2 feet southwest of southwest house line of Fifty-fourth.....		27	6	23				1
Springfield street, northwest side, 148 feet southwest of southwest curb line of Fifty-fifth.....		27	6	23				1
Spruce street, north side, 2 feet west of west house line of Twenty-third.....		8	6	14				1
Spruce street, north side, east house line of Twenty-fifth.....		8	6	14				1
Thirtieth street, east side, south house line of Marston.....		27	6	10				1
Thirtieth street, east side, north house line of Marston.....		27	6	10				1

New Fire Hydrants—Second District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Thirtieth street, east side, 660 feet south of south house line of Locust.....		27	6	11				1
Thirtieth street, east side, south house line of Locust.....		27	6	22				1
Thirty-first street, west side, south house line of Hamilton.....		24	6	17	9			1
Thirty-second street, east side, 2 feet south of south house line of Spring Garden.....		24	6	19				1
Thompson street, south side, east house line of Conestoga.....		34	6	18			1	
Twelfth street, west side, south house line of Locust.....		8	6	14			1	
Twentieth street, west side, north house line of Johnston.....		9	6	14				1
Twenty-fourth street, west side, north house line of Locust.....		8	6	14				1
Twenty-fourth street, east side, north house line of Sansom.....		8	6	14				1
Twenty-third street, east side, south house line of St. Jame's place.....		8	6	14				1
Twenty-third street, west side, 1 foot south of south house line of Filbert.....		9	12	10	5			1
Twenty-third street, west side, 2 feet south of south house line of Arch.....		9	12	7	6			1
Union street, west side, opposite centre of Atlanta.....		24	6	14	5			1
Vine street, north side, 16 feet west of west house line of New Market.....		11	10	14				1
Vine street, north side, west house line of Tenth.....		14	12	7	5			1
Vine street, south side, west house line of Twenty-third.....		10	6	11	9			1

New Fire Hydrants—Second District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Vine street, north side, opposite centre of St. David.....		15	6	18	8	.....	.....	1	
Walnut street, south side, 13 feet west of west house line of Eighteenth.....		8	12	9	.....	.....	.....	1	
Walnut street, south side, 67 feet east of east curb line of Nineteenth.....		8	12	7	6	.....	.....	1	
Walnut street, south side, west house line of Twenty-second.....		8	6	14	.....	.....	.....	1	
Walnut street, north side, 2 feet east of east house line of Thirty-seventh.....		27	10	24	7	.....	.....	1	
Water street, west side, 347 feet south of south house line of Vine.....		6	6	4	8	.....	.....	1	
Wyalusing street, south side, 224 feet 6 inches east of east house line of Forty-third.....		24	6	14	.....	.....	.....	1	
Total.....				1,499	0	.....	15	87	

NEW FIRE HYDRANTS—Continued.
THIRD DISTRICT.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Abigail street, southwest side, 106 feet southeast of southeast house line of Coral.....		31	6	9	.....	.....	.....	1	
Allegheny avenue, south side, southeast house line of Kensington avenue.....		25	6	10	5	.....	.....	1	
Allegheny avenue, north side, 171 feet east of east house line of Fillmore street.....		33	6	8	8	.....	1		
Allegheny avenue, north side, east house line of Fox street.....		33	6	8	8	.....	.....	1	
Allegheny avenue, north side, east house line of Lee street.....		33	6	8	9	.....	.....	1	
Allegheny avenue, south side, east house line of Front street.....		33	6	10	.....	.....	.....	1	
Amber street, southeast side, northeast house line of Norris.....		31	6	9	.....	.....	.....	1	
Amber street, southeast side, northeast house line of Ann.....		25	6	7	.....	.....	.....	1	
American street, east side, 262 feet 9 inches south of south house line of Diamond.....		19	6	8	6	.....	1		
Ann street, northeast side, north west house line of Belgrade.....		25	6	14	6	.....	.....	1	
Ann street, southwest side, northwest house line of Trenton avenue.....		25	6	13	10	.....	.....	1	
Ann street, southwest side, southeast house line of Amber.....		25	6	14	.....	.....	.....	1	
Aramingo street, northeast side, northwest house line of Tulip.....		31	6	14	5	.....	.....	1	
Athol street, east side, south house line of Allegheny avenue.....		33	6	8	2	.....	.....	1	
Ball street, northeast side, northwest house line of Beach.....		18	6	15	5	.....	.....	1	

New Fire Hydrants—Third District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Ball street, northeast side, southeast house line of Richmond.....		18	6	15	4	.....	.....	1	
Beach street, northwest side, northeast house line of Llewelyn.....		11	10	14	6	.....	.....	1	
Beach street, southeast side, 294 feet southwest of southwest house line of Laurel.....		16	10	14	6	.....	1		
Beaver street, north side, west house line of Second.....		16	6	11	4	.....	.....	1	
Beaver street, north side, east house line of St. John.....		16	6	9		.....	.....	1	
Bermuda street, southeast side, 221 feet southwest of southwest house line of Margaretta.....		23	6	14	6	.....	1		
Birch street, north side, west house line of Amber.....		25	6	8		.....	.....	1	
Birch street, south side, east house line of Frankford road.....		25	6	8	2	.....	.....	1	
Bridge street, northeast side, southeast house line of Trenton avenue.....		23	6	14	1	.....	.....	1	
Bridge street, northeast side, southeast house line of Edmund.....		23	6	14	4	.....	.....	1	
Brown street, north side, west house line of Third.....		12	6	16	3	.....	.....	1	
Brown street, north side, west house line of Charlotte.....		12	6	15		.....	.....	1	
Callowhill street, south side, 95 feet east of east house line of Fifth.....		12	4	11	10	.....	1	.....
Cambria street, south side, northwest house line of Emerald.....		25	6	18		.....	.....	1	
Cambria street, south side, northwest house line of Stoughton.....		25	6	17	6	.....	.....	1	
Cambria street, south side, west house line of Front.....		33	6	14	8	.....	.....	1	

New Fire Hydrants—Third District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Cambria street, north side, west house line of Philip.....		33	6	14	9			1	
Cambria street, north side, east house line of Lawrence.....		33	6	14				1	
Cemetery avenue, north side, east house line of Malvern.....		25	6	15	8		1		
Church street, south side, east house line of Eighth.....		19	6	9				1	
Clarion street, west side, south house line of Clearfield.....		25	6	9				1	
Clearfield street, north side, southeast house line of Jasper.....		25	6	17	2			1	
Clearfield street, south side, east house line of Potter.....		33	6	14	8		1		
Clearfield street, north side, east house line of F.....		33	6	14	4			1	
Clementine street, northeast side, northwest house line of Frankford avenue.....		25	6	15	10			1	
Cumberland street, northeast side, northwest house line of Richmond.....		18	6	18	9			1	
Cumberland street, southwest side, northwest house line of Salmon.....		18	6	18	7			1	
Darien street, east side, south house line of Cambria.....		33	6	9				1	
Dauphin street, south side, 4 feet 6 inches east of east house line of Front.....		31	6	15	5			1	
Deal street, south side, 76 feet east of east house line of Tulip.....		18	6	14	6			1	
Delaware avenue, west side, 240 feet south of south house line of Laurel.....		16	4	22			1		
Dreer street, northeast side, southeast house line of Coral.....		31	6	12				1	

New Fire Hydrants—Third District.—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Eighth street, east side, north house line of Somerset.....		33	6	15	.....				1
Ella street, west side, south house line of Indiana avenue.....		33	6	11	2	.....			1
Emerald street, northwest side, north house line of Allegheny avenue.....		25	6	14	10	.....			1
Eyre street, southwest side, 154 feet southeast of southeast house line of Belgrade.....		18	6	8	4	.....			1
Fairhill street, east side, south house line of Clearfield.....		33	6	14	6	.....			1
Fairhill street, on dead end of 6-inch pipe, 200 feet north of northwest house line of Glenwood avenue.....		33	6	.....	.....		1	.....
Fairmount avenue, north side, west house line of Second.....		11	6	17	.....				1
Fifth street, east side, south house line of Susquehanna avenue.....		19	6	18	10	.....			1
Foulkrod street, northeast side, northwest house line of Leiper.....		23	6	15	.....				1
Foulkrod street, southwest side, northwest house line of Oakland.....		23	6	14	10	.....			1
Foulkrod street, northeast side, northwest house line of Horrocks.....		23	6	14	7	.....			1
Foulkrod street, southwest side, northwest house line of Large.....		23	6	14	10	.....			1
Foulkrod street, northeast side, northwest house line of "B".....		23	6	14	8	.....			1
Fourth street, west side, north house line of Poplar.....		16	6	15	11	.....			1
Fox street, north side, south house line of Tioga.....		33	6	11	6	.....			1
Frankford avenue, northwest side, 28 feet northeast of northeast house line of Ruan.....		23	12	10	3	.....			1

New Fire Hydrants—Third District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Frankford avenue, northwest side, 227 feet northeast of northeast house line of Church.....		23	12	12	2	.....	1	
Frankford avenue, southeast side, northeast house line of Harrison.....		23	10	22	2	.....	1	
Frankford street, northeast side, 348 feet southeast of southeast house line of Melrose.....		23	3	32	7	.....	1	
Franklin street, west side, north house line of Church.....		19	6	11	5	.....	1	
Front street, west side, 131 feet north of north house line of Poplar.....		16	10	19	.....	1		
Front street, east side, 215 feet south of south house line of Norris.....		19	6	19	.....	1		
Front street, east side, north house line of Susquehanna avenue.....		31	6	19	6	.....	1	
Front street, west side, northeast house line of Tusculum.....		33	6	18	2	.....	1	
Garnet street, east side, south house line of Somerset.....		25	6	14	4	.....	1	
Geisler street, northeast side, northwest house line of Almond.....		25	6	8	2	.....	1	
Gurney street, northeast side, 124 feet northwest of northwest house line of Front.....		33	6	15	3	.....	1	
Gurney street, northeast side, opposite center of Howard.....		33	6	15	2	.....	1	
Hancock street, east side, south house line of Indiana avenue.....		33	6	14	10	.....	1	
Hart lane, southwest side, southeast house line of "D".....		33	4	18	4	.....	1	
Helen street, east side, 248 feet south of south house line of Somerset.....		25	6	8	.....	1		
Haworth street, southwest side, northwest house line of Willow.....		23	6	14	5	.....	1	

New Fire Hydrants—Third District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet	In.	O. S.	No. 1.	No. 2.	No. 3.
Haworth street, northeast side, 190 feet northwest of northwest house line of Willow.....		23	6	14	4	.....	1		
Haworth street, southwest side, southeast house line of Cedar.....		23	6	14	3	.....			1
Haworth street, northeast side, southeast house line of Frankford avenue.....		23	6	14	4	.....			1
Huntingdon street, northeast side, southeast house line of Sepviva.....		31	6	18	.....				1
Hutchinson street, west side, south house line of Cambria.....		33	6	14	8	.....			1
Indiana avenue, north side, west house line of Kipp.....		33	6	13	10	.....			1
Indiana avenue, south side, east house line of Fillmore.....		33	6	14	10	.....			1
James street, north side, east house line of Orthodox.....		23	6	16	9	.....			1
Jasper street, southeast side, northeast house line of Sterner.....		25	6	14	8	.....	1		
Jasper street, northwest side, northeast house line of Hilton.....		25	6	13	6	.....			1
Joyce street, southeast side, 104 feet northeast of northeast house line of Kettlewell.....		25	6	9	8	.....	1		
Judge street, northeast side, southeast house line of Thompson.....		25	6	8	6	.....	1		
Kensington avenue, southeast side, opposite centre of "C" street.....		25	6	9	.....				1
Kensington avenue, northwest side, east house line of Boudinot.....		33	6	9	4	.....			1
Kensington avenue, northwest side, east house line of "E" street.....		33	6	9	5	.....			1
Kensington avenue, southeast side, northeast house line of Monmouth.....		25	6	8	.....				1

New Fire Hydrants—Third District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Kensington avenue, southeast side, southwest house line of Orleans.....		25	6	9	3	.....	.....	1	
Kensington avenue, northwest side, 294 feet southwest of southwest house line of Clearfield		33	6	11	3	.....	1	.....
Kensington avenue, northwest side, opposite southwest house line of Meighan.....		33	6	11	7	.....	.....	1	
Kensington avenue, northwest side, northeast house line of Adams.....		23	6	10	6	.....	.....	1	
Laurel street, south side, 2 feet 6 inches west of west house line Delaware avenue.....		16	6	9	8	.....	.....	1	
Laurel street, south side, west house line of Beach.....		16	6	8	.....	.....	.....	1	
Lawrence street, east side, north house line of Berks.....		19	6	14	4	.....	.....	1	
Lawrence street, east side, south house line of Susquehanna avenue.....		19	6	15	.....	.....	.....	1	
Lehigh avenue, north side, opposite west house line of Collins.....		25	6	11	3	.....	.....	1	
Mascher street, west side, 76 feet south of south house line of Montgomery avenue.....		19	6	14	8	.....	.....	1	
Mascher street, east side, 80 feet south of south house line of Altmaier.....		19	6	14	6	.....	.....	.....	1
Mascher street, east side, south house line of Cumberland.....		19	6	14	2	.....	.....	1	
Mintzer street, west side, 162 feet south of south house line of Brown.....		11	6	4	11	.....	1	.....
Muttenstreet, east side, south house line of Cambria.....		33	6	11	.....	.....	.....	1	
Ninth street, west side, south house line of Indiana.....		33	6	14	10	.....	.....	1	
Norris street, south side, east house line of Philip.....		19	6	14	6	.....	.....	1	

New Fire Hydrants—Third District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	Inches.	O. S.	No. 1.	No. 2.	No. 3.
Ontario street, north side, west house line of Second.....		33	6	15				1
Ontario street, south side, west house line of American.....		33	6	14	4			1
Orchard street, northwest side, southwest house line of Unity.....		23	6	12	7			1
Orianna street, east side, south house line of Cumberland.....		19	4	8	10			1
Orianna street, east side, south house line of Huntingdon.....		19	6	9				1
Orthodox street, northeast side, 19 feet southeast of southeast house line of Gaul.....		25	6	17			1	
Philip street, east side, south house line of Indiana avenue.....		33	6	9				1
Philip street, west side, 139 feet south of south house line of Ontario.....		33	6	8	2		1	
Poplar street, southwest side, northwest house line of Beach.....		11	4	14	6			1
Poplar street, northeast side, northwest house line of Beach.....		16	4	15				1
Poplar street, southeast side, east house line of Canal.....		11	4	13	6			1
Poplar street, southeast side, east house line of Front.....		11	6	10	10			1
Porter's avenue, east side, 3 feet north of south house line of Elkhart.....		25	6	9			1	
Potter street, west side, 80 feet northeast of northeast house line of "F".....		33	6	8			1	
Richmond street, northwest side, northeast house line of Ash.....		18	6	15				1
Ruth street, east side, 123 feet 4 inches south of south house line of Cambria.....		33	4	15			1	

New Fire Hydrants—Third District.—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Salmon street, southeast side, northeast house line of Lefevre.....		25	6	11	9	.....	.....	1	
Salmon street, northwest side, 285 feet northeast of northeast house line of Lefevre.....		25	6	11	6	.....	1		
Salmon street, southeast side, southwest house line of Buckius.....		25	6	12	.....	.....	.....	1	
Second street, west side, 8 feet 9 inches south of south house line of Willow.....		11	6	16	6	.....	.....	1	
Second street, west side, opposite center of Pegg.....		11	6	19	.....	.....	.....	1	
Second street, east side, opposite north house line of Buttonwood.....		11	6	18	6	.....	.....	1	
Second street, east side, 74 feet north of north house line of Fairmount avenue.....		11	4	7	.....	.....	1	.....
Second street, east side, south house line of Lippincott.....		33	6	18	6	.....	.....	1	
Second street, west side, south house line of Allegheny avenue.....		33	6	18	6	.....	.....	1	
Second street, east side, south house line of Westmoreland		33	6	18	6	.....	.....	1	
Second street, west side, 312 feet south of south house line of Ontario.....		33	6	17	7	.....	1	.....
Second street, west side, northwest house line of Glenwood avenue.....		33	6	18	10	.....	.....	1	
Seventh street, west side, north house line of Cambria.....		33	6	14	10	.....	.....	1	
Seventh street, east side, south house line of Indiana avenue.....		33	6	15	.....	.....	.....	1	
Seventh street, west side, 274 feet north of north house line of Indiana avenue.....		33	6	15	.....	.....	1	.....
Shackamaxon street, northeast side, 63 feet 6 inches northwest of northwest house line of Wildey.....		18	6	17	5	.....	1	.....

New Fire Hydrants.—Third District.—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	Inches.	O. S.	No. 1.	No. 2.	No. 3.
Silver street northeast side, northwest house line of Helen.....		25	6	9	5	.....	1	.....	.....
Somerset street, north side, northwest house line of Emerald.....		25	6	20	4	.....	.....	.....	1
Somerset street, north side, southeast house line of Jasper.....		25	6	15	9	.....	.....	.....	1
Somerset street, north side, southeast house line of Kensington avenue.....		25	6	9	2	.....	.....	.....	1
Sorrell street, northeast side, southwest house line of Bath.....		25	6	11	7	.....	.....	.....	1
Sternor street, northeast side, northwest house line of Helen.....		25	6	8	7	.....	1	.....	.....
St. John street west side, 5 feet north of north house line of Wood.....		11	6	13	.....	.....	.....	1	.....
St. John street, east side, north house line of Callowhill.....		11	6	12	7	.....	.....	.....	1
St. John street, east side, north house line, Fairmount avenue.....		11	6	12	6	.....	.....	1	.....
Stoughton street, east side, 110 feet north of north house line of Hart lane.....		33	6	7	10	.....	1	.....	.....
Tackawana street, north west side, 40 feet northeast of northeast house line of Gillingham.....		23	6	15	2	.....	.....	1	.....
Tioga street, north side, east house line of Howard.....		33	6	15	.....	.....	.....	.....	1
Tioga street, north side, east house line of Mascher.....		33	6	15	.....	.....	.....	.....	1
Tioga street, south side, east house line of Cooper.....		33	6	15	.....	.....	.....	1	.....
Tioga street, south side, east house line of Second.....		33	6	15	.....	.....	.....	1	.....
Tioga street, north side, west house line of Turner.....		33	6	14	8	1

New Fire Hydrants—Third District—Continued.

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Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Trenton avenue, southeast side, 88 feet southwest of southwest house line of Susquehanna avenue.....		31	6	10	.....	.....	1		
Trenton avenue, southeast side, 81 feet northeast of northeast house line of Susquehanna avenue.....		31	6	10	4	.....	1		
Trenton avenue, southeast side, southwest house line of Dauphin.....		31	6	10	2	.....	.....	1	
Tulip street, southeast side, 49 feet 4 inches northeast of northeast house line of Norris.....		31	6	14	.....	.....	1		
Tulip street, southeast side, 82 feet northeast of northeast house line of Emlen.....		31	6	14	4	.....	.....	.....	1
Turner street, on dead end of 6-inch pipe 200 feet north of northwest house line of Glenwood avenue.....		33	6	.....	.....	.....	1		
Ulrick street, west side, south house line of Maria.....		11	6	5	6	.....	.....	1	
Unity street, northeast side, northwest house line of Frankford avenue.....		23	6	14	6	.....	.....	1	
Unity street, northeast side, southeast house line of Horrocks.....		23	6	15	.....	.....	.....	1	
Vienna street, northeast side, southeast house line of Richmond.....		23	6	11	.....	.....	.....	1	
Wakeling street, southwest side, southeast house line of Cedar.....		23	6	13	.....	.....	.....	1	
Wakeling street, northeast side, southeast house line of Frankford avenue.....		23	6	14	6	.....	.....	1	
Westmoreland street, southeast side, northwest house line of Trenton avenue.....		25	6	19	6	1	.....	.....	.....
Wrekin street, southwest side, west house line of Commerce.....		31	6	8	8	1	.....	.....	.....
Wrekin street, northeast side, southeast house line of Cedar.....		31	6	8	6	.....	.....	1	
York street, south side, east house line of Leithgrow.....		19	6	14	9	1	
Total.....				2,318	5	2	35	129	9

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**NEW FIRE HYDRANTS.
FOURTH DISTRICT.**

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Allegheny avenue, north side, 36 feet east of east house line of Eighteenth.....		28	6	9	4			1
Allegheny avenue, south side, 22 feet west of west property line of P. & R. R.....		28	6	3	6			1
Allegheny avenue, south side, 136 feet east of east house line of Twentieth.....		28	6	3	6			1
Allegheny avenue, south side, east house line of Twenty-first.....		28	6	8				1
Allegheny avenue, south side, east house line of Twenty-second.....		28	6	3	6			1
Arizona street, south side, east house line of Thirty-second.....		28	6	9				1
Arlington street, north side, west house line of Seventeenth.....		32	6	11	8			1
Berks street, south side, west house line of Eighteenth.....		32	6	13	6			1
Bouvier street, west side, south house line of Cumberland.....		28	6	8	5		1	
Broad street, west side, 6 feet 7 inches north of north house line of Vine.....		15	20	17	5			1
Broad street, east side, 6 feet 10 inches north of north house line of Vine.....		14	20	54	6			1
Broad street, east side, 6 feet 2 inches north of north house line of Wood.....		14	20	57				1
Broad street, west side, 6 feet 8 inches north of north house line of Wood.....		15	20	17				1
Brown street, south side, east house line of Eighth.....		13	6	14	5			1
Brown street, north side, 19 feet west of west house line of Darien.....		13	6	15	10			1

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward,	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Brown street, south side, 2 feet east of east house line of Eleventh.....		14	6	14	6	.....	.....	1	
Brown street, north side, east house line of Inquirer.....		14	6	14	9	.....	.....	1	
Cabot street, north side, east house line of Seventeenth.....		29	6	8	6	.....	1		
Callowhill street, south side, 1 foot 10 inches west of west house line of Fifteenth.....		15	10	19	7	.....	.....	1	
Callowhill street, south side, 2 feet 3 inches east of east house line of Eighteenth.....		15	10	17	3	.....	.....	1	
Canton street, east side 1 foot south of south house line of Noble.....		13	6	8	8	.....	1		
Canton street, east side, 3 feet south of south house line of Buttonwood.....		13	6	9	.....	.....	.....	1	
Carlton street, north side, 100 feet east of east house line of Eighteenth.....		15	6	7	10	.....	1		
Clarence street, north side, 167 feet 6 inches west of west house line of Twenty-second.....		28	6	11	.....	.....	.....	1	
Clearfield street, north side, west house line of Twenty-ninth.....		28	6	14	.....	.....	.....	1	
Clearfield street, north side, east house line of Thirty-second.....		28	6	11	8	.....	.....	1	
Colona street, south side, 3 feet 10 inches west of west house line of Eleventh.....		28	6	12	4	.....	.....	1	
Colorado street, east side, south house line of Cumberland.....		28	6	6	10	.....	1		
Columbia avenue, south side, 5 feet 6 inches east of east house line of Alder.....		20	6	17	4	.....	.....	1	
Columbia avenue, south side, 2 feet west of east house line of Twenty-ninth.....		29	6	8	3	.....	.....	1	
Columbia avenue, north side, 2 feet west of east house line of Twenty-ninth.....		29	6	8	3	.....	.....	1	

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION,		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Columbia avenue, south side, east house line of Thirtieth.....		29	6	3	8			1
Columbia avenue, north side, east house line of Thirtieth..		29	6	4				1
Dauphin street, south side, east house line of Camac.....		28	10	14	6			1
Edgely street, north side, west house line of Delhi.....		28	6	9			1	
Eighth street, west side, south house line of Columbia avenue.....		20	6	9	3			1
Eighteenth street, east side, 6 feet north of north house line of Norris.....		32	6	13	10			1
Eighteenth street, east side, 3 feet south of south house line of Diamond.....		32	6	12	6			1
Eleventh street, east side, 2 feet south of south house line of Cumberland.....		28	6	14	6			1
Eleventh street, east side, 14 feet north of north house line of Cambria.....		28	6	14	6			1
Fifteenth street, west side, 15 feet 9 inches south of south curb line of Pennsylvania avenue.....		15	6	14	8			1
Firth street, south side, on dead end of 6-inch pipe, opposite centre of Maple.....		28	6				1	
Franklin street, west side, 8 feet north of north house line of Columbia avenue.....		20	6	14	9			1
French street, north side, west house line of Delhi.....		28	6	9			1	
French street, north side, east house line of Thirty-second.....		32	6	7	6		1	
Garnet street, west side, 1 foot 6 inches north of north house line of Dauphin.....		28	6	8	6		1	
Girard avenue, south side, 1 foot east of east house line of Bambrey.....		29	10	11	8			1

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Hamilton street, south side, 122 feet west of west house line of Nineteenth.....		15	6	17	6				1
Harlan street, north side, east house line of Nineteenth.....		29	6	8	6				1
Herman street, north side, east house line of Thirty-second.....		28	6	12	3				1
Hicks street, east side, 6 feet south of south house line of Mundell.....		28	6	12			1		
Jefferson street, north side, east house line of Marshall.....		20	6	14	2				1
Jefferson street, south side, 7 feet west of east house line of Warnock.....		20	6	15	10				1
Jefferson street, south side, west house line of Marston.....		29	6	16					1
Lehigh avenue, south side, 1 foot west of west house line of Fifteenth.....		28	6	1	6				1
Lehigh avenue, north side, east house line of Twenty-seventh.....		28	6	13	6				1
Master street, south side, 8 feet west of east house line of Hutchinson.....		20	6	14	5				1
Master street, north side, 18 feet 6 inches east of east house line of Thirteenth.....		20	6	14	10				1
Master street, south side, 200 feet east of east house line of Sixteenth.....		29	6	18	8				1
Montgomery avenue, south side, east house line of Fifteenth.....		29	6	15					1
Montgomery avenue, south side, east house line of Sixteenth.....		29	6	16					1
Montgomery avenue, north side, four feet east of east house line of Seventeenth.....		32	6	13					1
Montgomery avenue, north side, east house line of Eighteenth.....		32	6	13	8				1

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-IN. CONNECTION.		STYLE.		
				Feet.	Inches.	O. S.	No. 1.	No. 2.	No. 3.
Monument street, north side, west house line of Seventeenth.....		28	6	11	6			1
Mundell street, northwest side, southwest house line of Fifteenth.....		28	6	9	6			1
Newkirk street, west side, south house line of Jefferson.....		28	6	9			1	
Newkirk street, east side, 130 feet south of south house line of Cumberland.....		28	6	10				1
Nineteenth street, east side, south house line of Carlton.....		15	6	14	4			1
Nineteenth street, west side, south house line of Hamilton.....		15	10	19				1
Nineteenth street, west side, south house line of Spring Garden.....		15	10	19	3			1
Nineteenth street, west side, 222 feet 6 inches north of north house line of Dauphin.....		28	6	14	10			1
Ninth street, east side, 8 feet 2 inches south of south house line of Norris.....		20	6	12	4			1
North College avenue, north side, east house line of West College avenue.....		29	6	16				1
Opal street, west side, north house line of Dauphin.....		28	6	8			1	
Park avenue, west side, north house line of Somerset.....		28	6	18				1
Park avenue west side, 2 feet north of north house line of Clearfield.....		28	6	18	8			1
Parrish street, south side, 7 feet west of west house line of Twenty-sixth.....		15	6	14	7			1
Pemberton street, east side, 7 feet 8 inches south of south house line of Wallace.....		14	4	10	8		1	
Philadelphia street, east side, south house line of Huntingdon.....		28	6	11				1

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH. CONNECTION.		STYLE.			
				Feet.	In'	O. S.	No. 1.	No. 2.	No. 3.
Poplar street, south side, 4 feet west of west house line of Twenty-fifth.....		15	6	5					1
Poplar street, north side, 9 feet east of east house line of Twenty-sixth.....		29	30	20	11				1
Richfield street, south side, 73 feet west of west house line of Thirteenth.....		28	6	8	3				1
Scott street, south side, 230 feet 6 inches west of west house line of Twenty-seventh.....		29	6	5	5		1		
Seventeenth street, east side, 3 feet south of south house line of Callowhill.....		15	6	17	7				1
Seventeenth street, west side, 55 feet 10 inches south of south house line of Pennsylvania avenue.....		15	6	14	6				1
Sixteenth street, east side, 6 feet south of south house line of Pearl.....		15	6	13					1
Sixteenth street, east side, south house line of Brandywine.....		15	6	12	8				1
Sixteenth street, east side, north house line of Oakdale.....		28	6	14	6		1		
Sixteenth street, west side, south house line of Indiana avenue.....		28	6	14	6				1
Spring Garden street, north side, east house line of Twenty-fifth.....		15	6	26					1
Sydenham street, west side, 132 feet 6 inches south of south house line of Jefferson.....		29	6	14				1	
Sydenham street, east side, west house line of Jefferson.....		29	6	15				1	
Sydenham street, east side, 200 feet north of north house line of Oxford.....		29	6	9	11			1	
Sydenham street, east side, 134 feet 6 inches north of north house line of Columbia avenue.....		29	6	11	7			1	
Sydenham street, west side, 8 feet south of south house line of Mundell.....		28	6	6				1	

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Thirteenth street, east side north house line of Susquehanna avenue.....		28	6	8	6				1
Thirteenth street, west side, 5 feet south of south house line of Master.....		20	6	14	4				1
Thirteenth street, east side, south house line of Somerset.....		28	6	9	6				1
Thirtieth street, west side, north house line of Master.....		29	10	14	9				1
Thirtieth street, west side, north house line of Master.....		29	12	13	5				1
Thirty-first street, east side, 7 feet 6 inches north of north house line of Master.....		29	10	13	8				1
Thirty-second street, west side, north house line of Diamond.....		32	6	15					1
Thirty-third street, east side, 2 feet south of south house line of Columbia avenue.....		29	12	4					1
Thirty-third street, west side, opposite centre of Montgomery avenue.....		29	6	9					1
Twelfth street, west side, south of house line of Callowhill.....		14	6	19					1
Twelfth street, west side, 6 feet south of house line of Norris.....		32	6	17	8				1
Twelfth street, east side, south house line of Dauphin.....		28	6	12	8				1
Twelfth street, west side, opposite centre of Colona.....		28	6	14	3				1
Twentieth street, west side, south house line of Hamilton.....		15	6	13	1				1
Twenty-eighth street, east side, north house line of Columbia avenue.....		28	6	14	9				1
Twenty-fifth street, west side, south house line of Jefferson.....		29	6	8					1

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Twenty-first street, east side, 178 feet north of north house line of Hamilton.....		15	6	15	7	.....	1		
Twenty-fourth street, east side, south house line of Berks.....		32	6	15				1	
Twenty-fourth street, west side, north house line of York.....		28	6	14				1	
Twenty-ninth street, east side, 2 feet 6 inches south of south house line of Fletcher.....		28	36	10	8	.....	1		
Twenty-ninth street, east side, 4 feet 6 inches south of south house line of Dauphin.....		28	36	10	8	.....	1		
Twenty-second street, east side, 12 feet south of southeast house line of Sedgely avenue.....		28	6	19				1	
Twenty-second street, east side, north house line of Lehigh avenue.....		28	6	8				1	
Twenty-seventh street, west side, north house line of Oxford.....		29	36	14	8	.....	1		
Twenty-seventh street, west side, 5 feet 9 inches north of north house line of Montgomery avenue.....		32	10	14	8	.....	1		
Twenty-seventh street, west side, north house line of Berks.....		32	10	13	6	.....	1		
Twenty-seventh street, east side, northwest house line of Sedgely avenue.....		32	6	13	6	.....	1		
Twenty-seventh street, west side, north house line of Huntingdon.....		28	6	14				1	
Twenty-sixth street, east side, 17 feet 2 inches south of south house line of Columbia avenue.....		29	6	14	11	.....	1		
Twenty-sixth street, west side, south house line of Hagert.....		28	6	14				1	
Van Pelt street, east side, 2 feet north of north house line of Dauphin.....		28	6	7			1		
Vineyard street, southeast side, southwest house line of Perkiomen.....		15	6	16			1		

New Fire Hydrants—Fourth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Warnock street, west side, 204 feet south of south house line of Columbia avenue.....		20	6	9	.....	.....	1		
Westmont street, north side, east house line of Thirty-second.....		32	6	8	11	.....	1		
York street, north side, 3 feet 6 inches east of east house line of Broad.....		28	6	15	6	.....		1	
York street, north side, 177 feet west of west house line of Thirtieth.....		28	6	13	10	.....		1	
Totals.....				1,699	2	.....	26	105	

NEW FIRE HYDRANTS.

FIFTH DISTRICT.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Charles street, southeast side, 8 feet 6 inches northeast of northeast house line of Mitchell		21	6	14	6	.....	.....	1
James avenue, northwest side, 14 feet southwest of southwest house line of Jeanette.....		21	6	21	.....	.....	1	.....
James street, northwest side, 324 feet southwest of southwest house line of Cresson.....		28	6	17	9	.....	.....	1
Manayunk avenue, southwest side, northwest house line of Osborne		21	6	14	6	.....	.....	1
Manayunk avenue, northeast side, 193 feet southeast of southeast house line of Levering.....		21	10	14	6	.....	1	.....
Manayunk avenue, northeast side, 18 feet northwest of northwest house line of Roxborough avenue		21	10	14	6	.....	.....	1
Mulberry street, northwest side, 6 feet southwest of southwest house line of Wood.....		21	6	11	6	.....	.....	1
Port Royal avenue, southeast side, 590 feet southwest of southwest house line of Bean street.....		21	6	9	6	.....	.....	1
Ridge avenue, southwest side, 202 feet southeast of southeast house line of James.....		28	12	9	.....	.....	.....	.....
Ridge avenue, southwest side, 159 feet northwest of northwest house line of Scott's lane.....		28	12	7	.....	.....	.....	1
Rodman street, southeast side, 8 feet southwest of southwest house line of Ridge avenue		28	4	10	.....	.....	.....	1
Selig street, southwest side, 169 feet northwest of northwest house line of Levering.....		21	6	14	6	.....	.....	1
Shur's Lane, northwest side, 4 feet southwest of southwest house line of Ashland		21	6	14	6	.....	.....	1
Terrace street, northwest corner of Rector.....		21	6	14	6	.....	.....	1
Thirty-fifth street, southeast house line of New Queen.....		28	6	18	6	.....	.....	1

New Fire Hydrants.—Fifth District.—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No 1.	No. 2.	No. 3.
Tibbens street, northeast side, 6 feet southeast of southeast house line of Prospect.....		21	6	12	.....	.....	.....	1	
Webster street, southwest side, 2 feet southeast of southeast house line of Church.....		21	6	11	.....	.....	.....	1	
Wendover street, northwest side, 300 feet 6 inches southwest of southwest house line of Manayunk ave....		21	6	11	6	.....	.....	1	
Wood street, northeast side, south east house line of Gates.....		21	6	14	6	.....	.....	1	
Wood street, southwest side, 184 feet northwest of northwest house line of Gates.....		21	6	14	6	.....	.....	1	
Total				269	3	.....	2	17	1

NEW FIRE HYDRANTS.

SIXTH DISTRICT.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	Inches.	O. S.	No. 1.	No. 2.	No. 3.
Apsley street, northwest side, southwest house line of Wayne.....		22	6	14				1
Apsley street, southeast side, northeast house line of Whittier.....		22	6	14			1	
Apsley street, northwest side, northeast house line of Pulaski.....		22	6	14				1
Broad street, west side, north house line of Bristol.....		33	6	9				1
Broad street, west side, north house line of Juniata.....		33	6	9				1
Camac street, east side, north house line of Louden.....		22	6	14				1
Carpenter street, southeast side, northeast house line of Wayne.....		22	6	14				1
Carpenter street, northwest side, 321 feet southwest of southwest house line of Sherman.....		22	6	14			1	
Cayuga street, northwest side, southwest house line of Germantown avenue.....		28	6	15				1
Cayuga street, southeast side, northeast house line of Wayne.....		28	6	15				1
Cayuga street, northwest side, northeast house line of Clarissa.....		28	6	14				1
Chelton avenue, southeast side, 3 feet 6 inches southwest of southwest house line of Morris.....		22	6	30				1
Coalter street, southeast side, northeast house line of Knox.....		22	6	18			1	
Coulter street, northwest side, northeast house line of Wayne.....		22	6	15			1	
Dennie street, northwest side, southwest house line of Wayne.....		28	6	14				1

New Fire Hydrants—Sixth District.—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Dennie street, southeast side, northeast house line of Clarissa.....		28	6	14				1	
Dorsett street, southeast side, northeast house line of Chew.....		22	6	16				1	
Dorsett street, northwest side, 310 feet northeast of northeast house line of Chew.....		22	6	16			1		
Dorsett street, northwest side, southwest house line of Boyer.....		22	6	16				1	
Duval street, northwest side, northeast house line of Jefferson.....		22	6	9					1
Emlen street, southwest side, southeast house line of Norton.....		22	6	14				1	
Good street, southeast side, 341 feet southwest of southwest house line of Germantown avenue.....		22	6	10			1		
Good street, northwest side, 666 feet 6 inches southwest of southwest house line of Germantown avenue..		22	6	10			1		
Gowen street, southeast side, northeast house line of Ardleigh.....		22	6	21	3			1	
Green street, northeast side, 214 feet northwest of northwest house line of Washington lane.....		22	6	16				1	
Hancock street, northeast side, southeast house line of Washington lane.....		22	6	16				1	
High street, southeast side, northeast house line of Cedar lane.....		22	6	22				1	
High street, northwest side, southwest house line of Weiskell.....		22	6	15				1	
High street, northwest side, 326 feet northeast of northeast house line of Norton.....		22	6	10				1	
Highland street, northwest side, southwest house line of Twenty-seventh.....		22	6	15				1	
Itchner street on dead end of 6-inch pipe, 182 feet east of east house line of Nineteenth.....		28	6			1			

New Fire Hydrants—Sixth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. B.	No. 1.	No. 2.	No. 3.
Jefferson street, southwest side, northwest house line of Norton.....		22	6	16					1
Little Wayne street, southwest side, 296 feet southeast of southeast house line of Lehman.....		22	6	11			1		
Logan street, northeast side, southeast house line of Ruffner.....		28	6	11					1
Marshall street, west side, south house line of Venango.....		38	6	14					1
McKean street, northeast side, 328 feet southeast of southeast house line of Manheim.....		22	6	14			1		
Mill street, northwest side, southwest house line of Bloyd.....		22	6	14					1
Mill street, northwest side, 500 feet southwest of southwest side of Chew.....		22	6	14			1		
Mill street, southeast side, northeast house line of Cedar lane.....		22	6	18					1
Mill street, southeast side, southwest house line of Wingohocking.....		22	6	18					1
Moreland street, north west side, northeast house line of Thirty-third.....		22	6	14					1
Moreland street, north west side, 40 feet northeast of northeast house line of Thirty-third.....		22	6	14					1
Morris street, northeast side, southeast house line of Rittenhouse.....		22	6	16					1
Morris street, southwest side, southeast house line of Lehman.....		22	6	15					1
Mt. Airy avenue, southeast side, southwest house line of Chew.....		22	12	16					1
Musgrove street, northeast side, southeast house line of Slocum.....		22	6	17					1
Newcomb street, southeast side, northeast house line of Clarissa.....		28	6	8					1

New Fire Hydrants—Sixth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
Newhall street, southwest side, northwest house line of Manheim.....		22	6	14	.....	.....	.....	1
Newhall street, northeast side, 304 feet northwest of northwest house line of Manheim.....		22	6	14	.....	.....	1	.....
Nineteenth street, east side, south house line of Ontario.....		28	6	14	.....	.....	.....	1
Otto street, southwest side, southeast house line of Spencer.....		22	6	13	.....	.....	.....	1
Penn street, southeast side, southwest house line of Wakefield.....		22	6	11	.....	.....	.....	1
Pulaski avenue, northeast side, 8 feet 6 inches northwest of northwest house line of Queen.....		22	6	20	.....	.....	.....	1
Pulaski avenue, northeast side, 218 feet northwest of northwest house line of Hansberry.....		22	6	19	.....	.....	.....	1
Pulaski avenue, northeast side, 269 feet 6 inches southeast of southeast house line of Hansberry.....		22	6	20	.....	.....	.....	1
Queen street, northwest side of southwest house line of Wissahickon avenue.....		21	6	5	.....	.....	.....	1
Queen street, northwest side, southwest house line of Morris.....		22	6	16	.....	.....	.....	1
Reading pike, northeast side, 561 feet northwest of northwest house line of Thorps lane.....		22	6	3	.....	1	.....	.....
Rittenhouse street, southeast side, 24 feet northeast of northeast house line of Wissahickon avenue.....		22	6	10	.....	.....	.....	1
Rittenhouse street, southeast side, southwest house line of Pulaski avenue.....		22	6	10	.....	.....	.....	1
Rockland street, southeast side, northeast house line of York road.....		22	6	14	.....	.....	.....	1
Rockland street, northwest side, southwest house line of Camac.....		22	6	14	.....	.....	.....	1
Rockland street, southeast side, southwest house line of Eleventh.....		22	6	14	.....	.....	.....	1

New Fire Hydrants—Sixth District—Continued.

1915

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.			
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.
School lane, northwest side, 43 feet northeast of northeast house line of Wissahickon avenue.....		22	6	14	.....	.....	.....	1	
Sedgwick street, northwest side, 2 feet southwest of southwest house line of Chew.....		22	6	14	.....	.....	.....	1	
Seymour street, northwest side, northeast house line of Wayne.....		22	.....	16	.....	.....	.....	1	
Seymour street, southeast side, northeast house line of Henry.....		22	6	20	.....	.....	.....	1	
Sixteenth street, east side, south house line of Cayuga.....		33	6	14	.....	.....	.....	1	
Slocum street, northwest side, 307 feet northeast of northeast house line of Musgrove.....		22	6	13	.....	.....	1		
Springfield street, northwest side, southwest house line of Twenty-ninth.....		22	6	13	.....	.....	.....	1	
Springfield street, southeast side, southwest house line of Cresheim.....		22	6	14	.....	.....	.....	1	
Springfield street, southeast side, northeast house line of Thirty-first.....		22	6	14	.....	.....	.....	1	
Stenton street, southwest side, northwest house line of Willow Grove avenue.....		22	6	21	.....	.....	.....	1	
Stenton street, southwest side, southeast house line of Sixty-fifth.....		22	6	16	.....	.....	.....	1	
Tioga street, south side, west house line of Fifteenth.....		28	6	18	.....	.....	.....	1	
Tioga street, north side, east house line of Twenty-second.....		28	6	13	.....	.....	.....	1	
Tioga street, south side, 4 feet west of west house line of Nineteenth.....		28	6	17	.....	.....	.....
Tioga street, north side, west house line of Twentieth.....		28	6	11		
Tioga street, south side, west house line of Twenty-first.....		28	6	17		

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New Fire Hydrants—Sixth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.		
				Feet.	In.	O. S.	No. 1.	No. 2	No. 3.
Tioga street, north side, west house line of Carlisle.....		28	6	17				2
Tioga street, north side, west house line of Sixteenth.....		28	6	12				1
Tioga street, south side, 4 feet west of west house line of Nineteenth.....		28	6					1
Tioga street, north side, west house line of Twentieth.....		28	6					1
Tioga street, south side, west house line of Twenty-first.....		28	6					1
Twenty-second street, east side, south house line of Westmoreland.....		28	6	14				1
Twenty-second street, east side, south house line of Ontario.....		28	6	11				1
Thirty-fifth street, southwest side, 123 feet north of north house line of Westmoreland.....		22	6	6			1	
Venango street, north side, east house line of Eleventh.....		33	6	15				1
Venango street, south side, 7 feet east of east house line of Twelfth.....		33	6	15				1
Walnut lane, southeast side, 303 feet northeast of northeast house line of Morton.....		22	6	18			1	
Walnut lane, southeast side, southwest house line of Cedar lane.....		22	6	19				1
Walnut lane, southeast side, southwest house line of Adams.....		22	6	22				1
Westmoreland street, north side, west house line of Smedley.....		28	6	16				1
Willow Grove street, northwest side, 400 feet northwest of northeast house line of Stenton ave., Mont'g Co.....		6	6	14			1	
Willow Grove street, northwest side, 400 feet southwest of southwest house line of Ardmore, Mont'g Co.....		6	6	14			1	

New Fire Hydrants—Sixth District—Continued.

Street.	Location.	Ward.	Size of Main.	6-INCH CONNECTION.		STYLE.				
				Feet.	In.	O. S.	No. 1.	No. 2.	No. 3.	
Willow Grove street, northwest side, southwest house line of Ardmore, Montgomery Co.....			6	14			1			
Winona street, on dead end of 6-inch pipe, 403 feet southwest of southwest house line of Morris.....		22	6			1				
Wissahickon street, northeast side, 281 feet southeast of southeast house line of Queen.....		22	12	9			1			
Wissahickon street, southwest side, northwest house line of Coulter.....		22	6	8				1		
Wissahickon street, southwest side, 177 feet southeast of southeast house line of School.....		22	6	8			1			
Wissahickon street, northeast side, 8 feet northwest of northwest house line of Lincoln Drive.....		22	20	19			1			
Wissahickon street, southwest side, 382 feet northwest of northwest house line of Washington.....		22	20	11			1			
Wissahickon street, northeast side, southeast house line of Norton.....		22	6	16			1			
Wissahickon street, northeast side, 235 feet southeast of southeast house line of Franklin.....		22	6	17			1			
Wissahickon street, northeast side, 9 feet northwest of northwest house line of Philollena.....		22	20	16			1			
Wissahickon street, northeast side, 222 feet northwest of northwest house line of Carpenter.....		22	20	18			1			
Wissahickon street, northeast side, 320 feet northwest of northwest house line of Ellet.....		22	20	16			1			
Wissahickon street, northeast side, 150 feet southeast of southeast house line of Mount Airy.....		22	20	16			1			
Wissahickon street, southwest side, 49 feet 6 inches southeast of southeast house line of Rittenhouse.....		22	16	23			1			
Total.....				1,508	3	3	28	73	2	

FIRE HYDRANTS RENEWED.

FIRST DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CON- NECTION.		STYLE.							
			Old.	New.	Feet.	Inches.	TAKEN OUT.				PUT IN.			
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.
Carpenter street, north side, 9 feet east of east house line of Sixth.....		2	6		15		1							1
Carpenter street, north side, 6 feet east of east house line of Passunk avenue.....		2	6		15		1							1
Carpenter street, north side, 115 feet east of east house line of Eighteenth.....		30	6		15		1							1
Catharine street, south side, 32 feet east of Grays Ferry road.....		30	6		12		1							1
Christian street, north side, 8 feet west of west house line of Twenty-second.....		30	6		14	6	1							1
Eighteenth street, east side, 7 feet south of Christian.....		30	6		15		1							1
Eleventh street, east side, 25 feet south of South.....		14	10		16		1							1
Ellsworth street, north side, 239 feet east of east house line of Twenty-first.....		26	6		14	6	1							1
Evangelist street, south side, 95 feet east of east house line of Eighth.....		3	4		4	6	1						1	
Fitzwater street, north side, 152 feet east of east house line of Seventh.....		4	6		15		1						1	
Godfrey street, north side, 159 feet east of southeast house line of Moyamensing avenue		1	4		10		1							1
Grays Ferry road, west side, 43 feet north of north house line of Eagleson.....		30	6		17	6	1							1
Hallowell street, north side, 46 feet west of west house line of Sixth.....		2	6		5		1						1	
Hepburn street, east side, 81 feet south of south house line of Bainbridge.....		30		6	8		1						1	

Fire Hydrants Renewed—First District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.								
			Old.	New.	Feet.	In.	TAKEN OUT.				PUT IN.				
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.	
Marriott street, northwest corner of Fifth.....		2	6							1					1
Monroe street, south side, west house line of Third.....		4	6		14	6	1								1
Monroe street, south side, 2 feet east of east house line of Fourth.....		4	6		18	6	1								1
Monroe street, north side, 156 feet east of east house line of Fifth.....		4	6		13	6	1					1			
Nineteenth street, east side, 6 feet south of south house line of Washington avenue.....		26	12		15		1								1
Queen street, south side, east house line of Swanson.....		3	6		15		1								1
Saranac street, north side, 2 feet east of southeast house line of Moyamensing avenue..		1	4		6		1					1			
Scott street, north side, 131 feet east of Ninth.....		1	4		9		1					1			
Seventeenth street, west side, 14 feet south of south house line of Carpenter.....		30	6		15		1								1
Sixth street, west side, 212 feet north of north house line of Catharine.....		3	6		15		1								1
Sixteenth street, east side, south house line of Bainbridge.....		30	6		14	6	1								1
Snyder street, south side, 14 feet east of Sixth.....		1	6		8		1								1
Sutherland avenue, east side, 181 feet north of north house line of Bainbridge.....		30	6	6	16		1								1
Third street, east side, north house line of Monroe.....		4	6		14	6	1								1
Twelfth street, east side, 7 feet north of north house line of Mifflin.....		1	6		15		1								1

Fire Hydrants Renewed—First District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION.		STYLE.								
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.					
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.	
Twelfth street, west side, 133 feet south of Wharton.....		26	6		15			1							1
Twelfth and Wharton street, First District Yard.....		26	6		3						1				1
Twenty-first street, east side 18 feet south of south house line of Catharine.....		30	6		14	6	1								1
Washington avenue, north side, east house line of Lingo.....		30	6		6		1								1
Webster street, south side, 89 feet east of east house line of Eighteenth.....		30	4		8	6	1							1	
Webster street, north side, 10 feet east of east house line of Twentieth.....		30	4		8	6	1							1	
Wharton street, south side, 182 feet east of east house line of Seventh.....		1	6		14		1							1	
Totals.....					481		34			2			10		26

FIRE HYDRANTS RENEWED.

SECOND DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.												
			Old.	New.	Feet.	In.	TAKEN OUT					PUT IN							
							O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	O. S.	No. 1.	No. 2.	No. 3.	No. 4.		
Aspen street, south side, 31 feet east of east house line of Union.....		24	6		14	2	1												
Asylum street, north side, 130 feet west of west house line of Broad.....		7	3				1							1					
Barclay street, north side, 167 feet west of west house line of Sixth.....		5	3	6	11		1								1				
Baring street, south side, 150 feet west of west house line of Thirty-second.....		24	6		17	6	1										1		
Baring street, south side, 97 feet east of east house line of Thirty-sixth.....		24	4		4		1								1				
Black Horse alley, southwest corner of Front.....		6	6							1							1		
Broad street, east side, 3 feet south of south line of Cherry.....		10	20										1				1		
Chester avenue, north side, 274 feet west of west house line of Forty-second.....		27	6		23	6	1										1		
Chestnut street, north side, 10 feet east of east house line of Strawberry.....		6	10								1							1	
Chestnut street, north side, 176 feet west of west house line of Ninth.....		9	10		4	6	1								1				
Chestnut street, north side, 166 feet 6 inches east of east house line of Thirty-second.....		27	6		22	10	1											1	
Chestnut street, south side, 25 feet 3 inches west of west curb line of Fifty-second.....		27	8				1							1					
Delaware avenue, west side, 195 feet south of south house line of Arch.....		6	6		8		1										1		
Dock street, west side, 242 feet southeast of east house line of Second.....		5	6		9		1										1		

Fire Hydrants Renewed—Second District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.													
			Old.	New.	Feet.	Inches.	TAKEN OUT.					PUT IN.								
							O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	O. S.	No. 1.	No. 2.	No. 3.	No. 4.			
Filbert street, north side, 44 feet west of west house line of Twenty-second.....		10	6				1							1						
Filbert street, south side, 223 feet east of each house line of Thirty-seventh.....		24	6		14	4	1													1
Fifty-second st., S. E. side, 26 feet 6 inches N. W. of N. W. curb line of Baltimore ave.....		27	6		19	2	1													1
Fifty-second street, east side, 267 feet north of north house line of South.....		27	36		6		1													1
Fifty-second street, east side, 22 feet north of north curb line of Walnut.....		27	36											1						1
Fifty-second street, east side, 2 feet 6 inches south of south house line of Market.....		27	36											1						1
Fortieth street, west side, 145 feet south of south house line of Brown.....		24	6		21		1													1
Forty-fifth street, west side, 151 feet north of north house line of Wallace.....		34	6		14		1													1
Forty-fifth street, west side, 256 feet south of south house line of Fairmount avenue.....		34	6							1										1
Forty-fifth street, east side, 118 feet north of north house line of Fairmount avenue.....		34	6		14		1													1
Forty-first street, west side, 136 feet north of north house line of Baring.....		24	6		18		1													1
Forty-second street, east side, 126 feet north of north house line of Pine.....		27	6		23	6	1													1
Forty-sixth street, west side, 238 feet south of south house line of Westminster avenue..		34	6				1							1						
Forty-sixth street, west side, 238 feet south of south house line of Westminster avenue....		34	6				1							1						
Gray's Ferry road, northwest corner of Forty-eighth.....		27	6		16	10														1

Fire Hydrants Renewed—Second District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.												
			Old.	New.	Feet.	Inches.	TAKEN OUT.					PUT IN.							
							O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	O. S.	No. 1.	No. 2.	No. 3.	No. 4.		
Greenway avenue, northw't side, 3 feet northe't of northe't house line of Seventy-second		27	6							1						1			
Greenway avenue, northw't side, 3 feet northe't of northe't house line of Seventy-second		27	6								1					1			
Haverford street, south side, 29 feet west of west house line of Thirty-third		24	6					1							1				
Haverford street, north side, 9 feet east of east house line of Thirty-sixth		24	4	20	8	6	1										1		
Haverford street, south side, 147 feet east of east house line of Fifty-first street		24	6				1								1				
Irving street, north side, 100 feet east of east house line of Thirty-eighth		27	4		11		1								1				
Lancaster avenue, northeast side, 297 feet northwest of west house line of Forty-ninth		34	6									1							1
Letitia street, east side, 136 feet north of north house line of Chestnut		6	6		9		1										1		
Locust street, north side, west house line of Quince		8	6		14		1								1				
Market street, north side, 53 feet east of east house line of Thirtieth		24	12				1								1				
Market street, north side, 131 feet west of west house line of Thirtieth		24	12				1								1				
Market street, south side, 71 feet 6 inches east of east house line of Forty-first		27	10		21	4	1										1		
Minor street, south side, 179 feet east of east house line of Sixth		6	6							1							1		
Ogden street, north side, 6 feet east of east house line of Brooklyn		24	6				1								1				
Pine street, south side, 253 feet east of east house line of Fortieth		27	8		18		1								1				

Fire Hydrants Renewed—Second District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CON- NECTION.		STYLE.												
			Old.	New.	Feet.	In.	TAKEN OUT.					PUT IN.							
							O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	O. S.	No. 1.	No. 2.	No. 3.	No. 4.		
Powelton avenue, south side, 22 feet west of west house line of Thirty-first.....		24	6					1							1				
Powelton avenue, south side, 22 feet west of west house line of Thirty-first.....		24	6						1										1
Powelton avenue, south side, 138 feet east of east house line of Thirty-third.....		24	6		28			1							1				
Powelton avenue, north side, 85 feet east of east house line of Thirty-fourth.....		24	6		18			1											1
Race street, north side, 75 feet east of east house line of Second.....		6	6		8	6		1							1				
Race street, north side, 149 feet east of east house line of Franklin.....		6	6										1						1
Sansom street, north side, west house line of Albion.....		8	6		11			1											1
Sansom street, north side, 6 feet west of west house line of Twenty-second.....		8	6							1									1
Sansom street, north side, 47 feet east of east house line of Thirty-eighth.....		27	6					1							1				
Sixtieth street, northwest side, 4 feet northeast of northeast house line of South.....		27	8					1											1
Sixtieth street, northwest side, 26 feet southwest of southwest house line of Hazel.....		27	8		1	6		1											1
Sixtieth street, northwest side, 41 feet southwest of southwest house line of Lombard...		27	8					1											1
Sixtieth street, northwest side, 224 feet northeast of northeast house line of Lombard...		27	8					1											1
Springfield street, southeast side, 2 feet northeast of northeast house line of Forty-seventh		27	6							1									1
Third street, west side, 2 feet north of south house line of Cherry.....		6	6		14			1											1

Fire Hydrants Renewed—Second District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION.		STYLE.																
			Old.	New.	Feet.	In.	TAKEN OUT.					PUT IN.											
							O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	O. S.	No. 1.	No. 2.	No. 3.	No. 4.						
Thirtieth street, east side, south house line of Marston.....		27	6																				
Thirty-second street, west side, north house line of Spruce.....		27	4					1								1							
Thirty-seventh street, west side, 121 feet south of south house line of Baring.....		24	6		18			1															
Thirty-sixth street, northeast corner of Sansom.....		27	6							1													
Thirty-third street, east side, 252 feet north of north house line of Race.....		24	6		17			1															
Thirty-third street, east side, north house line of Powelton avenue.....		24	6		20			1															
Thompson street, south side, 77 feet west of west house line of Forty-ninth.....		34	6											1									
Twenty-fifth street, east side, south house line of Factory.....		7	3	6	14			1															
Twenty-fourth street, west side, 189 feet north of north house line of Spruce.....		8	6		14			1															
Twenty-fourth street, west side, north house line of Locust.....		8	6							1													
Twenty-fourth street, west side, 105 feet north of north house line of Walnut.....		8	6		14			1															
Union street, north side, 178 feet east of east house line of Second.....		5	4	6	13		8	1															
Union street, south side, 186 feet 6 inches east of east house line of Third.....		5	4	6	12		8	1															
Vine street, north side, 30 feet west of west house line of St. John.....		11	10		14		6	1															
t, north side, 202 feet east of east house line of Tenth.....		13	12		6		6	1															

Fire Hydrants Renewed—Second District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CON- NECTION.		STYLE.																	
			Old.	New.	Feet.	In.	TAKEN OUT.					PUT IN.												
							O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	O. S.	No. 1.	No. 2.	No. 3.	No. 4.							
Vine street, south side, 2 feet west of west house line of Perry.....		10	12		14		1																	
Vine street, south side, east house line of Twenty-fourth.....		10	6		8	9	1																	
Walnut street, southeast corner of Nineteenth.....		8	12		11	6				1														1
Walnut street, south side, 9 feet 6 inches east of east house line of Thirty-ninth.....		27	10		21	10	1																	1
Walnut street, north side, 298 feet west of west house line of Thirty-ninth.....		27	10		23		1																	1
Walnut street, south side, 66 feet 8 inches west of west house line of St. Mark's square.....		27	8		28	3	1																	1
Walnut street, south side, 228 feet east of east house line of Forty-third.....		27	6							1														1
Water street, west side, 248 feet north of north house line of Walnut.....		5	6		5		1																	1
Water street, west side, 2 feet south of south house line of Chestnut.....		5	6		4		1																	1
Water street, west side, 2 feet south of south house line of Arch.....		6	6		4	6	1																	1
Water street, west side 298 feet south of south house line of Race.....		6	6		4	6	1																	1
Water street, west side, 14 feet south of south house line of Race.....		6	6		4	6	1																	1
Woodland avenue, north side, 89 feet west of west house line of Thirty-eighth.....		27	8		28		1																	1
Woodland avenue, north side, 89 feet west of west house line of Thirty-eighth.....		27	8							1														1
Totals.....					722		66	1	9	6	1	5	12	23	47	5	1							

FIRE HYDRANTS RENEWED.

THIRD DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.							
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.				
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.
Ash street, southwest side, 61 feet 8 inches northwest of northwest house line of Wildey		18	4	6	14	9	1					1		
Beaver street, north side, 95 feet west of west house line of Charlotta.....		16	4	6	9		1							1
Blair street, east side, 193 feet north of north house line of Norris.....		31	4				1						1	
Cadwalader street, west side, 190 feet south of south house line of Thompson.....		17	4		14	6	1						1	
Cemetery avenue, north side, east house line of Malvern.....		25	6					1						1
Delaware avenue, west side, 240 feet north of north house line of Poplar.....		16	4		24		1						1	
Diamond street, northeast corner of American.....		19	6						1					1
Fourth street, west side, 18 feet north of north house line of Poplar.....		16	6		6	8	1							1
Frankford avenue, northwest side, 6 feet northeast of northeast house line of Adams.....		23	12		25	9	1							1
Frankford avenue, southeast side, northeast house line of Green.....		23	{ 4 6		25	3	1							1
Frankford ave., southeast side, 226 feet 8 inches southwest of southwest house line of Ruan		23	{ 4 6		18	6	1							1
Frankford avenue, southeast side, 302 feet northeast of northeast house line of Unity.....		23	4		11	1	1						1	
Frankford avenue, southeast side, 114 feet northeast of northeast house line of Orthodox		23	4		11	2	1							1
Frankford avenue, northwest side, northeast house line of Allen.....		23	12		11	3	1							1

Fire Hydrants Renewed—Third District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION.		STYLE.								
			Old.	New.	Feet.	In.	TAKEN OUT.				PUT IN.				
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.	
Front street, east side, opposite north house line of Ellen.....		16	6							1					1
Frankford Pumping Station, west side, 33 feet west of west front of engine house.....		35			39			1							1
Girard avenue, southeast side, northwest house line of Montgomery avenue.....		18	6							1					1
Hope street, east side, 74 feet 9 inches north of north house line of Oxford.....		17	4		8	7	1							1	
Jasper street, northeast side, northwest house line of Sterner.....		25	6					1							1
Judd street, northeast side, southeast house line of Thompson.....		18	6						1						1
Kensington avenue, northwest side, opposite Hilton.....		33	6		11	6	1								1
Lawrence street, west side, 110 feet north of north house line of Thompson.....		17	6		11	6	1							1	
Lee street, east side, south house line of Tioga.....		25	6							1					2
Lettery street, N. E. side, 71 feet 6 inches S. E. of S. E. house line of Kensington ave....		31	6		10	6	1							1	
Manor street, east side, 95 feet 9 inches south of south house line of Berks.....		19	6		13	4	1								1
Marlborough street, S. W. side, 145 feet southeast of southeast house line of Girard ave..		18	6		14		1							1	
Mascher street, east side, 81 feet south of south house line of Altmeler.....		19	6							1				1	
Melvale street, northwest side, 36 feet southwest of southwest house line of Linden.....		25	6		14	8	1							1	.....
Montgomery ave., S. E. side, 172 feet northwest of northwest house line of Memphis.....		18	6		14	6	1							1	

Fire Hydrants Renewed—Third District.—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH. CONNECTION.		STYLE.								
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.					
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.	
Norris street, south side, east house line of Lawrence.....		19	6						1						1
Orchard street, northwest side, 293 feet northeast of northeast house line of Church....		23	6		12	6	1							1	
Paul street, west side, 121 feet south of southeast house line of Meadow.....		23	6		6	10	1							1	
Penn street, southeast side, southwest house line of Ruan.....		23	6		6	6				1					1
Poplar street, southwest corner of Fifth.....		16	16						1						1
Randolph street, east side, 115 feet 10 inches south of south house line of Columbia ave..		19	6						1						1
Richmond street, northwest side, 115 feet southeast of south house line of Plum.....		18	6		14		1							1	
Second street, west side, 18 feet north of north house line of Noble.....		11	6		18	9	1								1
Second street, west side, opposite Putnam.....		17	6		3	8	1							1	
Second street, east side, 192 feet north of north house line of Norris.....		19	6		18		1								1
Silver street, north side, west house line of Helen.....		33	6					1							1
Somerset street, north side, west house line of Emerald.....		25	6							1					1
Somerset street, north side, east house line of Jasper.....		25	6							1					1
Sterner street, northeast side, west house line of Helen.....		33	6					1							1
St. John street, west side, 5 feet 6 inches north of north house line of Willow.....		11	6		13	3	1							1	

Fire Hydrants Renewed—Third District.—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION.		STYLE.							
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.				
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.
St. John street, east side, 7 feet 4 inches south of south house line of Noble.....		11	6		12	8	1					1		
St. John street, east side, 6 feet south of south house line of Canal.....		16	6		18		1							1
Thompson street, northwest side, opposite Emory.....		18	6		8	6	1					1		
Tioga street, north side, east house line of Howard.....		25	6							1				1
Tioga street, north side, east house line of Mascher.....		25	6							1				1
Wood street, north side, west house line of Crown.....		12	6		16		1							1
York avenue, east side, south house line of Callowhill.....		12	6		18	10	1							1
York avenue, northeast side, southeast house line of Thompson.....		31	6		8	2	1							1
York street, northeast side, southeast house line of Memphis.....		31	6		5	3	1				1			
York street, northeast side, southeast house line of Memphis.....		31	6		8	7	1							1
Totals.....					479		86	6	5	7	1	19	34	

FIRE HYDRANTS RENEWED.

FOURTH DISTRICT.

1715

			SIZE OF MAIN.		6-INCH CONNECTION		STYLE.							
			Ward.	Old.	New.	Feet.	In.	TAKEN OUT.				PUT IN.		
								O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.
Brandywine street, south side, 86 feet west of west house line of Twentieth.....	15	6	.....	11	6	1	.....	.....	.....	.....	.....	1	.....	.....
Broad street, west side, 8 feet 3 inches north of north house line of Glenwood.....	28	6	.....	10	9	.....	.....	1	.....	.....	.....	.....	1	.....
Callowhill street, north side, 8 feet 6 inches west of west house line of Canton.....	14	10	.....	15	7	1	.....	.....	.....	.....	.....	1	.....	.....
Callowhill street, south side, 53 feet 2 inches west of west house line of Sixteenth.....	15	10	.....	19	6	1	.....	.....	.....	.....	.....	1	.....	.....
Callowhill street, north side, 195 feet west of west house line of Sixteenth	15	10	.....	22	10	1	.....	.....	.....	.....	.....	1	.....	.....
Eighteenth st., west side, 17 feet 9 inches south of south house line of Pennsylvania ave.	15	6	.....	14	5	1	.....	.....	.....	.....	.....	.....	1	.....
Eleventh street, west side, 21 feet south of south house line of Susquehanna avenue.....	28	6	.....	14	8	1	.....	.....	.....	.....	.....	.....	1	.....
Fairmount avenue, southeast corner of Twenty-first.....	15	6	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Gilbert street, south side, 173 feet east of east house line of Tenth.....	13	4	.....	8	6	1	.....	.....	.....	.....	.....	1	.....	.....
Jefferson street, southwest corner of Seventeenth.....	29	6	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Montgomery avenue, south side, 10 feet east of east house line of Thirteenth.....	20	6	.....	14	4	1	.....	.....	.....	.....	.....	.....	.....	1
Montgomery avenue, north side, east house line of Broad.....	32	8	.....	15	6	1	.....	.....	.....	.....	.....	.....	.....	1
North College avenue, south side, 208 feet east of east house line of West College avenue.	29	6	.....	14	2	1	.....	.....	.....	.....	.....	.....	.....	1
Noble street, south side, 200 feet east of east house line of Thirteenth.....	14	6	.....	5	2	1	.....	.....	.....	.....	.....	1	.....	.....

Fire Hydrants Renewed—Fourth District.—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CON- NECTION.		STYLE.										
			Old.	New.	Feet.	In.	TAKEN OUT.				PUT IN.						
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.			
Oxford street, northeast corner of Bailey.....		29	6							1				1			
Pennsylvania avenue, northeast side, 13 feet southeast of southeast house line of Gold...		15	4					1					1				
Sixteenth street, east side, 8 feet 6 inches south of south house line of Pennsylvania ave.		15	6					1						1			
Spring Garden street, north side, 65 feet east of east house line of Eleventh.....		14	6		11			1									1
Spring Garden street, north side, 152 feet 9 inches west of west house line of Eleventh....		14	6		11	6		1									1
Stanley street, east side, 18 feet 6 inches north of northeast house line of Ridge avenue.		28	6						1					1			
Twelfth street, west side, 4 feet 7 inches north of north house line of Hamilton.....		14	6		14	10		1									1
Twelfth street, west side, 4 feet 7 inches north of north house line of Hamilton.....		29	6		16	6		1									1
Twenty-eighth street, west side, 25 feet south of south house line of Montgomery ave....		29	6		3	6		1									1
Twenty-fifth street, southeast corner of Sharswood.....		29	6							1							1
Twenty-ninth street, northwest corner of Thompson.....		28	6						1								1
Twenty-second street, east side, south house line of Huntington.....		28	6														
Totals.....					219	3		18	2	1	4	1	8	15			1

FIRE HYDRANTS RENEWED.

FIFTH DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION.		STYLE.										
			Old.	New.	Feet.	In.	TAKEN OUT.				PUT IN.						
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.			
Apple street, northeast side, 134 feet southeast of southeast house line of Penn.....		21	4				1					1					
Gay street, southeast side, 45 feet northeast of northeast house line of Baker.....		21	6				1					1					
Green Lane, northwest side, 2 feet northeast of northeast house line of Hamilton.....		21	6		4		1									1	
Green Lane, southeast side, 10 feet northeast of northeast house line of Manayunk ave..		21	6				1					1					
Jefferson street, southeast side, 1 foot northeast of southwest house line of Fowler.....		21	6				1					1					
Levering street, southwest house line of Wood.....		21	6		14	6	1									1	
Leverington st., northwest side, 200 feet northeast of northeast house line of Ridge ave..		21	6				1					1					
Lycum avenue, southeast side, 12 feet northeast of northeast house line of Tower.....		21	6				1					1					
Main street, northeast side, 61 feet northwest of northwest house line of Levering.....		21	6				1					1					
Ridge avenue, northeast side, 16 feet southeast of southeast house line of Gerhart.....		21	6				1									1	
Ridge avenue, northeast side, 316 feet southeast of southeast house line of Queen Lane..		28	6		7		1									1	
Ridge avenue, southwest side, 192 feet northwest of northwest house line of Ferry.....		28	12							1						1	
Ridge avenue, northeast side, 9 feet north west of northwest house line of Scotts lane....		28	6		6		1									1	
Ridge avenue, northeast side, 12 feet southeast of southeast house line of James.....		28	6		6		1									1	

Fire Hydrants—Fifth District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION.		STYLE.								
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.					
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.	
Ridge ave., northeast side, 2 feet southeast of southeast house line of Roxborough ave...		21	6	.....	10	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Ridge avenue, northeast side, 12 feet southeast of southeast house line of James.....		28	6	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Ridge avenue, northeast side, 32 feet northwest of northwest house line of Hermit.....		21	6	.....	15	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Spencer street, north west side, 184 feet southwest of southwest house line of Cresson.....		28	6	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....
Wood street, northwest corner of Mulberry.....		21	6	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1
Total.....					62	6	15	1	3	.....	7	1	11		

FIRE HYDRANTS RENEWED.

SIXTH DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.							
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.				
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.
Ashmead street, southe't side, 35 feet southw't of Germantown branch of Reading R. R.		23	6	.....	11	.....	1	.....	.....	.....	.....	1	.....	.....
Bringhurst street, southeast side, 187 feet northeast of northeast house line of Mercer...		22	6	...	9	.....	1	.....	.....	.....	.....	1	.....	.....
Cheltenham avenue, southe't side, 3 feet 6 inches southw't of southw't house line of Morris...		22	6	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....
Eighteenth street, northeast side, 10 feet northwest of northwest house line of Dorrett...		33	6	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....
Germantown avenue, southwest side, southeast house line of Cheltenham avenue.....		22	6	.....	5	6	1	.....	.....	.....	.....	.....	1	.....
Germantown avenue, southwest side southeast house line of Cheltenham avenue.....		22	6	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....
Germantown avenue, southwest side, southeast house line of Cheltenham avenue.....		22	6	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....
Hancock street, northeast side, southeast house line of Walnut lane.....		22	6	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....
Johnson street, southe't side, 14 feet 4 inches southw't of southw't house line of Jefferson		22	10	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....
McAllum street, northeast side, 437 feet southeast of southeast house line of Allen's lane		22	16	.....	9	.....	1	.....	.....	.....	.....	1	.....	.....
Mount Airy street, northwest side, 242 feet southwest of southwest house line of Boyer...		22	6	.....	8	6	1	.....	.....	.....	.....	1	.....	.....
Mount Airy street, northwest side, northeast house line of Devon.....		22	6	.....	7	6	1	.....	.....	.....	.....	1	.....	.....
Mount Pleasant street, southe't side, 500 feet northe't of northe't house line of Cresheim		22	6	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....
Mount Pleasant street, northe't side, 39 feet southw't of southw't house line of Cresheim		22	6	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....

Fire Hydrants Renewed—Sixth District—Continued.

Street.	Location.	Ward.	SIZE OF MAIN.		6-INCH CONNECTION		STYLE.										
			Old.	New.	Feet.	In.	TAKEN OUT.			PUT IN.							
							O. S.	No. 1.	No. 2.	No. 3.	O. S.	No. 1.	No. 2.	No. 3.			
Mount Pleasant street, northw't side, 68 feet southw't of southw't house line of Mower...		22	6					1						1			
Ninth street, west side, 301 feet north of northwest house line of Ontario.....		22	6					1					1				
Rittenhouse street, southeast side, 24 feet northeast of Wissahickon.....		22	6							1							1
Tioga street, north side, 180 feet east of east house line of Nineteenth.....		28	6		12			1							1		
Tioga street, north side, 1026 feet east of east house line of Eighth.....		33	6		15			1							1		
Upsal street, northwest side, southwest house line of Emlen.....		22	6							1							1
Walnut lane, southeast side, southwest house line of Adams.....		22	6							1							1
Wister street, northwest side, 161 feet northeast of northeast house line of Olney road....		22	6		14			1							1		
Totals					91	6	14	7	1	2	11	9					

Recapitulation of Fire Hydrants Set, Renewed, and Removed.

DISTRICTS.		STYLE.					Total.
		Old Style.	No. 1. 1 Way.	No. 2. 2 Way.	No. 3. 3 Way.	No. 4.	
Set.	First		31	66			97
	Second		15	87			102
	Third	2	35	129	9		175
	Fourth		26	105			131
	Fifth		2	17	1		20
	Sixth	3	28	73	2		106
	Total	5	137	477	12		681
Renewed.	First		10	26			36
	Second	12	23	47	5	1	88
	Third	1	19	34			54
	Fourth	1	8	16	1		25
	Fifth	7	1	11			19
	Sixth	2	11	9			22
	Total	23	72	142	6	1	244
Total new hydrants							875
Removed.	First	57	1		1		59
	Second	42	1	7	3		53
	Third	69	1	1	1		72
	Fourth	43		4	4		51
	Fifth	3		1			4
	Sixth	28	2	1	5		36
	Total	242	5	14	14		275
Total added during 1891							356

Fire Hydrants by Purveyor's Districts.

DISTRICTS.	STYLE.						Totals.
	Old.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	
First.....	582	206	447	203			1,488
Second.....	950	210	490	186	1	26	1,863
Third.....	975	227	564	200	2		1,968
Fourth.....	568	163	545	229	1	4	1,510
Fifth.....	220	23	114	12			369
Sixth.....	401	208	248	105			957
Totals.....	3,696	1,032	2,408	935	4	30	3,105



Fire Hydrants by Wards.

WARDS.	STYLE.					Total.	
	O. S.	No. 1.	No. 2.	No. 3.	No. 4.		No. 5.
First.....	196	60	83	44			383
Second.....	72	26	59	29			186
Third.....	47	14	28	11			100
Fourth.....	36	12	21	24			93
Fifth.....	76	25	32	31		8	167
Sixth.....	38	13	40	34	1	4	130
Seventh.....	86	12	55	15		1	169
Eighth.....	72	25	62	18		3	180
Ninth.....	48	27	56	21		3	155
Tenth.....	56	25	38	13		7	139
Eleventh.....	41	11	29	2		1	84
Twelfth.....	58	4	15	10			87
Thirteenth.....	63	11	37	16			127
Fourteenth.....	49	10	35	18			112
Fifteenth.....	106	43	97	66	1	2	315
Sixteenth.....	40	13	34	8	1		96
Seventeenth.....	49	20	21	9			99
Eighteenth.....	113	21	42	20			196
Nineteenth.....	159	35	101	37			332
Twentieth.....	122	18	78	27			245
Twenty-first.....	196	19	99	9			323
Twenty-second.....	326	169	181	30			766
Twenty-third.....	158	23	63	20			259
Twenty-fourth.....	236	32	90	16		1	375
Twenty-fifth.....	177	43	102	15			337
Twenty-sixth.....	145	65	143	69			422
Twenty-seventh.....	218	35	98	20		1	367
Twenty-eighth.....	138	53	209	63			463
Twenty-ninth.....	119	33	104	44		1	301
Thirtieth.....	72	27	82	24			205
Thirty-first.....	89	25	53	23			195
Thirty-second.....	55	15	52	25		1	148
Thirty-third.....	111	50	120	59	1		341
Thirty-fourth.....	134	18	53	10		2	217
Thirty-fifth.....			1				1
Totals.....	3,696	1,032	2,408	935	4	30	8,105

Statement of the number of Fire Hydrants by Districts and Wards during 1891, and total previous thereto.

	FIRST DISTRICT.					SECOND DISTRICT.									THIRD DISTRICT.									FOURTH DISTRICT.					FIFTH DIST.			SIXTH DIST.																																				
	Wards.					Total.	Wards.									Total.	Wards.									Total.	Wards.		Total.	Wards.		Total.																																				
	1	2	3	4	5		6	7	8	9	10	11	12	13	14		24	27	34	11	12	16	17	18	19		20	23		25	31		33	35	13	14	15	20	28	29	32	21	28	22	28	33																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	24	27	34	11	12	16	17	18	19	20	23	25	31	33	35	13	14	15	20	28	29	32	21	28	22	28	33																											
Prior to 1891.....									
During 1891.....	27	6	7	4	35	18	97	1	13	12	10	1	2	1	22	30	10	102	13	3	9	8	14	25	37	15	50	1	175	4	6	21	10	50	26	14	131	16	4	20	79	21	6	106	681																				
Total.....
Taken out in 1891.....	59	53	72	51	4	86	275											
Total in city.....	1,409	1,894	1,968	1,508	869	967	8,105											

Number of attachments for fire purposes previously reported..... 395
 Made during 1891 {

Second District.....	3
Third District.....	1
Fourth District.....	1
Sixth District.....	1

*Attachments, etc., made by the Purveyors, in accordance with permits issued by the Bureau of Water.
Arranged by months.*

MONTHS.	NEW ATTACHMENTS.						SHUT OFF BY PERMIT.						WORK DONE WITHOUT PERMIT.						
	SIZE.						Reamed for Larger Attachment.	Re-driven.	Discontinued.	Transfer.	REPAIRS.		Total.	DRAWN.					Drawn and Re-driven.
	½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	Total.					Not Drawn.	Drawn and Re-driven.		Discontinued and Abandoned.	Duplicate.	Delinquent.	Leak.	Total.	
January.....	205	8	2	2		212	3	15			13	31	7		21	28	1		
February.....	216	1		1	2	220		12	1	2	3	18	4		12	16	1		
March.....	397	18	11	4	2	435	6	24	18		20	68	5		35	40	3		
April.....	730	12	16	16		775	12	40	9	5	31	97	13	2	17	32	150		
May.....	867	19	14	11		913	16	10	3	3	34	71	14		30	44	194		
June.....	618	29	11	23	2	685	82	25	29		2	35	123	16	11	22	55		
July.....	664	21	18	28		733	7	87	14		41	149	16	14	22	52	126		
August.....	888	38	11	22	1	913	11	31	17	1	2	80	92	3	36	39	18		
September.....	845	28	10	17	1	914	18	15	24	1	35	98	21	1	27	49	35		
October.....	861	29	12	9	4	922	12	15	50	5	1	28	111	80	24	74	82		
November.....	918	24	18	12	2	982	17	30	20	5	25	97	19	38	34	91	24		
December.....	448	11	7	7	1	474	9	21	20	1	16	67	14	10	20	44	24		
Total.....	7,607	243	180	152	13	8,178	148	325	210	21	7	311	1,017	182	1	75	300	558	668

*Attachments, etc., made by the Purveyors, in accordance with permits issued by the
Bureau of Water. Arranged by Districts.*

DISTRICTS.	NEW ATTACHMENTS.						SHUT OFF BY PERMIT.						WORK DONE WITHOUT PERMITS.							
	SIZE.						Reamed for larger Attachments.	Re-drive.	Discontinued.	Transfer.	REPAIRS.		Totals.	DRAWN.						
	½-inch.	¾-inch.	1-inch.	1 ¼-inch.	1 ½-inch.	2-inch.					Totals.	Not drawn.		Drawn and Re-driven.	Discontinued and Abandoned.	Duplicate.	Delinquent.	Leak.	Totals.	Drawn and Re-driven.
First.....	1,400	27	22	7	3	6	1,465	.....	49	86	6	.....	40	131	9	.....	3	66	78	119
Second.....	1,174	98	33	42	8	6	1,361	69	35	92	5	.....	49	250	18	.....	34	47	99	318
Third.....	1,991	34	31	63	.....	10	2,129	.....	145	10	4	.....	86	245	147	.....	12	75	234	.....
Fourth.....	2,150	58	31	25	1	9	2,274	71	74	64	1	6	112	328	8	1	25	87	121	159
Fifth.....	258	1	.....	3	.....	1	258	.....	7	.....	4	1	12	24	.....	.....	1	2	3	18
Sixth.....	689	25	13	12	1	1	691	3	15	8	1	.....	12	39	.....	.....	.....	23	23	49
Total.....	7,607	243	130	152	13	33	8,178	143	325	210	21	7	311	1,017	182	1	75	300	558	663

Account of New Stops for 1891.

DISTRICTS.	BUREAU OF WATER.		VINEY.			Total.
	2-Way.	Butterfly.	2-Way.	3-Way.	4-Way.		5-Way.
First	207	2		3		212
Second	167	5		3		175
Third	258			47		305
Fourth	217	6		2	1	228
Fifth	39			5		44
Sixth	163	2		9		174
Total	1,051	15		69	1	1,186

Repairs to Mains, Stops, and Fire Hydrants; also, Stops and Fire Hydrants Removed during 1891.

DISTRICTS.	Repairs to Mains.	STOPS.			FIRE HYDRANTS.		
		Repaired.	Renewed.	Removed.	Repaired.	Renewed.	Removed.
First	77	176	61	6	315	36	59
Second	146	263	57	6	197	88	58
Third	173	668	24	5	413	54	72
Fourth	228	386	10	5	1,159	25	51
Fifth	17	42	3		31	19	4
Sixth	74	34	18	1	22	22	36
Total	715	1,569	173	23	2,137	244	275

Number of Complaints and Examinations during 1890 and 1891.

Months.	Hydrants.		Service Pipes.		Wash Pavcs.		Spigots.		Water-Closets.		Horse Troughs.		No. Leaks.		Total.		
	1890.	1891.	1890.	1891.	1890.	1891.	1890.	1891.	1890.	1891.	1890.	1891.	1890.	1891.	1890.	1891.	
January.....	94	244	52	103	1	5	1	9	2	2	3	6	15	62	168	431	
February.....	90	109	47	61	.....	5	2	3	1	4	4	2	16	33	160	217	
March.....	90	126	58	64	.....	9	3	1	.....	4	3	3	84	48	188	255	
April.....	72	126	47	53	.....	3	5	1	5	.....	4	2	.....	30	52	155	245
May.....	106	116	70	67	.....	2	6	1	3	2	2	7	.....	69	49	257	243
June.....	96	82	67	71	.....	5	.....	.....	2	4	.....	13	.....	58	40	243	195
July.....	124	119	81	43	.....	3	5	2	.....	.....	2	.....	3	74	36	284	208
August.....	102	115	77	64	.....	3	5	2	.....	.....	1	3	.....	56	39	243	224
September.....	118	160	86	62	.....	6	3	3	.....	1	5	3	1	57	33	274	264
October.....	111	151	76	83	.....	2	6	3	.....	1	.....	8	.....	66	44	267	284
November.....	89	129	104	86	.....	10	3	5	.....	3	1	3	.....	47	33	261	252
December.....	163	174	107	65	.....	5	4	3	.....	3	.....	1	.....	52	29	335	272
Totals.....	1,255	1,651	872	822	41	56	26	23	17	25	50	15	574	498	2,335	3,090	

Number of Valves raised in the several Districts during the year 1891; Also, in each year since 1873.

DISTRICT.	6-inch Barton.	8-inch Barton.	6-inch Viney.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	36-inch.	Total.
Second				6	3	6			1		1			17
Third	1				4	14								19
Fourth.....	1	2	1		3	17		3				2		29
Totals for 1891	2	2	1	6	10	37		3	1		1	2		65
" 1890	8	3		3	23	68		7	1	1				114
" 1889	15		2	4	23	73		4	1	1		1		124
" 1888	6			8	26	74		10	1	2		1		123
" 1887	11			11	16	61		10	3	4	2	1	1	120
" 1886	12			13	18	57	1	3				1		105
" 1885				11	24	97	1	9		2		1		145
" 1884				7	13	71	1	4	2	1	3	6	1	109
" 1883				4	27	88		8		1		1	1	130
" 1882		1		14	25	58	1	5	1			1		106
" 1881				15	44	90		5	7					161
" 1880				7	23	47		8	1			1		87
" 1879				9	16	60	1	3	2			1	1	93
" 1878				27	22	100		3	1		1	1		155
" 1877				12	6	50		1			1			70
" 1876				3	17	49		3			1			73
" 1875				17	55	120	4	12	2	4	1	2		217
" 1874				13	32	111	6	6	3	3				174
Totals for 18 years.	54	6	3	184	420	1,311	15	104	26	19	10	20	4	2,176

Tabular Statement of Work Connected with the Distribution for the Twelve Years, 1880 to 1891, inclusive.

Years	PIPE.										Additional stops.	Additional fire hydrants.	Fire hydrants in use.	Meters in use.	SERVICE ATTACHMENTS.							
	Extensions.		Repairs and relays.		Total pipe handled.		Total amount in use.		Total amount handled.						½ in.	¾ in.	1 in.	1½ in.	2 in.	Total.		
	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.												
1880...	23,085	844,946	9,557	262,826	32,642	1,107,772	3,927,623	192,816,906	4,161,768	200,136,708	138	70	5,358	34	2,687	118	49	89	.....	.....	2,918
1881...	56,616	2,832,623	3,832	199,649	60,448	3,032,272	3,981,239	195,649,529	4,225,216	203,168,980	249	144	5,502	42	3,166	137	59	121	.....	.....	3,483
1882...	56,860	5,396,165	7,740	484,092	64,600	5,880,257	4,081,180	202,202,522	4,289,816	209,019,237	312	120	5,622	45	3,169	110	76	129	.....	.....	3,481
1883...	63,215	3,048,645	12,605	675,420	75,880	3,724,065	4,141,895	205,251,167	4,365,696	212,778,301	281	130	5,752	63	4,576	97	71	133	.....	.....	4,877
1884...	84,451	7,155,385	18,079	1,380,271	102,530	8,535,656	4,228,846	212,406,552	4,468,226	221,308,957	324	147	5,887	560	5,529	185	84	140	.....	7	5,945
1885...	137,967	12,234,074	93,783	3,265,537	231,850	15,499,611	4,366,813	224,640,526	4,700,076	236,808,568	539	307	6,195	305	6,734	254	121	160	.....	16	7,285
1886...	136,831	18,238,457	121,210	4,883,826	258,011	23,122,283	4,503,644	242,879,083	4,958,117	259,930,851	736	295	6,490	284	7,482	258	104	133	.....	32	8,009
1887...	122,790	14,780,082	34,098	1,329,008	156,888	16,109,165	4,626,434	257,659,165	5,115,005	276,040,016	546	429	6,715	253	7,892	317	124	143	2	54	8,532	
1888...	133,582	6,356,379	45,943	1,486,631	179,495	7,843,010	4,759,986	264,015,544	5,294,500	283,883,026	772	214	6,929	267	8,260	193	139	118	23	55	8,788	
1889...	147,171	12,270,311	57,836	2,410,677	205,007	14,680,988	4,907,157	276,285,855	5,499,507	298,514,014	601	247	7,433	304	8,950	263	149	119	17	46	9,544	
1890...	159,176	14,164,305	70,546	3,058,294	229,722	17,222,599	5,066,333	290,450,160	5,729,229	315,736,613	840	316	7,749	552	9,248	426	167	164	30	46	10,081	
1891...	221,336	21,493,086	64,491	2,051,782	285,827	23,544,868	5,287,669	311,943,246	6,015,056	339,281,481	1,136	356	8,105	697	7,607	243	130	152	13	33	8,178	

New Meters Set.

1895 Ward.	Occupant.	Location.	Date when Set.	Name of Meter.	Size.								Remarks.
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.		Total.
1	Elkinton, Joseph & Thos..	N. E. cor. Ninth and Mifflin st.	Dec. 22.....	Gem							1	1	4-in. meter on fire attach't.
1	Elkinton, Joseph & Thos..	N. E. cor. Ninth and Mifflin st.	Dec. 22.....	Crown					1			1	4-in. meter on fire attach't.
2	Campbell, Elliott & Co.....	1031 S. Twelfth street.....	May 23.....	Gem							1	1	
2	Hebrew Educational Soc..	S.W. cor. Tenth and Carpenter	Oct. 6.....	Gem					1			1	
3	Welde & Thomas.....	Juniper and Fitzwater streets..	April 5.....	Gem				3				3	
3	Welde & Thomas.....	Juniper and Fitzwater streets..	April 5.....	Crown			1					1	
5	Electro-Dynamic Co.....	212-24 Carter's alley.....	Feb. 6.....	Crown			1					1	
5	Miller, Geo. & Son.....	255-57 S. Third street.....	April 26.....	Gem				1				1	
5	Miller, Geo. & Son.....	255-57 S. Third street.....	April 26.....	Crown	1							1	
6	West Jersey Ferry Co.....	E.S. Delaware ave., S. Market st	Feb. 23.....	Gem				1				1	
8	Bureau of Water.....	Juniper, S. of Walnut street....	Oct. 7.....	Gem							1	1	
9	Bureau of Water.....	1321 Filbert street.....	Nov. 23.....	Crown ..	2							2	
9	Hall, E. L.....	N. W. cor. 23d and Filbert sts..	Dec. 21.....	Crown ..			1					1	
10	Nixon Paper Mills.....	Twenty-fourth and Vine sts....	Aug. 27.....	Gem							1	1	On fire attachment.
11	Cold Storage Co.....	509-13 N. Front street.....	Mar. 7.....	Crown ..			1					1	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when Set.	Name of Meter.	Size.								Remarks.	
					$\frac{1}{2}$ -inch.	$\frac{3}{4}$ -inch.	1-inch.	$1\frac{1}{2}$ -inch.	2-inch.	3-inch.	4-inch.	6-inch.		Total.
11	Cold Storage Co.....	509-13 N. Front street.....	Mar. 6.....	Gem						1			1	
11	Felton, W. S. & Co.....	431-35 St. John street.....	Jan. 10.....	Crown			1						1	
11	Frey, William.....	205 Willow street.....	Sept. 9.....	Crown		1							1	
11	Haggerty, F.....	431-35 N. Third street.....	Sept. 9.....	Crown.....			1		1				2	
11	Hawkins, Wm. & Co	206 Willow street.....	Nov. 10.....	Crown			1						1	
11	Peirson & Mitchell	W. s. New Market N. of Noble..	Aug. 26.....	Crown					1				1	
11	Patterson, J. W. & Co.....	131-35 Margareta street.....	Sept. 12.....	Gem						1			1	
11	Wright & Co	N. E. Second & Willow sts.....	Sept. 9.....	Crown.....				1					1	
12	Evans, John E. Son & Co.	S. E. cor. York ave. & Willow...	Sept. 11.....	Crown.....				1					1	
12	O'Callaghan, B. F.....	458-64 N. Third street	Sept. 11.....	Crown		1	1						2	
12	Peirson, John W.....	426 N. Third street.....	Nov. 9	Gem.....					1				1	
12	Peirson, John W.....	426 N. Third street.....	Nov. 9	Crown			1						1	
12	Stern, Jacob & Son.....	428 N. Third street.....	Nov. 9	Gem					1				1	
12	Stern, Jacob & Son.....	428 N. Third street	Nov. 9	Crown			1						1	
12	Tufts, Rudolph & Co.....	459-61 Dillwyn street.....	Sept. 11.....	Crown			1						1	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when Set.	Name of Meter.	Size.								Remarks.	
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.		Total.
13	Hance Bro. & White.....	N. W. cor. Marsh'll & Callowh'l	Nov. 24.....	Crown.....			1						1	
14	Windrim, J. H., Dir. P.W.	817 N. Broad street.....	Oct. 10.....	Nash.....		1							1	
15	Bement, Miles & Co.....	Twenty-fourth and Wood sts...	Aug. 28.....	Gem.....								1	1	On fire attachment.
15	Bement, Miles & Co.....	N. E. cor. 21st & Callowhill sts..	Sept. 2.....	Gem.....								1	1	On fire attachment.
15	Fleisher & Bro.....	Biddle st. E. of Twenty-fifth st	Aug. 27.....	Gem.....								1	1	On fire attachment.
15	Godshalk, The E. H. Co.	S. W. cor. 23d & Hamilton.....	Sept. 4.....	Gem.....							2		2	On fire attachment.
15	Godshalk, The E. H. Co.	S. W. cor. 23d & Hamilton sts...	Sept. 13.....	Gem.....								1	1	On fire attachment.
15	Kohnle, Joseph.....	1715-23 Buttonwood street.....	Sept. 1.....	Gem.....								1	1	On fire attachment.
15	Phila. & Reading R. R. Co.	S. E. cor. 16th & Penna. ave....	Aug. 17.....	Gem.....								1	1	On fire attachment.
15	Whitney, A. & Son.....	N. S. Callowhill, 16th to 17th sts.	Dec. 13.....	Crown ..			1						1	
15	Whitney, A. & Son.....	N. S. Callowhill, 16th to 17th sts.	Dec. 13.....	Gem.....							1		1	
16	Dotger, Henry C.....	1033 Canal street.....	Nov. 27.....	Crown.....			1						1	
16	Duncan & McElwee.....	1031 Canal street.....	Oct. 27.....	Crown.....			1						1	
16	Dungan, Hood & Co.....	5-11 Canal street.....	Oct. 9.....	Gem.....				1					1	
16	Holmes, Henry.....	52-58 Canal street.....	Oct. 22.....	Crown ..			1						1	

New Meters Set—Continued.

Wards.	Occupation.	Location.	Date when Set.	Name of Meter.	SIZE.								Remarks.		
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.		Total.	
16	Landrell, Charles W.....	1116-20 Canal street.....	Nov. 7.....	Crown				1						1	
16	Leib & Fritzsche.....	220 Slossman street.....	Sept. 10.....	Crown			1							1	
16	Megargee estate.....	912 N. Delaware avenue.....	Feb. 12.....	Crown		2								2	
16	Schimmel, J. O.....	920 Beach street.....	Dec. 29.....	Gem.....						1				1	
16	Schladensky, F. W.....	150 Laurel street.....	Oct. 22.....	Crown			1							1	
16	Schönherr, John.....	Rear 915-17 N. Front street.....	Nov. 15.....	Gem.....						1				1	
16	Schumann, Louis & Sons..	1027 Canal street.....	Sept. 14.....	Crown.....		1								1	
16	Schumann, Louis & Sons..	1027 Canal street.....	Sept. 14.....	Crown.....					1					1	
16	Schutt, F. & Son.....	1148 & rear Charlotte street.....	Sept. 10.....	Crown.....			1							1	
16	Simons, B. & Son.....	1005-7 Canal street.....	Oct. 27.....	Crown.....			1							1	
17	Baum, George & Son.....	1341-49 Hope street.....	Oct. 14.....	Crown.....			1							1	
17	Baum, George & Son.....	1341-49 Hope street.....	Oct. 14.....	Gem.....					1					1	
17	Craig, A. H. & J.....	531 Jefferson street.....	Oct. 10.....	Crown				1						1	
17	Kindsvater, G.....	528 Oxford street.....	Oct. 18.....	Gem.....						1				1	
17	McConnell, J. J.....	1214-28 Canal street.....	Oct. 17.....	Crown		1		1						2	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when Set.	Name of Meter.	SIZE.								Remarks.	
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.		Total.
17	McConnell, J. J.....	1214-28 Canal street.....	Oct. 17.....	Gem					1				1	
17	Printz, G. & Son.....	1421-23 Randolph street.....	Oct. 10.....	Crown.....				1					1	
17	Selser, Meurer & Co.....	S. E. cor. 2d and Oxford sts.....	Jau. 16.....	Crown.....					1				1	
17	Schoering, Jacob & Son...	1533-45 Randolph street.....	Oct. 12.....	Gem.....					1				1	
17	Schoering, Jacob & Son...	1533-45 Randolph street.....	Oct. 12.....	Crown.....			2						2	
17	Volmer, E.....	1420-24 Randolph street.....	April 24.....	Crown.....	1								1	
18	Neafie and Levy.....	1365 Beach street.....	April 14.....	Gem							1		1	On fire attachments.
18	Paxon, J. W. & Co.....	1015-21 N. Delaware avenue.....	Feb. 7.....	Crown.....	1			1					2	
19	Blessing Charles.....	Randolph st. & Montgomery av.	Feb. 25.....	Gem					1		1		2	4-in. meter on fire attachment.
19	Burk & Bro	1641-43 Hancock street.....	Oct. 23.....	Gem					2				2	
19	Cox, A. Stove Works.....	N. E. cor. American & Dauphin.	Dec. 16.....	Crown		1	2						3	
19	Consolidated Ice Co..	2345 Bodine street.....	April 24.....	Gem					1				1	
19	Davenport, John.....	N.W. Hancock and Somerset st	Feb. 13.....	Crown.....			2						2	
19	Finkenaur, T.....	1715 N. Fifth st.....	Feb. 11.....	Crown.....						1			1	
19	Finkenaur, T.....	1715 N. Fifth st.....	Feb. 11.....	Gem					1				1	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when Set.	Name of Meter.	SIZE.								Remarks.		
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.		Total.	
19	Finkenaur, T.....	1714-16 Germantown ave.....	April 7.....	Crown ...	1	1								2	
19	Foerderer, F.....	1712-16 Randolph st.....	Oct. 22.....	Crown ...				1						1	
19	French, H.....	N.W. Third and Cumberland st.	Nov. 30.....	Crown ...			1							1	
19	Harvey, G.....	S.W. Fifth and Columbia ave...	Jan. 24.....	Gem						1	1			2	4-in. meter on fire attach- ment.
19	Harvey, J.....	S.E. Randolph and Columbia av	Feb. 3.....	Crown ...			1		1					2	
19	Illingsworth, Chas.....	N.W. Mascher and Columbia av	Nov. 16.....	Gem					1					1	
19	Illingsworth, Chas.	N.W. Mascher and Columbia av	Nov. 16.....	Crown ...			1							1	
19	Loughrey & Brown.....	2309-13 N. Seventh st.....	March 4.....	Crown ...	1									1	
19	McNeely & Co.....	Randolph st. S. of Montgom'y av	April 9.....	Gem							1			1	On fire attachment.
19	Merchants' Elect. Lt. Co...	2217-23 Hope st.....	Feb. 10.....	Crown ...					1					1	
19	Reinke, H.....	E.S. Randolph S. of Columbia av	Oct. 13.....	Gem					1					1	
20	Fenlin, John M.....	1719-29 Slaty st.....	Sept. 13.....	Crown ...			1		1					2	
20	Gerlach & Fritz.....	1240 N. Ninth st.....	Feb. 4.....	Crown ...		1								1	
20	Girard Avenue Theatre...	Marshall and Girard ave.....	June 12.....	Gem					1					1	
20	Northwestern Ice Mfg Co.	W. S. Broad N. of Columbia av...	Aug. 18.....	Crown ..					1					1	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Remarks.	
					½ inch.	¾ inch.	1 inch.	1½ inch.	2 inch.	3 inch.	4 inch.	6 inch.		Total.
21	Adams, J. M.....	Main street, north of Green la.	Feb. 28.....	Gem.....						1			1	
21	Bureau of Water.....	Ridge av., 419 ft. S.E. Wis'kn drv	Oct. 27.....	Gem.....								2	2	
21	Harding, W. G.	4364 Main street.....	Feb. 12.....	Crown.....					1				1	
21	Hey, R. & Son.....	Main st., north of Ridge ave....	Oct. 8.....	Gem.....						1			1	
21	Penna. R. R. Co.....	Shawmont Station.....	Sept. 16.....	Gem.....					1				1	
21	Schofield, S.....	Main and Robinson streets	Feb. 5.....	Crown.....			1						1	
22	Clower, W. L.....	4607 and rear Main street.....	April 28.....	Gem.....					1				1	
22	Cope & Co.....	Wayne Junction.....	Feb. 9.....	Gem.....					1		1		2	} 4-in. meter on fire attach't.
22	Cope & Co.....	Wayne Junction.....	Feb. 9.....	Crown.....					1				1	
22	Fling, J.....	N.E. cor. Wister and Armstrong	Mar. 10.....	Gem.....					1		1		2	} 4-in. meter on fire attach't.
22	Fling, J.....	N.E. cor. Wister and Armstrong	Mar. 10.....	Crown.....			1						1	
22	Wagner, Gen. Louis.....	Chew and Locust streets.....	Feb. 12.....	Crown.....				1					1	
24	Avil Printing Co.	8941-43 Market street.....	Dec. 23.....	Crown... 1	1								1	
24	Filter Company.....	Belmont Pumping Station.....	Aug. 25.....	Gem.....					1				1	
25	Blood & Bro.....	S.W.c. Allegheny av. and Janney	Feb. 2.....	Crown...		1							1	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when Set.	Name of Meter.	SIZE.								Remarks.	
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inches.	3-inches.	4-inches.	6-inches.		Total.
25	Bridesburg Mfg Co.....	N.E. c. Richmond and Franklin	Sept. 14.....	Gem.....							1		1	On fire attachment.
25	Forderer, Robert H.....	Rear 3971 Frankford ave.....	Dec. 27.....	Gem.....							2		2	
26	American Sew'g Mach. Co...	S.W. c. 20th and Washington av.	Sept. 3.....	Gem.....							1		1	On fire attachment.
26	Campbell, Geo. W.....	S. E. cor. 21st & Wgshington av	Nov. 6.....	Crown.....			1						1	
26	Harrison Bros. & Co.....	35th & Grays Ferry Road.....	Oct. 19.....	Gem.....							1		1	
26	Harrison Bros. & Co.....	35th & Grays Ferry Road.....	Oct. 20.....	Crown.....				1					1	
26	Woodward, Jas. S.....	S. E. cor. 16th & Reed streets...	May 7.....	Gem.....					1				1	
26	Woodward, Jas. S.....	S. E. cor. 16th & Reed streets...	May 7.....	Crown.....	1	1							2	
27	Baltimore & Ohio R.R.Co.	60th st. & Woodland ave.....	April 28.....	Gem.....							1		1	
27	Gray, Wm. & Sons.....	203 S. Thirtieth street.....	Nov. 13.....	Gem.....					1				1	
27	New Phila. Market Co.....	30th & Market streets.....	Jan. 8.....	Gem.....						1			1	
27	New Phila. Market Co...	30th & Market streets.....	June 27.....	Gem.....						1			1	
27	Powelton Elect'c Light Co	43d & Media Railroad.....	Dec. 2.....	Crown.....		1							1	
28	Bremmer.....	8248 Germantown avenue.....	Feb. 26.....	Gem.....					1				1	
28	Dingee Brick Works.....	N. E. cor. 26th & Hagert sts.....	Feb. 27.....	Crown.....		1							1	

New Meters Set—Continued.

Wards.	Occupant.	Location.	Date when Set.	Name of Meter.	Size.							Remarks.		
					½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.		6-inch.	Total.
28	Dingoe Brick Works.....	N. E. cor. 26th & Hagert sts.....	Mar. 25	Crown				1					1	
28	13th & 15th sts. P.R.W.Co	15th & Cumberland streets.....	Feb. 4.....	Crown			1						1	
29	Barrington, Boyd C.....	1626 N. Fifteenth street.....	Oct. 31.....	Crown				1					1	
29	Burg & Pfaender	33d st N. of Thompson st.....	Aug. 12.....	Gem							1		1	
29	Carbon Dioxide & Mag. Co	31st st. N. of Jefferson st.....	Aug. 11.....	Crown			1						1	
29	Columbia Electric Lt. Co.	1426-34 N. Twentieth street.....	Jan. 15.....	Gem						1			1	
29	Franconi.....	N. side of Harland W. of 18th...	March 26.....	Crown.....		1							1	
29	Germania Brewing Co.....	Broad st. N. of Columbia ave...	May 10.....	Gem.....							1		1	
29	Graham, Walter.....	1925-33 Seybert st.....	June 5.....	Crown.....			1						1	
29	Keller, George.....	E. side of 33d st. S. of Master st.	April 20.....	Gem.....					1				1	
29	Muller, Henry (estate)....	N. E. 31st and Jefferson sts.....	August 6.....	Gem.....						1			1	
29	Poth, F. A., Brewing Co...	N. W. 31st and Jefferson sts.....	February 20.	Gem.....						1			1	
29	Schemm, Peter.....	N. W. W. College ave. & Poplar	August 14.....	Gem.....						2			2	
30	Howell & Burk.....	N. W. 21st st. & Washington av	September 26	Gem.....							1		1	On fire attachment.
31	Bureau of Water.....	Emerald st. below Lehigh ave.	December 5...	Gem.....								2	2	

Pumpage.	Average per day.	Percentage of pumpage.	Maximum Gallons for one day.	Minimum Gallons for one day.	Total Steam Pumpage.	Total Water Pumpage.
24,161	129,700,366	7.64	154,742,355	83,079,673	3,258,087,384	1,003,436,777
732,186	125,246,435	6.30	139,413,116	108,538,531	2,434,162,029	1,072,570,157
239,179	134,171,173	7.54	162,499,690	73,057,433	3,093,122,066	1,162,117,113
73,092	138,125,769	7.45	152,483,496	118,765,870	3,048,120,922	1,095,652,170
197,033	155,722,807	8.68	166,164,135	141,877,479	3,765,962,475	1,061,444,558
735,176	156,758,829	8.45	167,925,471	146,887,461	4,011,491,698	691,273,478
881,450	161,921,982	9.14	182,434,854	136,820,154	4,272,930,266	811,751,184
892,421	166,021,543	9.33	180,453,967	104,135,428	4,194,114,829	1,012,777,592
701,404	171,099,046	9.23	183,421,163	145,173,955	4,145,892,302	986,809,102
131,816	159,784,897	8.90	172,387,450	150,249,375	4,204,118,319	749,213,467
529,802	163,624,326	8.82	181,419,950	110,898,728	4,126,733,355	781,996,447
70,280	149,472,292	8.52	169,300,230	120,250,457	3,730,087,755	1,011,782,525
648,090	152,508,624	100.00	.....	.....	44,284,823,430	11,380,824,570
739,301	10,868,875	.....	12,820,586	11,700,911	4,949,361,861	.....
						982,162,500



APPENDIX E.

REPORT

ON THE

Operations of the Construction and Repair Shop

DURING 1891.

TWELFTH AND REED STREETS,
Philadelphia, January 20, 1892.

JOHN L. OGDEN,
 Chief of Bureau.

SIR:—I respectfully herewith submit the annual report of the operations of the Construction and Repair Shop for the year ending December 31, 1891.

Respectfully,
 JAMES H. DEAN,
Superintendent of Shop.

MERCHANTISE.	DR.
To Stock on hand January 1, 1891.....	\$19,273 86
Steel.....	618 77
Lumber.....	1,958 57
Paints, brushes, etc.....	75 75
Oil and tallow.....	130 64
Chandlery.....	197 40
Machinery.....	2,859 55
Miscellaneous.....	2,019 63
Coal.....	969 03

Gum goods.....	3,467 82
Brass fittings.....	228 58
Lead coating.....	511 24
Iron castings.....	23,971 62
Wrought iron.....	1,480 27
Bolts and nuts.....	1,646 60
Hardware.....	693 19
Brass castings.....	6,743 43
Wages.....	28,833 91
	<u>\$95,679 86</u>

	MERCHANDISE.	CR.	
First District.....	\$12,926 49		
Second ".....	12,518 15		
Third ".....	15,016 61		
Fourth ".....	21,577 57		
Fifth ".....	2,622 02		
Sixth ".....	9,124 13		
			<u>\$73,784 97</u>

FAIRMOUNT PUMPING STATION.

Machinery.....	\$343 85	
Buildings and grounds.....	55 74	
		<u>399 59</u>

SPRING GARDEN PUMPING STATION.

Machinery.....	\$2,415 85	
Boilers.....	231 70	
Buildings and grounds.....	504 14	
		<u>3,151 69</u>

BELMONT PUMPING STATION.

Machinery.....	\$315 23	
Boilers.....	155 54	
Buildings and grounds.....	16 07	
		<u>486 84</u>

FRANKFORD PUMPING STATION.

Machinery.....	\$1,234 84	
Boilers.....	11 60	
		<u>1,246 44</u>

ROXBOROUGH PUMPING STATION.

Machinery.....	\$213 89	
Boilers.....	199 24	
		<u>413 13</u>

MOUNT AIRY PUMPING STATION.

Machinery.....	\$145 08	
Boilers	12 12	
	<u> </u>	157 20

CHESTNUT HILL PUMPING STATION.

Machinery	\$27 01	
	<u> </u>	27 01
Old metals.....		\$1,290 17
Ferrules.....		45 55
General buildings and grounds.....		444 94
Main office.....		46 88
Meters.....		323 70
Fixed patterns.....		73 95
Machinery		921 56
Construction and repair shop.....		1,330 14
Distribution		1,536 50
		<u> </u>
		\$85,680 26
Stock on hand January 1, 1892.....		20,416 56
		<u> </u>
Cr. " "		\$106,096 82
Dr. December 31, 1891		95,679 86
		<u> </u>
Bal. to Cr.....		\$10,416 96
		<u> </u>

Articles Delivered to Purveyors Districts, Works, etc., 1891—Continued.

DISTRICTS.	FIRE HYDRANTS.		KEYS.			CHISELS.					PLUGS.			Spirals for Donkey Pump, Mt. Airy.					
	No. 1.	No. 2.	Stop.	Hydrants.	Plug Monkey.	Flat.	Hand Dia Points.	Handle Dia Points.	Pipe Cutters.	Caps.	Wood.	Iron.	Brass.		Reducing Caps.	Pressure Caps.	Lead Pots.	Hand Gouges.	Handle Gouges.
First	44	98	2	5	72	96	48				182		131			8			
Second	21	106				12				12	178		276			6			
Third	56	163									246	24	108	3		4			
Fourth	21	125			86	80	12	6	86		235		134			10	12		
Fifth	5	25														1			
Sixth	30	81				48		24	24							2			
Works																			254
Total	177	598	2	5	108	186	60	30	60	12	791	24	649	3		26	12		254

List of Articles—Continued.

DISTRICTS.	S. Hooks.	Clevises.	Hook Bolts.	Stub End Straps.	Mandrels.	Hammers.	Eye Bolts.	Tail Clamps.	Reamers.	Wrenches.	Wedges.	Plug Risers.	Iron Furnaces.	Gasket Irons.	Caulking Tools.	Glands.	Fire Hydrant Reducers.	Set Screws for Drill Machines.	Gum Joint Rings.	Brass Comb Reducer.	
First.....	192	72			1		12			7	12		2	4	10		2			60	
Second.....	36	36				6	48			8					17	1	4			36	
Third.....							12											3	6	36	
Fourth.....	60		4		6		48			6		6			20	18	6	57			
Fifth.....	36	36					12			2	6	1	1						6		
Sixth.....							147	54		4		5			6	18				24	
Works.....																					1
Total.....	324	144	4	21	7	6	270	54		22	18	12	3	4	53	37	15	69	156	1	

Stop Cocks, Fire Hydrants, etc., delivered from Department Construction and Repair Shop to Purveyor's Districts, Works, etc., during the Year 1891.

DISTRICTS.	STOP COCKS.											STOP SCREWS.						STOP BOXES AND RISERS.				
	4 Inch.	6 Inch.	8 Inch.	10 Inch.	12 Inch.	16 Inch.	20-inch Rotary.	20-inch Flange.	30-inch Flange.	30-inch Rotary.	36-inch Wedge.	36-inch Rotary.	48-inch Rotary.	6 Inch.	8 Inch.	10 Inch.	12 Inch.	16 Inch.	20 Inch.	30 Inch.	Boxes.	Risers.
First.....	215	28	22	7	5				2												312	270
Second.....	7	208	8	24	10	2		2						12							368	207
Third.....	5	247		2	9									24							485	118
Fourth.....		180		15	8		6	2	2	4	7	2	2								312	108
Fifth.....	4	58		2	2									6							78	72
Sixth.....	6	161		4	14	1		8													243	
Works.....																						
	22	1,069	26	69	50	8	6	7	2	6	7	2	2	42							1,798	775

Stop Cocks, etc—Continued.

1915

DISTRICTS.	IRON BANDS.									SOCKET SCREWS.					STOP.							
	4 Inch.	6 Inch.	8 Inch.	10 Inch.	12 Inch.	16 Inch.	20 Inch.	30 Inch.	36 Inch.	48 Inch.	4 Inch.	6 Inch.	8 Inch.	10 Inch.	12 Inch.	Cast-Iron Monkey Legs.	Wrought-iron Monkey Legs.	Cross Heads.	Nuts.	Spindles.	Barton Bonnet and Screws.	
First.....	2	6	2	4	11										6				1			
Second.....		36	6	6	6	4	12	4	4							36	12	12	12	12	3	
Third.....		162		6													24	36	24			
Fourth.....		30			12		12										24	8			2	
Fifth.....	6	12																	3			
Sixth.....		48			6	2		6														
Works.....																						
	8	294	6	8	34	6	24	21	4						6	36	60	60	36		5	

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INVENTORY, JANUARY 1, 1892.

7 No. 1 fire hydrants, at \$ 29 25.....	\$204 75	
40 No. 2 fire hydrants, at \$37 00.....	1,480 00	
25 4-inch stops, at 13 00.....	325 09	
12 8-inch stops, at 24 00.....	288 00	
7 10-inch stops, at 31 00.....	217 00	
3 12-inch stops, at 37 00.....	111 00	
4 16-inch stops, at 60 00.....	240 00	
1 36-inch stops, at 300 00.....	300 00	
Finished parts of stop cocks.....	1,283 46	
		<u>\$4,449 21</u>
2 48-inch rotary valves at \$665 00.....	\$1,330 00	
Finished parts of rotary valves.....	311 30	
		<u>1,641 30</u>
Unfinished parts of fire hydrants.....	\$1,965 18	
Labor on " " "	52 00	
		<u>2,017 18</u>
Unfinished parts of stop cocks.....	\$868 02	
Labor on " " "	40 00	
		<u>908 02</u>
Unfinished parts of rotary valves.....	\$30 90	
Labor on " " "	83 00	
		<u>113 90</u>
46 4-inch stop screws at \$2 25.....	\$103 50	
111 6-inch " " " 2 50.....	277 50	
6 8-inch " " " 3 25.....	19 50	
72 10-inch " " " 4 50.....	324 00	
36 12-inch " " " 5 00.....	180 00	
1 16-inch " " " 6 50.....	52 00	
2 20-inch " " " 8 25.....	16 50	
4 36-inch " " " 12 00.....	48 00	
2 48-inch " " " 15 00.....	30 00	
		<u>1,051 00</u>
		<u>\$10,180 61</u>
6 30-inch stop screws, O. S., at \$10 25.....	\$61 50	
5 36-inch stop screws, O. S., at 12 00.....	60 00	
134 Socket screws, at 1 75.....	235 00	
46 4-inch O. S. spindles, at 1 50.....	69 00	
32 Barton stop screws, at 4 50.....	144 00	
2 Barton bonnets and screws, at 8 00.....	16 00	
23 Plug screws, at 05.....	1 15	
		<u>\$586 65</u>

31 6-inch iron bands, at	\$4 00.....	\$124 00
4 8-inch iron bands, at	5 00.....	20 00
7 10-inch iron bands, at	6 00.....	42 00
4 12-inch iron bands, at	7 00.....	28 00
10 16-inch iron bands, at	7 50.....	75 00
11 30-inch iron bands, at	15 00.....	165 00
14 36-inch iron bands, at	17 00.....	238 00
6 48-inch iron bands, at	20 00.....	120 00
		<hr/>
		\$812 00
28 iron plug risers, at \$2 50.....		\$70 00
41 band bolts, at 9 cents.....		3 69
8 large lead pots, at \$4.....		32 00
2 medium lead pots, at \$2 50.....		5 00
8 small lead pots, at \$1 35.....		10 80
12 reducing caps for nozzles, c. i., at \$1.....		12 00
6 reducing caps for nozzles, brass, at \$2 25.....		13 50
1666 gum joints, at 40 cents.....		666 40
466 gum joints, large, at 45 cents.....		209 70
Sheet gum		15 00
5 bundles spring wire.....		15 88
		<hr/>
		\$1,053 97
21 stub end straps, at \$9 50.....		199 50
60 pounds rolled brass, at 23 cents.....		13 80
45 wedges 6'' x 1'', at 35 cents.....		15 75
7 square shank 1-inch drills, at \$1 25.....		8 75
8 square shank 3/4-inch drills, at \$1 12.....		8 96
109 hand diamond point chisels, at 35 cents.....		38 15
120 hand caulking tools (5 in a set), at \$2 50.....		60 00
19 gasket irons, at 60 cents.....		11 40
71 round point gouges, at 50 cents.....		35 50
17 lead cutting chisels, at 50 cents.....		8 50
87 handled pipe cutters, at 60 cents.....		52 20
51 handled caulking tools, at 90 cents.....		45 90
10 caulking hammers, at \$1.....		10 00
46 dozen clevises, at 75 cents.....		34 50
34 dozen plug monkey keys, at 25 cents.....		8 50
55 dozen S. hooks, at 50 cents.....		27 50
46 stop monkey keys, at 75 cents.....		34 50
36 4-inch c. i. monkey legs, at \$1 50.....		54 00
59 6-inch c. i. monkey legs, at \$1 50.....		88 50
10 6-inch w. i. monkey legs, at \$3 25.....		33 50
83 frost rods, at 40 cents.....		33 20
100 brass plugs, at 50 cents.....		50 00
186 wooden plugs at 50 cents.....		93 00
46 4-inch gum valves, at \$2.....		92 00

138 6-inch gum valves, at \$4.....	\$552 00	
21 valve rods, at 40 cents.....	8 40	
34 hoe heads for fire irons, at \$1 50.....	51 00	
		<hr/> \$1,668 01
		<hr/> \$14,301 24
2,360 pounds white (non-shrinking) metal, at 24 cents.....	\$566 40	
3,041 pounds finished brass castings, at 20 cents...	608 20	
17,551 pounds unfinished brass castings, at 13 cents..	2,281 63	
9,953 pounds iron castings at 2½ cents.....	211 50	
34,100 pounds iron castings, at 2½ ¹⁷ / ₁₀₀ cents.....	808 17	
4,609 pounds cast steel, at 8 cents.....	368 72	
623 pounds cast steel, for tools, at 15 cents.....	93 45	
289 pounds shear steel, at 8 cents.....	23 12	
122 pounds spring steel, at 3½ cents.....	4 27	
1,232 pounds machinery steel, at 3 cents.....	37 74	
		<hr/> \$5,003 20
Hardware.....	\$320 93	
Bolts and nuts.....	479 15	
Oil and tallow.....	6 50	
Chandlery.....	8 05	
Paints, oil, brushes, &c.....	1 45	
Lumber.....	296 04	
		<hr/> 1,112 12
		<hr/> \$20,416 56

ARTICLES MANUFACTURED DURING 1891

102 No. 1 fire hydrants, at \$29 25.....	\$2,983 50
652 No. 2 fire hydrants, at 37 00.....	24,124 00
1,099 6-inch stop cocks, at 15 00.....	16,485 00
61 10-inch stop cocks, at 31 00.....	1,891 00
21 12-inch stop cocks, at 37 00.....	777 00
6 16-inch stop cocks, at 60 00.....	360 00
3 20-inch stop cocks, at 95 00.....	285 00
1 30-inch stop cocks, at 190 00.....	190 00
9 36-inch stop cocks, at 300 00.....	2,700 00
6 20-inch rotary stop valves, at \$265 00.....	1,590 00
2 48-inch rotary stop valves, at 665 00.....	1,330 00
4 36-inch rotary stop valves, at 525 00.....	2,100 00
6 30-inch rotary stop valves, at 385 00.....	2,310 00
76 4-inch stop screws, at \$2 25.....	171 00
50 6-inch stop screws, at 2 50.....	125 00
56 10-inch stop screws, at 4 50.....	252 00

20	12-inch stop screws, at \$5 00.....	\$100 00
8	16-inch stop screws, at 6 00.....	48 00
3	20-inch stop screws, at 6 50.....	19 50
6	30-inch stop screws, O. S., at \$10 25.....	61 50
5	36-inch stop screws, O. S., at 12 00.....	60 00
24	4-inch socket screws, at \$1 50.....	36 00
9	6-inch socket screws, at 1 75.....	15 75
8	Barton stop screws, at 3 25.....	26 00
8	4-inch iron bands, at 2 00.....	16 00
290	6-inch iron bands, at 2 15.....	623 50
29	8-inch iron bands, at 3 50.....	92 50
5	10-inch iron bands, at 5 00.....	25 00
48	12-inch iron bands, at 6 00.....	288 00
12	16-inch iron bands, at 7 50.....	90 00
24	20-inch iron bands, at 10 50.....	252 00
32	30-inch iron bands, at 15 00.....	480 00
8	36-inch iron bands, at 17 00.....	136 00
36	48-inch iron bands, at 20 00.....	720 00
62	pairs w. i. monkey legs, at \$3 25.....	201 50
130	pairs c. i. monkey legs, at 1 50.....	195 00
19	cross heads and nuts, at \$1 50.....	28 50
134	spindles, at \$3 50.....	469 00
1,267	wooden plugs, at 50 cents.....	633 50
24	iron plugs, at 50 cents.....	12 00
749	brass plugs, at 50 cents.....	374 50
184	flat chisels, at 35 cents.....	64 40
103	gouges, at 50 cents.....	51 50
169	hand diamond points, at 35 cents.....	59 15
8	handled diamond points, at 90 cents.....	7 20
59	pipe cutters, at 60 cents.....	35 40
12	cape chisels, at 35 cents.....	4 20
21	lead pots, at \$2 62.....	55 02
3	reducing caps, at \$1 00.....	3 00
1,177	s. hooks, at 75 cents per dozen.....	73 50
715	clevises, at 75 cents per dozen.....	45 00
4	hook bolts, at 15 cents.....	60
18	mandrils, at \$1 25.....	22 50
53	sets caulking tools, at \$2 50.....	132 50
4	gasket irons, at 60 cents.....	2 40
21	stub end straps, at \$9 50.....	199 50
1,744	wooden stop boxes, at \$2 50.....	4,360 00
787	wooden stop boxes risers, at 35 cents.....	275 45
22	wrenches, at 50 cents.....	11 00
82	wedges, at 35 cents.....	28 70
3	furnaces, at \$17 00.....	51 00

8 f. h. reducers, at \$1 00.....	\$ 8 00
279 eye bolts, at 40 cents.....	111 60
6 caulking hammers, at \$1 00.....	6 00
5 hydrant keys, at \$2 25.....	11 25
110 plug monkey keys, at 25 cents.....	27 50
12 plug risers, at \$2 00.....	24 00
54 tail clamps, at 75 cents.....	40 50
2 stop keys, at \$5 25.....	10 50
	<hr/>
	\$67,282 62

APPENDIX F.

REPORT OF JOHN E. CODMAN, In Charge of Hydrographic Work.

BUREAU OF WATER.

Philadelphia, January 18, 1892.

JOHN L. OGDEN,
Chief, Bureau of Water.

SIR:—The following report of hydrographic work and data collected during the year 1891, in connection with the investigations of the sources for a future water supply, is respectfully submitted.

Stream flow observations on the Perkiomen, Neshaminy and Tohickon streams have been continued, completing eight years continuous records.

Rain-fall observations with the three automatic gauges have also been continued, completing nine years continuous records. Records of this kind have been made by the Department of Public Works in the City of New York on the Croton river for over twenty years, and by the City of Boston on the Sudbury river for over sixteen years. A comparison of the data collected is made in Table VII.

The average yearly flow of the Perkiomen in comparison with the rain-fall is three per cent. more; of the Neshaminy, one per cent. less; and of the Tohickon, ten per cent. more than either the Croton or Sudbury. The average rain-fall on the Pennsylvania streams is about five inches greater.

The distribution of the rain-fall throughout the year, with the exception of the months of April and May, was nearly normal. The average for each month on the water shed of the Perkiomen stream was 4.20 inches, on the Neshaminy 4.10 inches, and on the Tobiokon 4.29 inches. The greatest monthly rain-fall occurred in August, 7.74 inches. The least monthly rain-fall occurred in May, 2.28 inches.

The rain-fall for the eastern counties of Pennsylvania was 50.07 inches, being 1.50 inches above the average for the past nine years. No very heavy or long continued storms occurred, and only nine or ten showers, in which the rate for short periods of time exceeded one inch per hour, or more. Very little snow fell during the year, the total amount not exceeding ten inches in depth, and remaining on the ground but a short time after each storm.

In the results obtained the three Automatic Rain Gauges in use by the Bureau are practical and satisfactory. With the exception of a local cause, that can be corrected, these record a diagram clearly, showing the beginning, ending, intensity, and the total amount of precipitation.

The total precipitation registered by the Automatic Gauge at Thirty-second and Spruce streets, Philadelphia, for the year 1891 was 39.99 inches. For the purpose of correcting errors due to location, size of collector, and elevation above the surface of the ground, comparative observations have been made on this gauge. The locality selected is particularly favorable for obtaining this data, and therefore the information obtained is believed to be correct. The diameter of the collector of this gauge is 22½ inches, which is much larger than is commonly used. Some doubts were expressed at first about the accuracy of the records obtained from so large a collector. Reliable information on this point not being accessible, gauges of different diameters were placed in close proximity to the large one, and at the same elevation, so that conditions relating to locality should affect all alike.

Observations upon these have been made continuously for

the past three years. The results show that with an average yearly rain-fall of forty-five inches the variation between the smallest and largest is less than three-quarters of one per cent., and also show that it makes no practical difference whether the collector is twenty-four inches in diameter or only two inches. During 1888 it was found that the Automatic Gauge on the roof of the small building did not collect as much as one placed upon or near the surface of the ground. During 1889, 1890 and 1891 observations were made with a collector twenty inches from the ground. The result showed that about 13 per cent. more was collected in the ground gauge. In order to determine whether this discrepancy was due to the difference in elevation above the surface of the ground or was caused by local conditions, a series of collectors were suspended on a mast at elevations of 50 feet, 25 feet, 15 feet, 10 feet, and 5 feet above the surface of the ground. Small lead pipes leading from each collector conveyed the water to separate vessels. The drawing in elevation shows the relative position of the collectors on the mast, and the drawing in plan, their relative position to the points of the compass. During the year observations have been made at the end of each rain storm, noting the general direction of the wind and the amount of rain collected.

The results (tabulated in Table V) have been compared with those obtained from the gauge on the ground and the Automatic Gauge. There is no material variation in the amount for each month or for the year between the gauges on the mast and the one on the ground, yet the variation in single storms will, at times, amount to as much as 0.30 inch, according to the direction and velocity of the wind. This variation it was soon found was caused by the mast producing counter currents of air. Although the mast was only eight inches in diameter and the collectors were suspended at a distance of five feet from it, yet those on the windward side collected more than those on the lee side. The wind in the majority of storms had an easterly direction, and the gauges

on the northeast and southeast side of the mast collected the greater quantity. Comparing the results obtained on the mast with those obtained from the gauge on the ground, no material difference is found. A gauge at an elevation of fifty feet or less above the surface of the ground will collect the same amount as one on the ground, provided both are situated in a position not affected by counter currents of air. The 13 per cent. difference observed between the Automatic Gauge and those on the mast or the one on the ground, is due to the roof of the building on which the collector is fastened producing a current of air which carries a portion of the rain upward and over the collector. This is found to be nearly a constant quantity, and it can be added to the amount collected by the Automatic Gauge. The results of the observations upon this gauge are also confirmed by the records of the Automatic Gauges at the Forks of the Neshaminy and Spring Mount.

At both places comparisons have been made with gauges upon the ground, the difference being about 11 per cent. in a total rain fall for the year of 55 inches. The difference is slightly less than that shown by the Philadelphia gauge, and is accounted for from these facts: first, that the roofs have a much greater pitch; second, the distance from the roof to the edge of the collector is greater; third, the upward current of air produced by the roof has less force, consequently so much of the rain cannot be carried over the collector.

The automatic gauge in this city recorded twenty-seven storms in which the rate exceeded 0.25 inch per hour, and one hundred and thirty-two days in which the precipitation exceeded 0.01 of an inch. The greatest amount of rain recorded in a single storm was on September 5th and 6th, when 1.75 inches fell in ten hours. The greatest amount for a short period of time was on April 16th, when 0.60 of an inch fell in 12 minutes, or at the rate of 3 inches per hour.

The amount of rain recorded at stations outside of the City was from thirteen to sixty-eight per cent. more than was re-

corded by either the Bureau or Signal Service gauges. The automatic gauge at the Forks of the Neshaminy recorded twenty-two rain storms in which the rate exceeded 0.25 of an inch per hour. The greatest amount of rain recorded in a single storm was on September 5th and 6th, when 2.43 of an inch fell in twelve hours and fifteen minutes. The greatest amount for a short period of time was during a shower on July 24th, when 0.70 of an inch fell in 24 minutes, or at the rate of 1.75 per hour.

The automatic gauge at Spring Mount, P. & R. R. R., recorded twenty-seven rain storms in which the rate exceeded 0.25 of an inch per hour. The greatest amount recorded in a single storm was on August 24th, when 2.80 inches fell in twenty-four hours. The greatest amount for a short period of time was during the same storm, when 0.66 inch fell in twenty-four minutes, or at the rate of 1.65 inches per hour. The greatest amount collected at any of the Stations was 64.00 inches at West Chester.

The various tables of data collected during the year relating to rain-fall and stream flow are continued as in former years.

Table I shows the monthly and total precipitation for 1891 compared with the United States Signal Service, and the average comparison for the past nine years, at twenty-one different locations in Eastern Pennsylvania.

Tables II, III and IV are compiled from the records of the automatic gauges and show the number, amount and intensity of all rainstorms during the year that exceed 0.25 of an inch per hour.

Table V. shows the amount of rain collected each month since March at different elevations above the surface of the ground, the number of times rain fell each month, and the general direction of the wind during the time rain was falling.

The average daily flow of the Perkiomen for the past eight years was 190,576,912 gallons, the year ending September 30. The flow of the same stream for the year 1891 was 186,501,174,

or 3 per cent less than the average of the past eight years. The rain-fall on the water shed was 0.25 of an inch less than the average. The flow of the Perkiomen from September 30, 1890, to October 1, 1891, was over fifty millions of gallons per day less than the flow for the year ending September 30, 1890. The average per cent. of rain-fall flowing in the Perkiomen during the past eight years was 52.4, equivalent to 26.09 inches of rain-fall over the whole water shed, or 1.94 cubic feet per second per square mile.

The average daily flow of the Neshaminy for the past eight years was 163,620,429 gallons. The daily flow of the same stream for the year 1891 was 162,874,703, or one-half of one per cent. less than the average of the past eight years. The rain-fall on the water shed was 0.92 of an inch less than the average. The flow of the Neshaminy from September 30, 1890, to October 1, 1891, was over ten millions of gallons per day less than the flow for the year ending September 30, 1890. The average per cent. of rain-fall flowing in the Neshaminy for the past eight years was 48.8, equivalent to 24.44 inches of rain-fall over the whole water shed, or 1.82 cubic feet per second per square mile.

The average daily flow of the Tohickon for the past eight years was 154,123,630 gallons, the year ending September 30. The flow of the same stream for the year 1891 was 147,633,844 gallons, or five per cent. less than the average of the past eight years. The rain-fall on the water shed was one inch less than the average. The flow of the Tohickon from September 30, 1890, to October 1, 1891, was over fifteen millions of gallons per day less than the flow for the year ending September 30, 1890. The average per cent. of rain-fall flowing in the Tohickon for the past eight years was 60.0, equivalent to 31.48 inches of rain-fall over the whole water shed, or 2.335 cubic feet per second per square mile.

The yearly flow of these streams gradually increased, with an increasing yearly rain-fall from 1885 to a maximum in 1889, the increase in flow being in 1889 seventy per cent., the

increase in rain-fall being sixty per cent. above those of 1885.

Two diagrams illustrating the rapid rise in the Tohickon and Neshaminy streams have been made from the record of the automatic gauges on August 24. This storm was confined to a comparatively small area of country. The rain-fall at Doylestown—nearly in the centre of the storm—was 5.25 inches in less than 24 hours.

The storm passing in an easterly direction over the lower valley of the Tohickon and the upper valley of the Neshaminy, the highest point recorded by the Neshaminy gauge occurred some six hours after that on the Tohickon.

The bridge at the Tohickon and the float-box at the Neshaminy were both carried away by the sudden rise of the streams. Repairs were made at once without interfering with the observations. All the instruments belonging to the Bureau used in making observations during the year are in good condition.

Observations up on the Tohickon Weir have been made whenever practicable and a correction made in the low stream flow.

The records kept at Fairmount of the amount of water flowing over the flash-boards at Fairmount dam during 1891, showed a total of 64 feet 10 inches, being 23 feet 7 inches less than the records of 1890, and 131 feet less than the records of 1889. The average rain-fall in the Schuylkill valley for 1890 was 50.07 inches or 1.14 inches, more than the average for 1890.

The computed flow from the above records give 36 per cent of the total rain-fall, or 1,512,400,000 gallons per day as the average flow of the Schuylkill river for the year 1891.

The following named persons have been engaged as observers and rodmen during the entire year :

John G. Hilsman, rodman and gauge observer, Rush Valley P. O.

George W. Wood, rodman and gauge observer, Spring Mount, Pa.

R. G. Stover, gauge observer, Point Pleasant, Pa.

Dr. George M. Grim, gauge observer, Ottsville.

George Lowder, gauge observer, Smith's Corner.

Dr. J. A. Roth, gauge observer, Seisholtzville.

A. W. Walton, gauge observer, Doylestown.

H. L. Shull, gauge observer, Lansdale.

The Bureau is indebted to the following persons who have kindly furnished rain-fall records :

Mr. Thomas MacKellar, Germantown, Philadelphia.

Mr. J. L. Heacock, Quakertown, Pa.

L. M. Dey, U. S. Signal Service.

T. F. Townsend, U. S. Signal Service.

Mr. Benjamin Shoemaker, Pennsylvania Hospital, Phila.

Mr. E. F. Smith, Chief Engineer of Canals, Reading, Pa.

Mr. Thomas J. Beans, Moorestown, N. J.

Dr. Charles Moore, Pottstown, Pa.

Professor J. W. Moore, Lafayette College, Easton, Pa.

Professor Seldon, Lafayette College, Easton, Pa.

During 1891 all observations on rain-fall were taken uniformly in accordance with the instructions given at the beginning of the year.

Respectfully,

JOHN E. CODMAN,

In Charge of Hydrographic Work.

EDS,



ES.

NESHAMINY SERIES.

CORNER.		POINT PLEASANT.		LANSDALE.		FORKS OF NESHAMINY.		DOYLESTOWN.	
480		119.5		350		143		405	
Difference.	Precipitation.	Difference.	Precipitation.	Difference.	Precipitation.	Difference.	Precipitation.	Difference.	
+ 1.99	6.53	+ 2.94	6.04	+ 2.45	6.11	+ 2.52	6.29	+ 2.70	
- 0.20	4.67	- 0.04	4.43	- 0.28	4.50	- 0.21	4.89	+ 0.18	
- 0.47	5.08	+ 0.66	4.67	+ 0.25	4.51	+ 0.09	5.55	+ 1.13	
- 0.59	1.70	- 0.64	2.12	- 0.22	1.65	- 0.69	1.92	- 0.42	
+ 1.07	2.94	+ 1.20	2.66	+ 0.92	2.66	+ 0.92	3.43	+ 1.69	
- 0.03	3.51	+ 1.00	2.90	+ 0.39	3.83	+ 1.32	3.66	+ 1.15	
- 2.80	6.94	- 2.29	6.36	+ 1.71	4.44	- 0.21	6.30	+ 1.65	
- 5.96	9.56	- 5.34	6.62	+ 2.40	4.90	- 0.68	8.68	+ 4.46	
- 0.61	1.31	- 0.59	2.57	+ 0.67	3.08	+ 1.18	1.98	+ 0.08	
- 1.80	4.32	- 1.75	3.09	- 0.52	3.68	- 1.11	4.22	+ 1.65	
- 0.02	1.95	- 0.25	1.73	- 0.03	2.04	+ 0.34	1.87	+ 0.17	
- 0.93	4.86	+ 1.08	3.41	- 0.37	4.88	- 1.10	4.29	+ 0.51	
- 12.67	53.37	- 15.24	46.60	+ 8.47	46.28	- 8.15	53.08	+ 14.95	
.....	140	.....	122	.....	121	.....	139	.....
.....	53.33	.....	47.74	.....	49.55	.....	50.69	.....
.....	134	.....	118	.....	125	.....	127	.....

1

TABLE 2.

Rain Storms Exceeding Rate 0.25 Inches Per Hour, as Recorded by the Automatic Rain Gauge at Frederick for the Year 1891.

Date of Observation, 1891.	AUTOMATIC RAIN GAUGE.				
	TOTAL FALL.		MAXIMUM FALL.		
	Amount in Inches.	Duration in Hr. Min.	Amount in Inches.	Duration in Minutes.	Rate per Hour dur- ing Maxi- mum Fall.
January 2d, rain and snow.....	.74	23—00	.20	.48	.25
January 11th, rain and snow.....	1.35	20—24	.20	.16	.75
January 22d, rain and snow.....	1.08	11—50	.20	.36	.33
February 1st, rain and hail.....	.47	4—40	.30	.76	.24
February 17th, rain and snow.....	1.16	18—10	.10	.08	.75
March 20th to 23d.....	3.49	74—55	.40	.40	.60
April 11th, shower.....	.44	3—45	.15	.12	.75
May 3d, S. E. rain storm.....	.97	5—10	.15	.16	.56
June 16th, shower.....	.20	0—12	.20	.12	1.00
June 18th, N. E. rain storm.....	.75	2—10	.30	.24	2.75
June 21st, N. E. rain storm.....	.30	1—00	.30	.60	.30
July 3d, shower.....	.40	3—20	.16	.24	.40
July 15th, shower.....	.76	2—50	.35	.28	.75
July 16th and 17th, S. E. rain storm.	2.27	16—00	.30	.20	.90
July 24th, showers.....	.46	1—20	.36	.36	1.90
July 29th, S. E. rain storm.....	1.98	12—10	.25	.15	1.00
August 1st, showers.....	.27	0—50	.22	.24	.55
August 4th, showers.....	1.13	21—05	.66	.52	.76
August 12th, 3 showers.....	.49	1—50	.19	.12	.95
August 15th, 3 showers.....	1.01	4—40	.44	.20	1.32
August 21st, showers.....	.39	4—40	.32	.32	.60
August 24th and 25th, rain storm...	2.80	24—00	.66	.24	1.65
August 27th, showers.....	.57	5—42	.37	.12	1.35
September 3d, shower.....	.23	0—15	.23	.15	1.15
September 5th, N. E. rain storm.....	1.27	6—15	.67	.40	1.90
October 20th, N. E. rain storm.....	1.39	17—00	.58	.36	1.45

TABLE 3.

Rain Storms Exceeding in Rate 0.25 inches per hour, as Recorded by the Automatic Rain Gauge at Forks of Neshaminy, for the year 1891.

Date of Observation, 1891.	AUTOMATIC RAIN GAUGE.				
	TOTAL FALL.		MAXIMUM FALL.		
	Amount in Inches.	Duration in Hr. Min.	Amount in Inches.	Duration in Minutes.	Rate per Hour during Maximum Fall.
January 2d, snow and rain.....	0.64	26—15	0.15	28	0.23
January 11th, snow and rain.....	1.42	21—55	0.15	20	0.45
January 13th, rain and sleet.....	1.21	20—10	0.20	60	0.30
January 22d, rain.....	1.71	12—45	0.15	24	0.57
February 1st, rain.....	0.48	12—55	0.20	56	0.21
February 17th, rain.....	0.83	10—10	0.20	48	0.25
March 10th, thunder shower.....	0.24	3—00	0.20	32	0.37
March 21st, rain.....	1.28	24—00	0.20	60	0.20
April 11th, shower.....	0.69	20—00	0.15	12	0.75
May 21st, shower.....	0.36	0—24	0.30	12	1.50
May 22d, shower.....	0.28	0—25	0.10	8	0.75
June 7th, N. E. rain storm.....	0.94	23—15	0.10	36	0.17
June 17th, N. E. rain storm.....	1.24	15—40	0.55	32	1.03
July 3d, shower.....	0.53	9—35	0.30	12	1.50
July 20th, shower.....	0.17	0—16	0.17	16	0.61
July 24th, shower.....	0.88	8—50	0.70	24	1.75
July 29th, S. E. rain storm.....	0.75	12—30	0.25	60	0.25
August 1st, shower.....	0.50	4—45	0.25	25	0.60
August 15th, showers.....	0.52	6—00	0.15	15	0.60
August 19th, rain storm.....	0.90	8—30	0.20	16	0.75
August 23d and 24th, showers.....	1.35	4—15	0.30	48	1.00
Sept. 5th and 6th, N. E. rain storm	2.43	12—15	1.05	40	1.57
October 20, N. E. rain storm.....	1.56	18—00	1.11	80	0.88

TABLE 4.

Rain Storm Exceeding in Rate 0.25 inches per hour as Recorded by the Automatic Rain Gauge at Philadelphia, Pa., for the year 1891.

Date of Observation, 1891.	AUTOMATIC RAIN GAUGE.				
	TOTAL FALL.		MAXIMUM FALL.		
	Amount in Inches.	Duration in Hr. Min.	Amount in Inches.	Duration in Minutes.	Rate per Hour during Maximum Fall.
January 2d, rain.....	0.41	6—20	0.20	40	0.80
January 11th, rain.....	0.86	20—55	0.15	52	0.20
February 9th, rain.....	0.60	20—40	0.15	32	0.28
February 17th, shower.....	0.36	8—30	0.15	12	0.75
March 10th, rain.....	0.38	19—15	0.15	32	0.28
March 21st, rain.....	1.50	26—20	0.30	60	0.30
March 22d, shower.....	0.34	20—35	0.20	20	0.60
April 16th, shower.....	0.60	3—50	0.60	12	3.00
May 3d, S. E. rain storm.....	0.60	4—10	0.20	60	0.20
June 7th, N. E. rain storm.....	0.89	16—15	0.15	42	0.21
June 18th, N. E. rain storm.....	0.70	6—45	0.55	32	1.03
June 19th, N. E. rain storm.....	0.36	3—30	0.15	20	0.45
June 21st, N. E. rain storm.....	0.71	3—40	0.35	16	1.31
July 3d, shower.....	0.68	1—00	0.28	12	1.40
July 8th and 9th, N. E. rain storm.	1.45	32—00	0.10	24	0.25
July 18th, S. E. rain storm.....	0.58	17—20	0.20	12	1.00
July 24th, shower.....	0.28	1—45	0.20	16	0.75
July 28th and 29th, S. E. rain storm	1.76	14—35	0.55	36	0.92
July 30th, shower.....	0.40	2—40	0.25	20	0.75
August 2d, shower.....	1.05	5—40	0.70	44	0.96
August 12th, shower.....	0.87	3—30	0.60	32	1.12
August 15th, shower.....	0.51	2—55	0.36	28	0.77
August 23d, shower.....	0.81	1—50	0.75	32	1.40
Sept. 5th and 6th, N. E. rain storm.	1.75	10—00	0.77	40	1.18
September 7th, shower.....	0.84	2—05	0.14	8	1.05
October 20th, N. E. rain storm.....	1.27	14—20	0.37	20	1.11

TABLE 5.

Table Showing Observations on Rainfall at different Elevations Above the Surface of the Ground.

MONTH.	ELEVATION ABOVE THE GROUND—Ft.						Number of Observations	DIRECTION OF WIND.			
	0	5	10	15	25	50		No. of Observations N. E.	No. of Observations. S. E.	No. of Observations S. W.	No. of Observations N. W.
January.....											
February.....											
March.....											
April.....	2.44	2.34	2.22	2.26	2.34	2.32	6	3	1	1	1
May.....	1.86	1.57	1.67	1.82	1.72	1.73	10	5	1	2	2
June.....	2.95	3.02	2.78	2.99	2.90	2.84	8	7	1		
July.....	5.88	5.28	5.71	5.75	5.70	5.53	10	3	4	2	1
August.....	4.99	4.63	4.92	4.88	4.96	4.78	11	1	3	3	4
September.....	2.65	2.64	2.78	2.70	2.68	2.65	6	2	1	1	2
October.....	3.05	2.98	3.18	3.37	3.54	3.24	5	4	.....	1	
November.....	2.38	2.14	2.46	1.98	2.30	2.20	5	2	1	2	
December.....	4.32	4.47	4.74	4.21	4.56	4.50	7	2	3	1	1
Total.....	30.52	29.07	30.41	29.96	30.70	29.79	68	29	15	13	11

Gauges at 15 and 25 feet are on the North and East Side of Pola.

TABLE 6.
Comparative Statistics of Watersheds.

WATERSHEDS.	Area in miles.	STATISTICS OF WATERSHEDS IN PERCENTAGES OF TOTAL AREA.				PERCENTAGE OF RAINFALL REACHING THE STREAMS.												
		Woodland.	Cultivated.	Flats.	Roads.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Perkiomen, at Frederick, eight years.....	152.	25	71	2	2	80	85	104	86	38	26	19	35	31	21	49	60	52.4
Neshaminy, below Forks, eight years.....	139.3	6	92	$\frac{1}{4}$	2	92	98	100	78	27	15	16	22	20	20	40	73	46.8
Tohickon, eight years.....	102.2	24	72	2	2	107	118	118	89	29	22	20	29	32	26	52	.....	60.0
Average																		
Perkiomen, at Frederick.....						93	111	191	114	49	39	40	62	50	49	78	75	
						72	49	65	41	29	13	8	16	17	9	25	32	
Neshaminy, below Forks.....						103	138	177	122	36	23	44	71	41	50	74	100	
						77	70	62	43	18	5	2	9	3	2	14	47	
Tohickon						138	191	190	148	49	53	52	81	66	51	90	97	
						78	64	90	42	17	9	2	7	2	2	18	49	

TABLE 7—Average Annual Yield of Sundry Streams October 1 to October 1, 1890-91.

Watersheds.	Area in miles.	Average rainfall, inches.	Average rainfall collected, inches.	Per cent. collected.	Average annual yield in gallons.	Average daily yield in gallons.	Average yield in cubic ft. per second per square mile of drainage area.	Average yield in cubic ft. per second per square mile of drainage area for each in. of rainfall.
Perkiomen at Frederick, eight years.....	152.0	50.176	26.092	52.4	69,559,853,618	190,576,912	1.9400	0.0366
Neshaminy below Forks, eight years.....	139.3	50.085	24.441	48.8	59,715,605,163	163,620,429	1.8175	0.0362
Tohickon, eight years.....	102.2	52.477	31.486	60.9	56,348,776,388	154,123,650	2.3350	0.0445
Sudbury, Mass., sixteen years.....	75.2	45.800	22.670	49.5	29,616,392,000	81,140,800	1.6700	0.0364
Croton, N. Y., seventeen years.....	338.0	45.970	22.760	49.5	135,400,000,000	371,600,000	1.6800	0.0365

TABLE 8—Observed Minimum Stream Flow and Minimum Flow October 1 to October 1, 1890-91.

Stream.	PREVIOUSLY OBSERVED MINIMUM FLOW.	Date.	MINIMUM FLOW, 1891.	Date.
	Cubic feet per 24 hours.		Cubic feet per 24 hours.	
Perkiomen at Frederick.....	653,184	September 4, 1885.....	1,728,000	June 27th.
Neshaminy below Forks.....	108,864	September 28, 1885.....	1,226,880	July 28th.
Tohickon.....	17,280	July 23, 1885.....	232,280	July 17th.

TABLE 9—Observed Maximum Stream Flow and Maximum Flow October 1 to October 1, 1890-91.

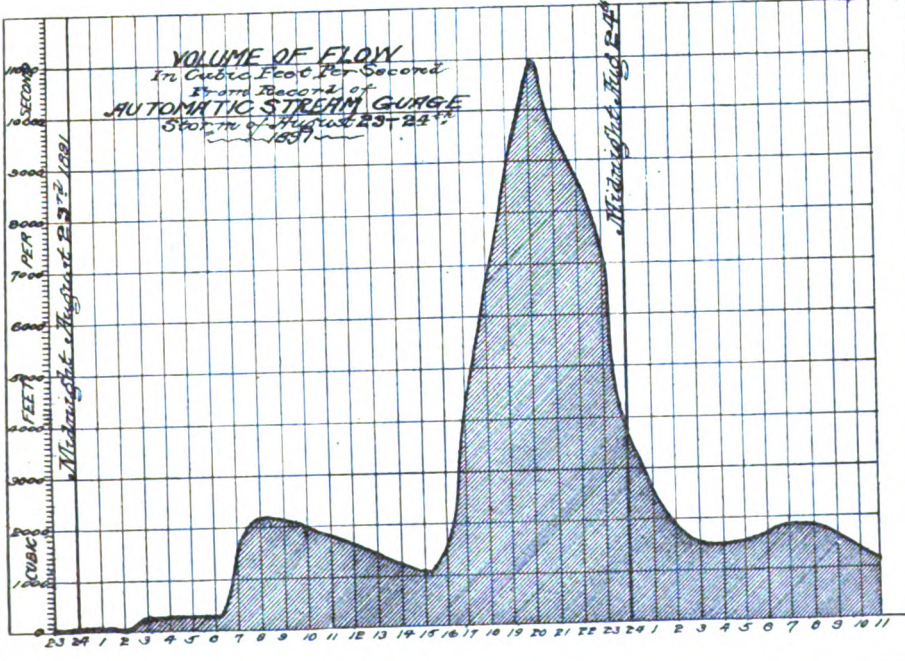
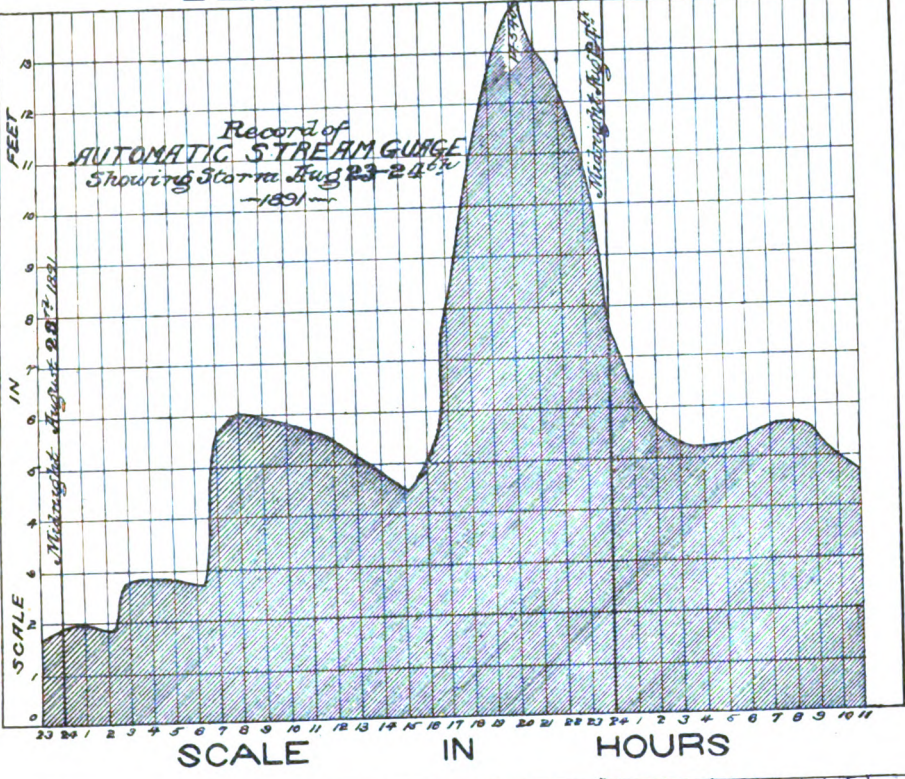
Stream.	PREVIOUSLY OBSERVED MAXIMUM FLOW.	Date.	MAXIMUM FLOW, 1891.	Date.
	Cubic feet per 24 hours.		Cubic feet per 24 hours.	
Perkiomen at Frederick.....	458,352,000	September 18, 1888.....	414,961,920	March 21st.
Neshaminy below Forks.....	498,268,800	February 11, 1886.....	283,029,120	August 24th.
Tohickon.....	479,174,400	September 18, 1888.....	272,946,240	August 24th.

TABLE 10.

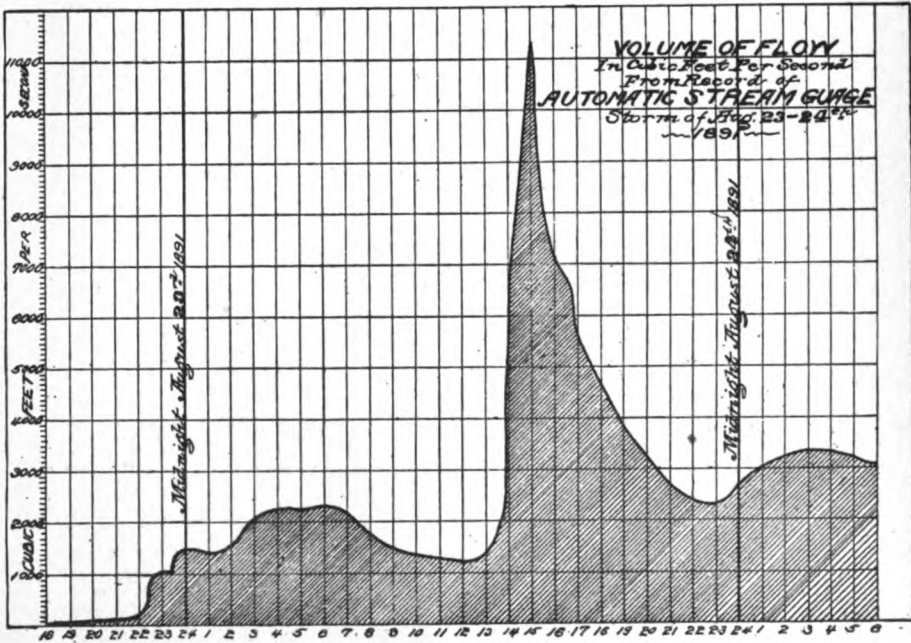
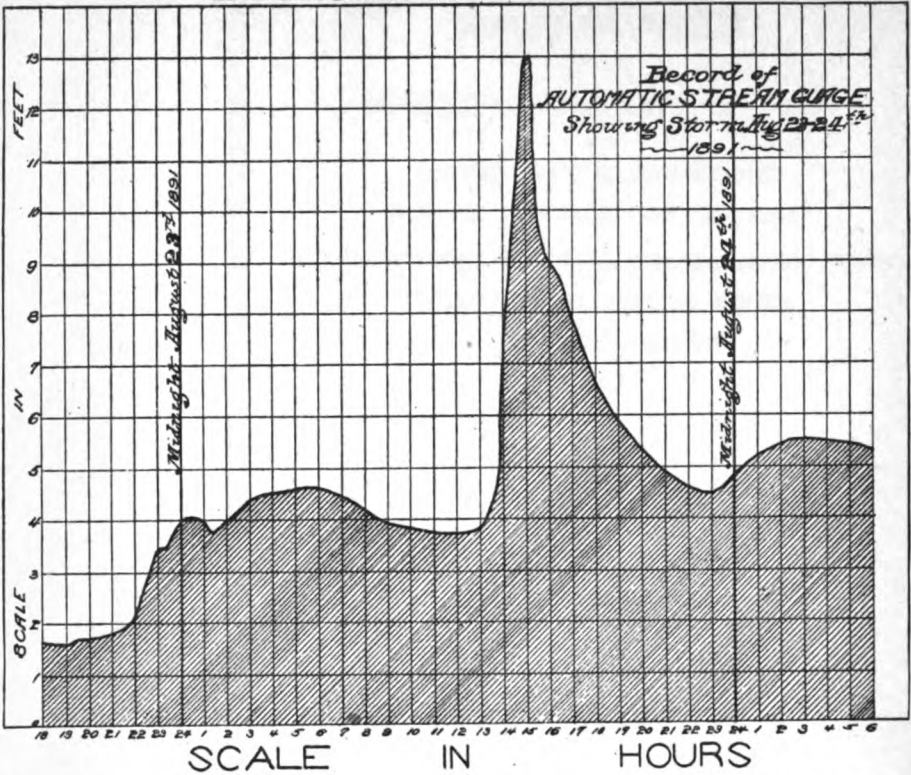
Yield on Sundry Streams for the year 1891.

Months.	PERKIOMEN CREEK, AT FREDERICK.			NESHAMINY, BELOW FORKS.			TOHICKON.		
	MONTHLY YIELD.	AVERAGE DAILY YIELD.		MONTHLY YIELD.	AVERAGE DAILY YIELD.		MONTHLY YIELD.	AVERAGE DAILY YIELD.	
	Cubic Feet.	Cubic Feet.	Gallons.	Cubic Feet.	Cubic Feet.	Gallons.	Cubic Feet.	Cubic Feet.	Gallons.
January	1,871,752,320	60,379,107	451,667,086	1,883,520,000	60,758,709	454,506,707	1,469,002,240	47,004,570	351,618,601
February.....	1,482,166,080	52,934,503	395,977,580	1,452,176,640	51,863,451	387,965,563	1,310,135,040	46,790,537	350,017,522
March.....	1,646,809,920	53,122,900	397,386,862	1,407,447,360	45,401,528	339,626,993	1,194,022,080	38,516,841	288,125,961
April.....	638,962,560	21,298,752	159,325,727	479,027,520	15,967,584	119,446,816	373,014,720	12,433,821	93,011,460
May.....	234,472,320	7,563,623	56,579,829	104,613,120	3,374,617	25,243,887	66,415,680	2,142,441	16,026,571
June.....	127,586,880	4,252,896	31,813,870	80,861,760	2,695,392	20,162,931	44,677,440	1,498,248	11,207,673
July.....	297,069,120	9,582,875	71,684,882	107,248,320	3,459,823	25,879,776	217,874,880	7,028,222	52,574,753
August.....	724,127,040	23,355,711	174,712,840	629,968,320	20,322,478	152,022,691	935,910,720	30,190,670	225,841,893
September.....	542,082,240	18,069,403	135,168,550	407,331,520	13,584,384	101,618,243	220,302,720	7,343,424	54,932,626
October.....	197,320,320	6,366,172	47,622,272	173,525,760	5,597,605	41,872,990	104,699,520	3,377,404	25,264,735
November.....	207,489,600	6,916,320	51,737,666	187,388,800	6,246,293	46,725,516	149,973,120	4,999,104	37,396,893
December.....	1,014,958,080	32,740,583	244,916,553	979,050,240	31,582,270	236,251,783	1,015,372,800	32,753,961	245,016,628
Totals.....	8,984,796,480	24,606,000	184,140,464	7,892,359,360	21,623,000	161,751,271	7,191,400,960	19,702,500	147,384,934

NESHAMINY CREEK

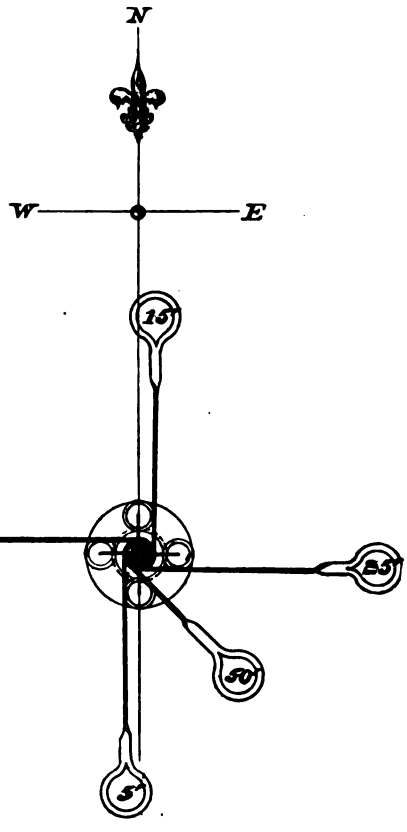
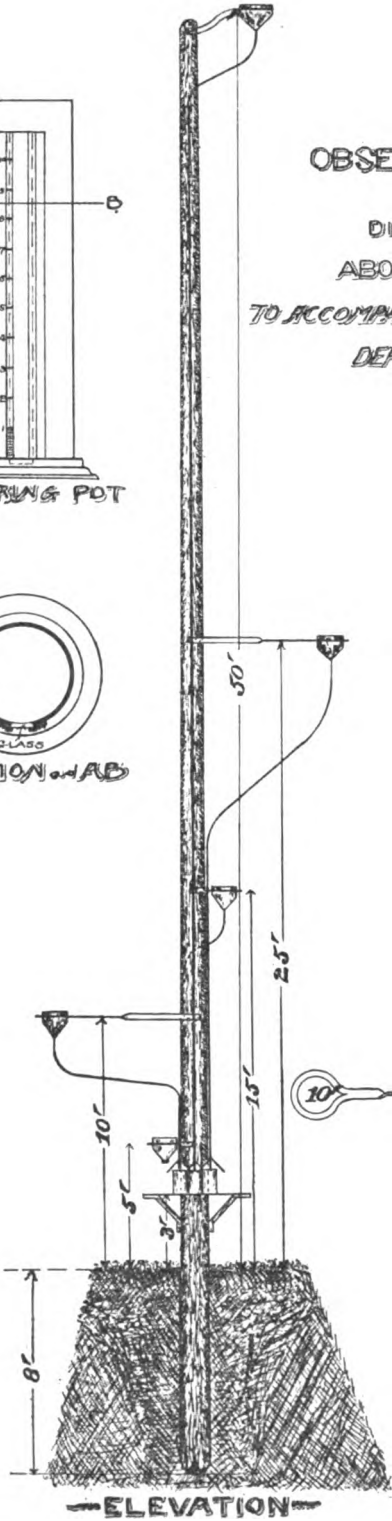
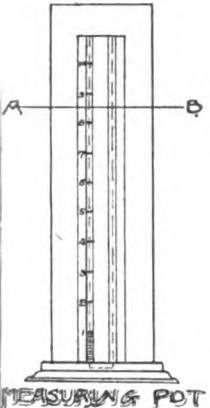


TOHICKON CREEK



RAIN GAUGES FOR OBSERVING AMOUNT OF RAIN AT DIFFERENT ELEVATIONS ABOVE SURFACE OF GROUND

*TO ACCOMPANY REPORT OF HYDROGRAPHIC WORK
DEPARTMENT OF PUBLIC WORKS
BUREAU OF WATER
1891*



—PLAN—

—ELEVATION—

APPENDIX G.

REPORT OF JOHN E. CODMAN,

CHIEF DRAUGHTSMAN.

BUREAU OF WATER

Philadelphia, January 18, 1892.

MR. JOHN L. OGDEN,

Chief, Bureau of Water.

SIR:—The following report of work under my charge in the draughting room for the year 1891 is respectfully submitted.

Seventy-five drawings relating to buildings, grounds and reservoirs have been made and recorded. These comprise general drawings and details as follows:

Eleven drawings, including specifications showing design, details and construction of a new Boiler House; thirteen drawings, including specifications showing details and construction of five steel boilers; and one drawing including specification showing details and construction of a brick stack one hundred and fifty feet high, all of which work was for the Spring Garden Pumping Station.

Fifty drawings showing details of machinery, of boilers, of steam engines and pumps, and of air pumps and valves were made for the various pumping stations.

All of these drawings required particular care and attention both in design and detail, as the responsibility for the correctness of the work is placed upon the Draughting Department.

Calculations of the horse power of over three hundred boilers and engines were made from the data furnished by the inspectors.

About seven hundred blue prints were printed.

Plans are now being prepared showing the alteration of the old building at the Spring Garden Water Works for the new twenty million gallon engine.

By your direction the Chief Draughtsman supervised the construction of the new steel boilers built by the Southwark Foundry and Machine Co. The steel plates were rolled by the Lukens Steel and Iron Co., Coatesville, Penna. The plates, to save time and expense, were inspected at the rolling mill. The test coupons attached to each plate were carefully marked for identification, and also for position of the plate in the boilers, and then forwarded to the Southwark Foundry and Machine Co. to be finished to the required size as per drawing and specification. These were then sent to the Department of Mechanical Engineering of the University of Pennsylvania, where they were tested for elastic limit, elongation and ultimate strength. Copies of the results obtained are given in the following tables. Ten observations of the applied force and elongation were made on each coupon. Diagrams showing graphically the elongation, elastic limit and ultimate strength have been made from these observations. One coupon was cut from each sheet entering into the construction of the boiler. Nine defective sheets were rejected. Seventy-three coupons in all were tested. Tests were also made of the iron used in the construction of the boiler house roof.

The steel plates used in the construction of the boiler for the Mount Airy Pumping Station were made by the Black Diamond Steel Works, Pittsburg, Penna.

The coupons were cut from the plates finished and tested under the supervision of the Chief Draughtsman. Copies of the results are given in the following tables.

The new boilers at the Spring Garden Station were set in brick work to bring the waste heat under and to the front of

the boilers. Drawings have been made to show the manner in which this was done. In the original design the boilers were covered with a non-conducting material, and no brick work setting was required. When the extra cost of setting and the repairs to the brick work are considered, it is extremely doubtful whether there is any saving by this arrangement in the cost of running.

The daily pumpage chart for the report of the Chief Engineer and the stream flow charts for the Hydrographic Report have been prepared as in previous years.

Respectfully,

JOHN E. CODMAN,
Chief Draughtsman.

TESTS OF STEEL BOILER PLATE

Made for the Department of Public Works, Bureau of Water, Philadelphia, by the University of Pennsylvania, Department of Mechanical Engineering.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION in eight inches.		REDUCTION OF AREA.				Remarks.		
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.			
506 D No. 23	1.015	.374	.3796	6,750	.....	.0042	.....	.....	.....	.....	.....	Shell of dome. Broke $\frac{4}{8}$ inches below top.		
				11,100	.....	.0072	.....	.....	.....	.....	.....		.....
				12,700	.....	.0089	.....	.....	.....	.....	.....		.....	.....
				14,600	.....	.0105	.....	.....	.....	.....	.....		.....	.....
				15,800	.....	41,600	.....	.....	.....	.....	.....		.....	.....
				16,540	.....	.....	.....	.1852	.....	.....	.....		.....	.....
				19,900	.....	.....	.....	.5000	.....	.....	.....		.....	.....
				21,300	.....	.....	.....	1.0000	.....	.....	.....		.....	.....
				21,560	.....	.....	.....	1.50	.....	.....	.....		.....	.....
				21,580	.....	.....	.....	2.00	.....	.....	.....		.....	.....
16,680	.....	.....	.....	56,850	.....	27.8	.....	.734	.230	.1688	55.5			
503 B No. 24	1.023	.558	.5708	3,080	.....	.0014	.....	.....	.....	.....	.....	Combustion chamber.		
				10,120	.....	.0045	.....	.....	.....	.....	.....		.....
				15,010	.....	.0093	.....	.....	.....	.....	.....		.....	.....
				17,000	.....	.0200	30,000	.....	.....	.....	.....		.....	.....
				19,020	.....	.1221	.....	.....	.....	.....	.....		.....	.....
				21,000	.....	.1873	.....	.....	.....	.....	.....		.....	.....
				26,700	.....	.50	.....	.....	.....	.....	.....		.....	.....
				29,420	.....	1.00	.....	.....	.....	.....	.....		.....	.....
				30,100	.....	1.50	.....	.....	.....	.....	.....		.....	.....
				30,120	.....	2.00	.....	52,768	.....	.....	.....		.....	.....
21,800	.....	.....	.....	.....	.....	28.0	.....	.6625	.3295	.2188	61.7			

Tests of Steel Boiler Plate—Continued.

21 st MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION in eight inches		REDUCTION OF AREA.				Remarks.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
502 D F No. 25	Yield Point.	.562	.5637	8,6600078	30.0	.631	.323	.2088	68.7	Back heads.
				10,130	.....	.0157				
				15,030	.....	.0189				
				16,250	.....	.0196				
				18,000	.....	.0238				
				20,080	.....	.0244				
				25,050	.....	.50				
				27,900	.....	1.00					
				28,580	.....	1.50					
				28,860	.....	2.00					
20,720	.....	2.46									
502 A F No. 26	Yield Point.	.5395	.5417	10,0800050	26.0	.727	.336	.244	54.9	Front head.
				15,070	.....	.0084				
				17,000	.....	.0127				
				19,400	.....	.0279				
				21,050	.....	.1238				
				28,030	.....	.1908				
				29,000	.....	.50				
				31,230	.....	1.00					
				32,150	.....	1.50					
				32,100	.....	2.00					
32,100	.....	2.08									
507 B No. 27	Yield Point.	.366	.3755	3,0600018	.218	.785	.248	.1947	48.1	Dome heads. Rejected.—J. E. C.
				8,030	.....	.0055				
				13,100	.....	.0093				
				15,130	.....	.0122				
				17,050	.....	.0344				
				17,300	.....	.46,071				
				17,520	.....	.1381				
				22,350	.....	.50				
				24,230	.....	1.00					
				24,250	.....	1.50					
20,600	.....	1.75									

825

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION. In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.	
505 A No. 28				3,0000036						
				9,010	.....	.0047				
				13,000	.....	.0242				
				14,010	.....	.1268				
				17,000	.....	.2390				
				19,060	.....	.50				
				20,750	.....	1.00					
				21,010	.....	1.50					
20,000	52,864	2.00	27.1								
18,700	2.17	.644								.245	.1878	60.3
503 A No. 29				3,2800020						
				9,080	.....	.0041				
				13,050	.....	.0042				
				15,080	.....	.0080				
				18,050	.....	.0266				
				2,160	.....	.31				
				27,150	.....	.50				
				30,310	.....	1.00					
				30,380	.....	1.50					
				30,150	54,617						
21,800	2.43	.0665	.846	.2306	58.6						
507 A No. 30				3,0100034						
				8,400	.....	.0051				
				13,340	.....	.0095				
				15,050	.....	.0122				
				16,6000297						
				18,6902356						
				22,12050						
				23,750	1.00						
				24,650	1.50						
				24,070	63,014						
	2.87	.780	.240	.1965	47.8						

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Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION in eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
502 E B No. 31	1.000	.574	.574	11,2000055						Back heads.
				17,0500537						
	19,020	.....	.1081							
	21,020	.....	.1775							
	21,400	.....	37,282								
	22,680	.....	.2587							
	26,120	.....	.50							
	28,150	.....	1.00								
	28,770	.....	50,122								
	24,400	.....	2.00								
23,250	.....	2.09		26.1	.641	.359	.2301	60.0			
502 B B. No. 32	1.017	.565	.5746	5,0000024						Back Heads.
				11,0400652						
	17,140	.....	.0114							
	18,020	.....	31,361								
	26,930	.....	.50							
	30,100	.....	1.00								
	30,710	.....	53,445								
	30,530	.....	2.00								
	25,000	.....	2.32		29.	.674	.340	.2292	60.0		
	502 C F 33	1.004	.586	58.83	4,9700026					
11,050				0058						
17,060		.....	.0148							
19,050		.....	.0213							
20,770		35,305									
21,480	1031									
23,000	1428									
31,010	50									
33,830		1.00									
34,100		57,964		17.7	.830	.457	.3793	35.5			

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Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
503 D No. 34	1.003	.565	.5667	11,0000044						Combustion Chamber.
				17,080	.....	.0133				
				19,000	.....	.0629				
				20,500	.....	38,174					
				21,050	.....	.1635				
				21,979	.....	.1936				
				26,210	.....	.50				
				28,100	.....	1.00					
				28,550	.....	50,379					
				27,600	.....	1.50					
				21,000	.....	2.00					
					2.23	38.0	.615	.8395	.2088	63.1		
502 A B No. 36.	.994	.565	.5616	4,9700029						Front head.
				11,050	.....	.0057				
				17,040	.....	.0096				
				19,200	.....	.0132				
				20,200	.....	35,968					
				21,000	.....	.1435				
				32,000	.....	1.00					
				32,640	.....	58,120					
				26,650	.....	1.50					
					1.97	24.6	.728	.380	.2766	50.7		
502 D B No. 36	1.014	.559	.5668	5,0000026						Back head.
				10,120	.....	.0052				
				15,050	.....	.0113				
				16,300	.....	.0998				
				21,000	.....	.2079				
				26,130	.....	.50				
				28,870	.....	1.00					
				29,360	.....	51,782					
				29,300	.....	2.00					
				24,570	.....	2.45					

Tests of Steam Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied loads.	Strain in pounds per sq. in.	ELONGATION (In Eight Inches).		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Per centage.	
503 C No. 37	Yield Point.	.990 .561 .5554	5,1000024	.610 .304 .1854	66.6	Combustion chamber.				
			10,100	.....	.0047					
			15,080	.....	.0092					
			18,400	.....							
			18,800	.....	.0948					
			25,520	.....	.50					
			27,490	.....	1.00						
			28,060	.....	1.50						
			28,080	.....	2.00						
			22,000	.....	2.29						
505 C No. 38	Yield Point.	.976 .3895 .3802	3,0300009	.655 .240 .1672	58.7	Combustion chamber.				
			8,100	.....	.0060					
			11,800	.....	.0179					
			12,200	.....	.1343					
			17,360	.....	.50					
			19,300	.....	1.00						
			19,750	.....	1.50						
			19,970	.....	2.00						
			15,200	.....	2.34						
			505 E No. 39	Yield Point.	1.011 .413 .4175							
8,6000051										
12,6200260										
13,1000893										
19,87050										
21,600	1.00										
22,630	1.50										
22,040	2.00										
18,820	2.40										

Tests of Steam Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.	
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.		
506 E No. 40	Yield Point.	.3715	.3719	3,050								Shell of dome. Defective sheet. Rejected—J. E. C.	
				8,030		.0033							
				12,000		.0065							
				15,050		.0133							
				15,250	41,006								
				19,760		.50							
				21,150		1.00							
				21,360		1.50							
21,530		2.00											
18,100		2.16	27.0	.730	.236	.1728	53.6						
507 C No. 41	Yield Point.	.3661	.3668	3,000		.0028						Dome head. Rejected—J. E. C.	
				8,020		.0064							
				13,270		.0602							
				17,820	48,582								
				18,150		.1985							
				22,200		.50							
				23,650		1.00							
				23,880		1.50							
20,870	65,104	1.79	22.4	.758	.248	.1880	48.7						
506 A No. 42	Yield Point.	.4063	.4076	2,050		.0128						Shell of dome.	
				6,050		.0150							
				11,050		.0197							
				12,700	31,168								
				13,150		.1020							
				17,760		.50							
				19,770		1.00							
				20,300		1.50							
20,600	50,540	2.00	31.6	.623	.2373	.1478	63.7						
14,240		2.53											

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in Pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.	
505 D No. 43	Yield Point.	.3951	.3983	2,0600009	28.9	.680	.261	.1707	57.2	Combustion chamber.
				6,060	.....	.0088				
				11,100	.....	.0096				
				12,640	31,735	.....					
				12,960	.....	.0448				
				19,000	.....	.50				
				20,580	.....	1.00					
				21,000	.....	1.50					
				21,200	53,225	.....					
				16,460	.....	2.00					
					2.81							
506 C No. 44	Yield Point.	.400	.4004	3,0700019	29.6	.635	.239	.1518	62.1	Shell of dome.
				8,100	.....	.0051				
				12,350	30,844	.....					
				13,010	.....	.1551				
				17,550	.....	.50				
				19,170	.....	1.00					
				19,590	.....	1.50					
				19,720	49,300	.....					
				14,750	.....	2.00					
506 B No. 45	Yield Point.	.402	.4031	3,0100147	31.0	.647	.238	.1540	61.8	Shell of dome.
				8,050	.....	.0182				
				12,150	.....	.1462				
				12,500	51,009	.....					
				17,410	.....	.50				
				19,300	.....	1.00					
				19,750	.....	1.50					
				19,850	49,243	.....					
				15,410	.....	2.00					

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in Pounds per Sq. inch.	ELONGATION In Eight Inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Per-centage.	
505 B No. 46	1.003	.402	.4032	3,000							Combustion chamber.
				8,000	.....	.0047					
				10,100	.....	.0071					
				12,100	.....	.0101					
				12,850	.....						
				31,870	.....						
		Yield	Point.	13,200	.....	.1871					
				18,500	.....	.50					
				20,520	.....	1.00					
				21,000	.....	1.50					
			21,050	.....	2.00						
			52,363	.....	2.35	29.4	.675	.2505	.1691	58.2	
502 C. B. No. 47.	1.015	.584	.5928	3,0800014						Back head.
				9,050	.....	.0039					
				15,060	.....	.0074					
				19,150	.....						
				32,304	.....						
				19,520	.....	.1284					
				26,720	.....	.50					
				29,120	.....	1.00					
				29,980	.....	1.50					
				50,776	.....	2.00					
			23,250	.....	2.18	27.21	.689	.375	.2586	56.4	
502 B. F. No. 48.	1.0008	.5568	.562	3,0600015						Front head. Rejected, J. E. C.
				9,060	.....	.0035					
				15,060	.....	.0061					
				19,900	.....						
				35,409	.....						
				20,540	.....	.1042					
				29,120	.....	.50					
				82,370	.....	1.00					
				33,190	.....	1.50					
				59,057	.....	1.63	20.0	.841	.4315	.3629	34.8

Tests of Steel Boiler Plate—Continued.

MARKS	MEASUREMENTS.			Applied load.	Strain in Pounds per sq. inch.	ELONGATION. In eight inches.		REDUCTION OF AREA.				REMARKS.		
	Breadth	Width.	Area.			Elongation in inches.	Elongation in Percentage.	Breadth	Width.	Area.	Percentage.			
502 E. B. No. 49.	Yield Point.	1.012	.5601	.5668	5,000								Defective coupon. Back head. Rejected, J. E. C.	
					11,040	.0014								
					17,000	.0944								
					19,000	.1608								
					19,640	34,652								
					21,000	.2461								
					24,780	.50								
					27,030	1.00								
					27,670	1.50								
					27,740	48,941								
					27,740	2.00								
					21,620	2.30	28.7	.6985	.341	.2382	57.9			
501 A. No. 50	Yield Point.	1.001	.612	.613	3,120								Shell. Defection coupon, (See letter from S. F. & M. Co., April 17, 1891.	
					9,270	.0013								
					15,650	.0046								
					21,200	.0076								
					21,570	.0155								
					23,000	35,187								
					31,000	.1365								
					34,600	.50								
					35,120	1.00								
					28,380	57,292	20.0	.786	.485	.320	4.78			
504 B. No. 51.	Yield Point.	1.005	.571	.574	3,010								Spandrells.	
					10,400	.007								
					15,000	.0054								
					16,170	.0108								
					17,510	.1242								
					24,520	.50								
					27,720	1.00								
					28,620	1.50								
					28,750	50,090								
					19,370	2.66	33.2	.611	.322	.197	65.7			

Tests of Steel Boiler Plate.—Continued.

MARKS.	MEASUREMENTS.			Applied load	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
504 A. No. 52.	Yield Point.	.570	.573	3,0000014						
				9,970	.....	.0045				
				15,120	.....	.0997				
				17,050	.....	29,756					
				19,000	.....	.1366				
				25,760	.....	.50				
				28,970	.....	1.00					
				29,590	.....	1.50					
				29,700	.....	51,832					
				20,870	2.68							33.5	.638	.306	.195	66.0
500 D No. 53	Yield Point.	.612	.615	3,1200010						
				9,220	.....	.0038				
				16,100	.....	.0073				
				23,000	.....	37,398					
				23,550	.....	.1349				
				31,600	.....	.50				
				34,780	.....	1.60					
				35,630	.....	1.50					
				35,770	.....	58,162					
				26,620	2.29							28.6	.677	.392	.265	56.9
501 C No. 54	Yield Point.	.648	.647	3,0700012						
				9,040	.....	.0041				
				18,010	.....	.0081				
				22,650	.....	.0171				
				23,320	.....	36,043					
				24,460	.....	.0866				
				35,300	.....	.50				
				38,540	.....	1.00					
				39,270	.....	1.50					
				39,700	.....	61,360					
81,850	2.08	26.0	.710	.450	.320	50.5					

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.	
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.		
501 B No. 56	Yield Point.	.645	.650	3,050	.....	.0011						Shell.	
				9,050	.....	.0037							
				15,000	.....	.0063							
				21,750	.....	.0301							
				22,520	.....	34,646							
				23,000	.....	.0806							
				32,860	.....	.50							
				36,350	.....	1.00							
				37,170	.....	1.50							
				37,400	.....	57,536							
						2.25	28.1	.648	.417	.270	58.5		
503 E No. 56	Yield Point.	.567	.570	3,170	.....	.0032						Combustion chamber.	
				9,075	.....	.0065							
				15,075	.....	.0125							
				16,000	.....	28,070							
				16,500	.....	.0780							
				24,209	.....	.50							
				27,000	.....	1.00							
				27,730	.....	1.50							
				27,840	.....	48,842							
										2.50	31.2		.617	.298	.184	67.7
500 C No. 57	Yield Point.	.622	.630	3,170	.....	.0014						Shell.	
				9,140	.....	.0040							
				15,040	.....	.0071							
				21,850	.....	34,683							
				22,000	.....	.0808							
				31,650	.....	.50							
				35,100	.....	1.00							
				35,730	.....	1.50							
				35,800	.....	56,825							
										2.14	26.0		.689	.380	.262	58.4

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
T 23 502 E F No. 58	1.008	.560	.562	14,800 27,540 21,720	26,334 49,004	Yield. 2.52	Point. 31.5	......645	......338	......218	..... 61.2	Second test on this is now passed.—J. E. C. Front head.
500 B No. 59	1.007 Yield	.630 Point.	.634	3,000 9,170 15,720 22,960 23,500 32,800 36,250 37,010 31,100	..... ..... ..... 36,214 58,375 .....	..... ..... ..... ..... ..... ..... 1.00 1.50 1.95	..... ..... ..... ..... ..... ..... ..... ..... ..... ..... 24.3	...................................................740	...................................................422	...................................................312	..... ..... ..... ..... ..... ..... ..... ..... ..... ..... 60.8	Shell.
500 A No. 60	1.011 Yield	.619 Point	.626	3,040 9,170 15,130 23,500 25,000 33,280 36,000 36,450 36,460 28,970	..... ..... ..... 37,540 58,243 .....	..... ..... ..... ..... ..... ..... 1.00 1.50 2.00 2.08	..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... 26.0	........................................................730	........................................................414	........................................................302	..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... 51.8	Shell.

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in Pounds Per Sq. In.	ELONGATION in Eight Inches.		REDUCTION OF AREA.				REMARKS.					
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Percentage.						
509 A No. 61	1.007	.505	.509	3,0700017						Butt Straps.					
				9,000	.....	.0049									
				15,010	.....	.0173									
				15,600	30,648	.....										
				16,050	.....	.0880									
				22,900	.....	.50									
				25,160	.....	1.00										
				25,700	.....	1.50										
				25,770	50,628							2.00				
				19,150	2.62							32.7	.679	.320	.217	57.4
508 A No. 62	1.004	.381	.383	2,0400014						Butt straps.					
				7,010	.....	.0049									
				12,060	.....	.0085									
				17,110	44,678	.....										
				17,500	.....	.2867									
				19,500	.....	.50									
				20,510	.....	1.00										
				20,580	53,734							1.50				
				20,580	1.70							21.2	7.59	.222	.168	56.1
				509 B No. 63	1.007	.501							.505	3,0100014	
9,000	.....	.0051													
15,480	.....	.0127													
16,200	32,079	.....														
17,010	.....	.1109													
23,350	.....	.50													
25,670	.....	1.00														
26,150	.....	1.50														
26,180	51,841	.....	2.00													
20,950	2.27	.712				?										

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION in eight inches.		REDUCTION OF AREA.				REMARKS.	
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.		
502 EF No. 149	Yield	Point.	.575	3,000	.....	.0012						Front head. New plate, to replace Coupon No. 49.	
				9,050	.....	.0040							
				15,120	.....	.0088							
				19,300	.....	33,565							
				21,070	.....	.....	1.00						
				29,200	.....	.....	.50						
				32,020	.....	.....	1.50						
				32,640	56,730	25.3	.768	.428		.325	43.5
500 H No. 150	Yield	Point.	.641	2,970	.....	.0012					Shell.		
				9,070	.....	.0038							
				15,100	.....	.0078							
				19,500	.....	30,516							
				21,500	.....	.....	1.090						
				29,900	.....	.....	.50						
				32,950	.....	.....	1.00						
				33,680	52,739	26.5	.704		.424	.298	58.4
500 G No. 151	Yield	Point.	.649	3,140	.....	.0013					Shell.		
				9,750	.....	.0040							
				15,100	.....	.0071							
				19,480	30,015							
				21,500	1.028						
				30,00050						
				33,700	1.00						
				34,600	53,314	26.1	.695		.425	.295
27,800	2.09								

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Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
500 I No. 152	Yield Point.	.634	.633	3,520								Shell.
				9,070		.0018						
				15,020		.0056						
				18,600	29,384							
				21,030		.1245						
				28,900		.50						
				32,000		1.00						
				33,200		1.50						
33,440	52,828		2.00									
					2.20	27.5	.662	.393	.260	59.0		
500 J No. 153	Yield Point.	.658	.654	3,000		.0011						Shell. Another coupon to be tried, J. E. C.
				9,020		.0035						
				16,000		.0060						
				21,050		.0135						
				21,800	33,833							
				23,000		.0878						
				34,750		.50						
				37,800		1.00						
38,600	59,022		1.51		19.	.837	.538	.450	31.2			
500 E No. 154	Yield Point.	.630	.627	3,200		.0013						Shell.
				9,100		.0038						
				15,180		.0074						
				19,000	30,302							
				21,030		.1028						
				28,950		.50						
				32,050		1.00						
				32,760		1.50						
32,800	52,313		2.00									
					2.57	32.1	.667	.400	.263	58.		

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS			Applied load.	Strain in Pounds Per Sq. In.	ELONGATION In Eight Inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Per-centage.	
500 K No. 155	Yield Point.	.628	.627	2,9700014	27.7	.690	.410	.288	54.9	Shell.
				9,200	.....	.0040				
				15,050	.....	.0073				
				19,300	30,781	.....					
				21,030	.....	.1277				
				28,620	.....	.50				
				31,670	.....	1.00					
				32,500	.....	1.50					
				32,520	51,865	.....					
				26,040	.....	2.22					
501 E No. 156	Yield Point.	.630	.631	3,0000022	23.1	.655	.393	.257	59.3	Shell.
				9,000	.....	.0046				
				15,090	.....	.0090				
				19,500	30,903	.....					
				21,500	.....	.1146				
				29,400	.....	.50				
				32,450	.....	1.00					
				33,000	.....	1.50					
				33,000	52,300	.....					
				26,800	.....	2.25					
502 C F No. 157	Yield Point.	.575	.575	3,0000013	32.6	.684	.345	.219	61.9	Front head.
				9,000	.....	.0042				
				15,075	.....	.0109				
				16,500	28,695	.....					
				18,000	.....	.1094				
				25,000	.....	.50				
				27,790	.....	1.00					
				28,500	.....	1.50					
				28,600	49,740	.....					
				22,300	.....	2.61					

Tests of Steel Boiler Plate—Continued.

21 ¹⁵ MARKS.	MEASUREMENTS.			Applied Load.	Strain in Pounds per Sq. Inch.	ELONGATION (In Eight Inches).		REDUCTION OF AREA.				REMARKS.	
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Percentage.		
501 D No. 158	Yield	.639	.638	3,0000013							Shell.
				9,100	.....	.0037					
				15,150	.....	.0070					
				20,230	.....							
				21,200	.....	.0895					
				31,600	.....	.50					
				34,600	.....	1.00						
				35,400	.....	1.50						
35,430	55,533	2.00	26.	.706	.433	.306	52.0					
28,550	.....	2.03										
500 F. No. 159.	Yield	.648	.646	3,0000011							Shell.
				9,120	.....	.0035					
				15,100	.....	.0070					
				18,630	.....							
				21,020	.....	.1201					
				29,500	.....	.50					
				32,380	.....	1.00						
				33,000	.....	1.50						
33,020	51,114	2.00	31.1	.641	.406	.260	59.7					
26,320	.....	2.49										
501 F. No. 160.	Yield	.661	.660	3,0200011							Shell.
				9,090	.....	.0034					
				15,090	.....	.0074					
				19,700	.....							
				21,000	.....	.0851					
				31,320	.....	.50					
				34,220	.....	1.00						
				35,340	.....	1.50						
28,800	53,545	2.00	25	.691	.445	.307	53.5					

Tests of Steel Boiler Plate—Continued.

MARKS	MEASUREMENTS.			Applied load.	Strain in Pounds per sq. inch.	ELONGATION. In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Per-centage.	
502 B. F. No. 161.	1.000	.574	.574	3,1000018						Front head. New plate to replace Coupon No. 48.
	Yield	Point.		9,070	.....	.0041					
				15,110	.....	.0092					
				17,000	.....						
				19,040	.....	.1091					
				27,480	.....	.50					
				30,270	.....	1.00					
				30,820	.....	1.50					
				30,830	.....	2.00					
				24,700	.....	2.22	27.7	.659	.333	.219	61.9
506 E. 507 A.D. No. 162.	1.001	.380	.380	2,0200014						Second test. J. E. C. Shell of dome and dome heads.
	Yield	Point.		6,030	.....	.0042					
				11,050	.....	.0087					
				13,500	.....						
				13,820	.....	.1661					
				17,900	.....	.50					
				19,540	.....	1.00					
				19,950	.....	1.50					
				19,970	.....	2.00					
				14,730	.....	2.86	29.5	.666	.215	.143	62.4
501 G. No. 163.	1.007	.644	.649	3,0000011						Rejected.
	Yield	Point.		9,010	.....	.0035					
				15,100	.....	.0057					
				22,000	.....	.0098					
				26,220	.....						
				26,920	.....	1.008					
				35,670	.....	.50					
				39,300	.....	1.00					
				39,700	.....	1.50					
				40,500	.....	1.77	22.1	.956	.529	.506	22.0

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.	
507 E. No. 164	1.003	.413	.414	2,0000012	27.1	.698	.264	.176	57.5	
				7,000	.....	.0044				
				12,000	.....	.0092				
				14,480	34,976	.....					
				15,000	.....	.1161				
				19,900	.....	.50				
				23,050	.....	1.00					
				23,500	.....	1.50					
				23,500	56,763	.....					
				18,500	.....	2.00					
						2.17						
501 H No. 165	1.023	.647	.662	3,0000010	30.6	.709	.435	.308	53.5	
				9,100	.....	.0054				
				15,400	.....	.0079				
				20,900	31,571	.....					
				23,300	.....	.50				
				26,750	.....	1.00					
				27,570	.....	1.50					
				28,120	57,588	.....					
				31,070	.....	2.00					
501 J No. 166	1.005	.646	.649	3,0500007	29.4	.630	.371	.234	62.9	
				9,000	.....	.0032				
				15,150	.....	.0050				
				19,800	30,508	.....					
				20,350	.....	.0988				
				22,000	.....	.50				
				32,000	.....	1.00					
				33,000	.....	1.50					
				33,020	50,878	.....					
				28,900	.....	2.35					

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ENLARGEMENT in eight inches.		REDUCTION OF AREA.				REMARKS.	
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.		
500 T No. 167	Yield Point.	.654	.661	3,100	.....	.0010						Rejected—J. E. C.	
				9,010	.....	.0052							
				15,300	.....	.0061							
				21,070	.....	.0085							
				27,630	.....	41,634							
				28,030	.....		.1402						
				36,950	.....		.50						
				40,400	.....		1.00						
				40,800	.....		61,706		1.50				
				40,800				1.56	19.5	.894		.560	.501	24.1
500 L No. 168	Yield Point.	.650	.653	3,000	.....	.0008							
				9,070	.....							
				15,110	.....							
				19,420	.....	29,739							
				20,000	.....		.0859						
				29,520	.....		.50						
				32,550	.....		1.00						
				33,640	.....		51,531		1.50				
				33,650	.....				2.00				
				24,500				2.23	28.0	.629		.389	.245	62.5
501 I No. 169	Yield Point.	.640	.643	3,000	.....	.0009							
				9,120	.....							
				15,550	.....		.0055						
				22,100	.....	34,375							
				24,020	.....		.0803						
				35,060	.....		.50						
				37,950	.....		1.00						
				38,520	.....		59,953		1.50				
				38,550	.....				2.00				
				28,950				2.17	27.1	.687		.413	.284	55.8

778

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied Load.	Strain in Pounds Per Sq. In.	ELONGATION In Eight Inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in Inches.	Elongation in Percentage.	Breadth	Width.	Area.	Percentage.	
500 M No. 170	1.003	.644	.646	3,050	.....	.0011						
				9,020	.....	.0057						
				15,020	.....	.0087						
				20,100	31,115							
				21,300	.....	.0866						
				30,150	.....	.50						
				32,300	.....	1.00						
				33,910	.....	1.50						
				34,040	52,694							
				24,330	.....	2.27	28.4	.649	.377	.245	62.1	
500 S No. 171	1.015	.631	.640	3,000	.....	.0013						
				9,060	.....	.0057						
				15,020	.....	.0056						
				21,070	.....	.0123						
				22,500	35,156							
				23,210	.....	.0837						
				34,410	.....	.50						
				37,460	.....	1.00						
				38,070	.....	1.50						
				38,100	59,531							
			29,700	.....	2.21	27.6	.703	.414	.291	54.5		
500 J No. 172	1.008	.655	.660	3,060	.....	.0010						
				9,000	.....	.0032						
				15,050	.....	.0067						
				21,150	.....	.0097						
				23,000	34,848							
				24,000	.....	.0848						
				35,720	.....	.50						
				38,990	.....	1.00						
				39,350	58,106							
				39,350	.....	1.66	20.7	.770	.504	.388	41.2	

943

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.	
500 N No. 173	Yield	.623	.627	3,1000036	30.6	.652	.359	.254	62.7	Shell
				9,050	.....	.0062				
				12,350	.....	.0109				
				20,300	.....						
				20,750	.....	.1877				
				27,800	.....	.50				
				31,020	.....	1.00					
				31,820	.....	1.50					
				31,900	.....	2.00					
				22,980	.....	2.45					
500 O No. 174	Yield	.655	.663	3,0300012	23.4	.728	.437	.318	52.	Shell.
				9,070	.....	.0038				
				15,100	.....	.0068				
				20,950	.....	.0084				
				23,000	.....						
				23,800	.....	.0922				
				34,720	.....	.50				
				38,230	.....	1.00					
				38,800	.....	1.50					
				38,850	.....	1.87					
500 R No. 175	Yield	.523	.629	3,2000018	27.3	.709	.422	.299	52.5	Shell.
				9,010	.....	.0037				
				15,120	.....	.0058				
				21,140	.....	.0137				
				22,610	.....						
				22,900	.....	.1048				
				33,550	.....	.50				
				36,720	.....	1.00					
				37,410	.....	1.50					
				37,470	.....	2.00					
30,250	.....	2.22									

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.	
500 Q No. 176	1.002	.641	.642	8,0000012						Shell
				9,0700037						
	15,000	.....	.0064							
	21,080	.....	.0184							
	23,000	35,826	.....								
	24,500	.....	.1059							
	34,500	.....	.50							
	37,460	.....	1.00								
	38,000	.....	1.50								
	38,000	59,190	2.00								
	30,080	2.09	.26.1	.704	.418							.291	54.7
500 P No. 177	1.010	.638	.644	8,0200012						
				9,0600035						
	15,060	.....	.0065							
	20,990	.....	.0226							
	21,250	32,997	.....								
	22,260	.....	.0815							
	33,600	.....	.50							
	37,140	.....	1.00								
	37,660	.....	1.50								
	37,700	53,540	2.00								
	29,170	2.18	.27.8	.704	.424							.298	53.7
90 501 G No. 178	.998	.644	.643	7,4800037						Rejected. J. E. C.
				15,5000071						
	24,800	38,569	.....								
	25,650	.....	.1051							
	35,100	.....	.50							
	38,170	.....	1.00								
	38,920	.....	1.50								
	39,000	60,651	1.63	20.4	.801							.499	.404	37.1

Tests of Steel Boiler Plate—Continued.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.	
	Breadth	Width.	Area.			Elongation in inches	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.		
89	.996	.643	.640	7,500	.....	.0016						
500				10,950	.....	.0035						
				21,270	33,234								
				22,430	.....	.1521						
T	Yield	Point.		29, 00	.....	.50						
No. 179				32,200	.....	1.00						
				32,670	.....	1.50						
				32,770	51,203	2.00							
				27,100	.....	2.44	30.5	.622	.381	.237	.63	
501	.987	.640	.6317										
G	Yield	Break ing.		23,300	36,880								
No. 187				39,260	62,140	.....	19.2	.....	.....	.3496	44.6	
507	1.029	.866	.3766										
A	Yield	Point.		16,690	44,237	.....						
No. 30				24,070	63,914	1.87	23.3	.789	.249	1965	47.8	Dome heads. Rejected. J. E. C.

TESTS OF WROUGHT IRON BARS

Made for the Department of Public Works, Bureau of Water, Philadelphia, by the University of Pennsylvania, Department of Mechanical Engineering.

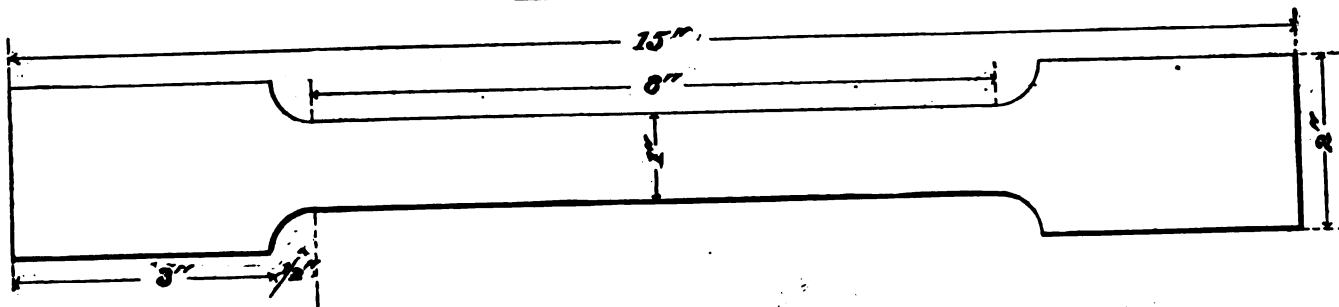
MARKS.	MEASUREMENTS.			Applied Load.	Strain in pounds per sq. inch.	ELONGATION ° In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Per-centage.	
No. 147	.748	.754	.564	22,100	89,185	1.60	20.0	.629	.634	.899	29.2	Tension rods, roof of boiler house.
				28,000	49,645	.....	.....	.....	.....	.....	.....
No. 148	.750	.785	.566	22,500	89,750	1.62	20.3	.622	.622	.387	31.6	Tension rods, roof of boiler house.
				33,200	58,660	.....					

TESTS OF STEEL BOILER PLATE

Made for the Department of Public Works, Bureau of Water, Philadelphia, by the Testing Department of Henry Warden, Germantown Junction, by John E. Codman.

MARKS.	MEASUREMENTS.			Applied load.	Strain in pounds per sq. inch.	ELONGATION In eight inches.		REDUCTION OF AREA.				REMARKS.
	Breadth	Width.	Area.			Elongation in inches.	Elongation in percentage.	Breadth	Width.	Area.	Percentage.	
1 S	.383	1.375	.5266	19,300 28,390	36,600 53,973	2.260	28.	.214	.990	.2118	60.	Yield point. Shell.
2 S	.388	1.281	.497	18,870 27,050	37,970 54,426	1.595	20.	.236	.982	.2199	55.7	Defective coupon, rejected.
2 S	.393	1.484	.5635	18,560 29,250	32,906 51,861	2.332	29.	.244	1.180	.2879	.49	Yield point. Shell. 2d coupon.
1 C	.387	1.420	.5495	18,960 31,540	34,400 57,345	2.269	28.	.285	1.051	.2995	45.6	Yield point.
2 C	.387	1.282	.496	17,090 27,270	34,455 54,980	1.968	24.	.260	.906	.2353	52.6	Yield point.
1 S H	.515	1.321	.680	22,650 38,580	33,310 56,785	2.335	29.	.292	.949	.2771	59.	Yield point. Inside head.
2 S H	.514	1.268	.644	20,400 34,700	31,677 53,882	2.245	28.	.318	.861	.2788	57.5	Yield point. Inside head.
F H	.579	1.623	.9397	29,000 54,210	30,861 57,670	2.245	28.	.397	1.186	.471	50.	Yield point. Front head.

— BEFORE TEST —



— AFTER TEST —

10.45"
Elongation 2.45"
31%
Reduction in Area
57%

FORM OF TEST COUPON
FROM

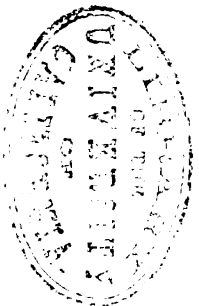
STEEL PLATES

Used in Constructing New Boilers at
SPRING GARDEN PUMPING STATION

BUREAU of WATER
TESTS

DEPARTMENT of PUBLIC WORKS

JOHN L. OSBORN
Chief Engineer

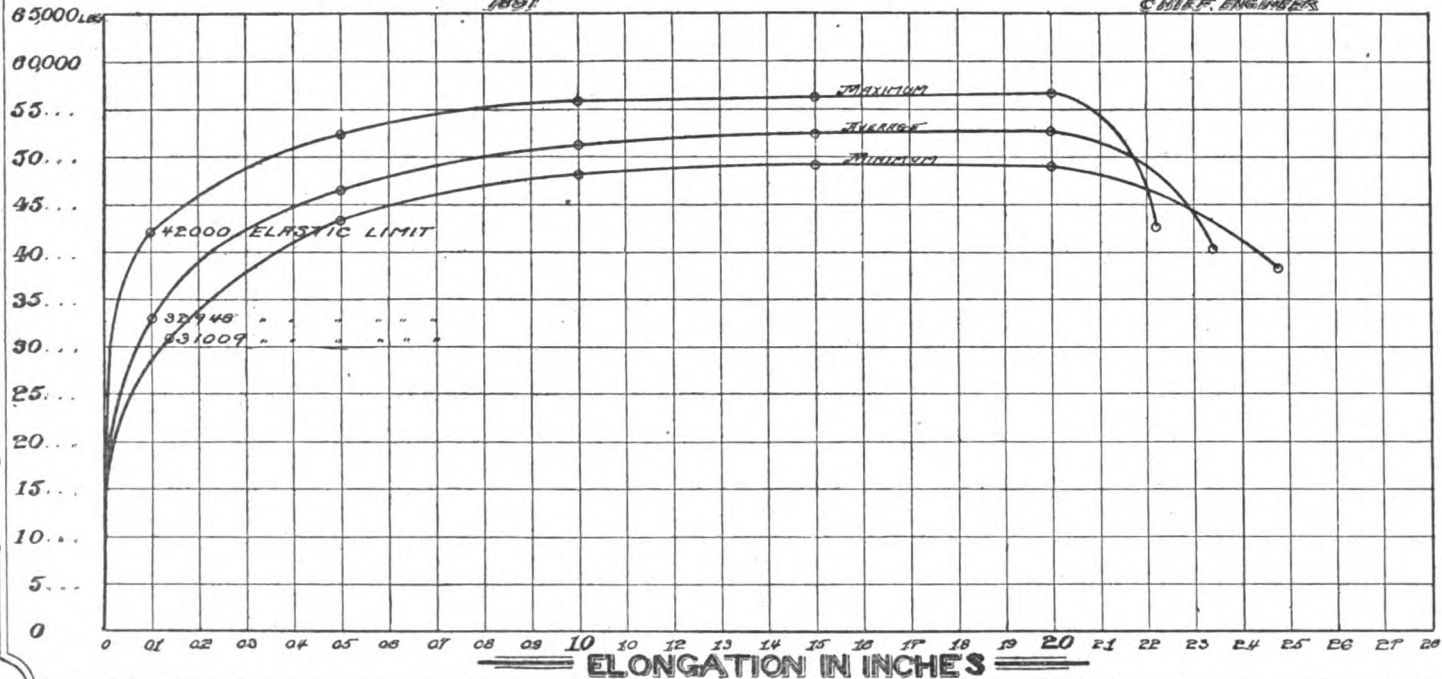


STRAIN DIAGRAM OF STEEL COMBUSTION CHAMBER PLATES USED IN NEW BOILERS SPRING GARDEN PUMPING STATION

BUREAU OF MINES
1891

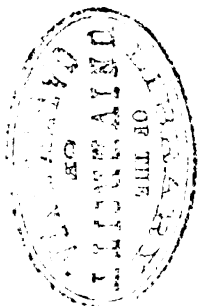
DEPARTMENT OF PUBLIC WORKS

JOHN L. OGDEN
CHIEF ENGINEER



ELONGATION IN INCHES

SMITHSONIAN

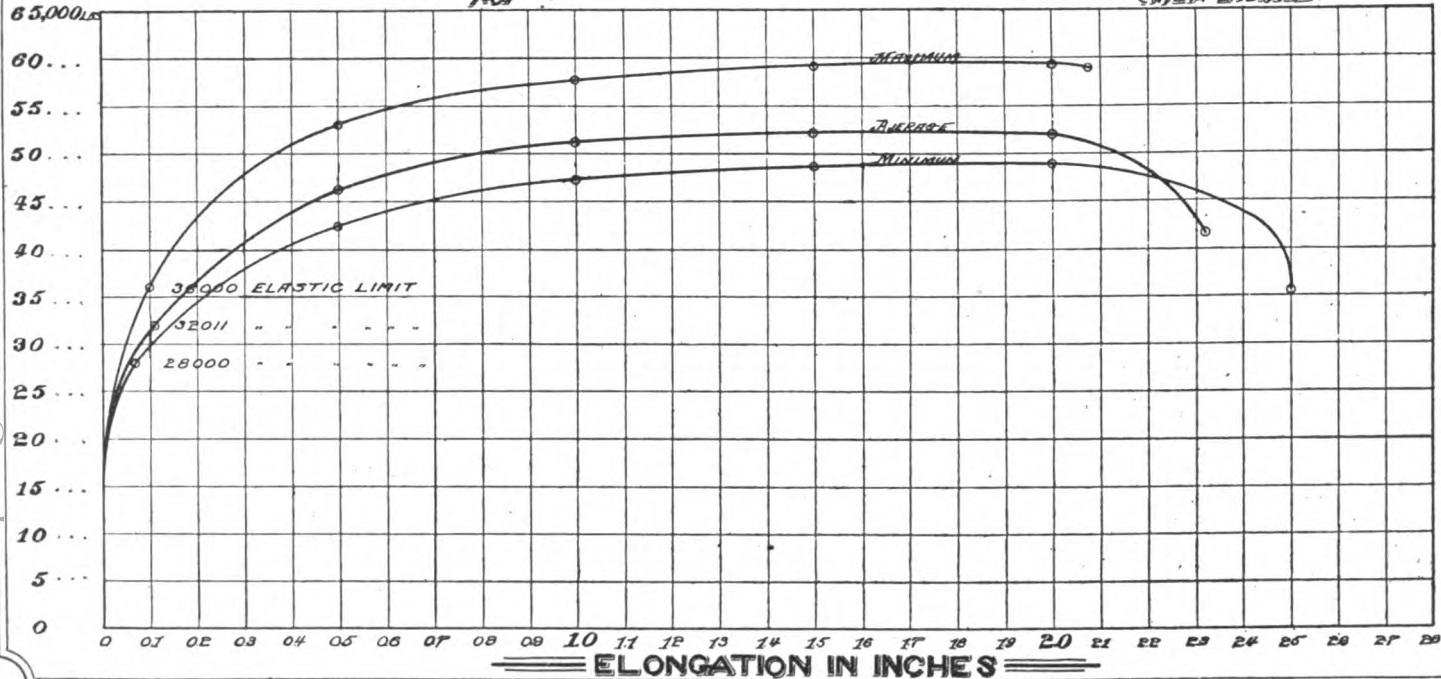


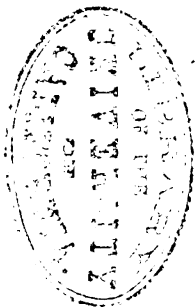
STRAIN DIAGRAM OF STEEL HEAD PLATES USED IN NEW BOILERS SPRING GARDEN PUMPING STATION

BUREAU OF WATER
1931

DEPARTMENT OF PUBLIC WORKS

JOHN LOGDEN
CHIEF ENGINEER



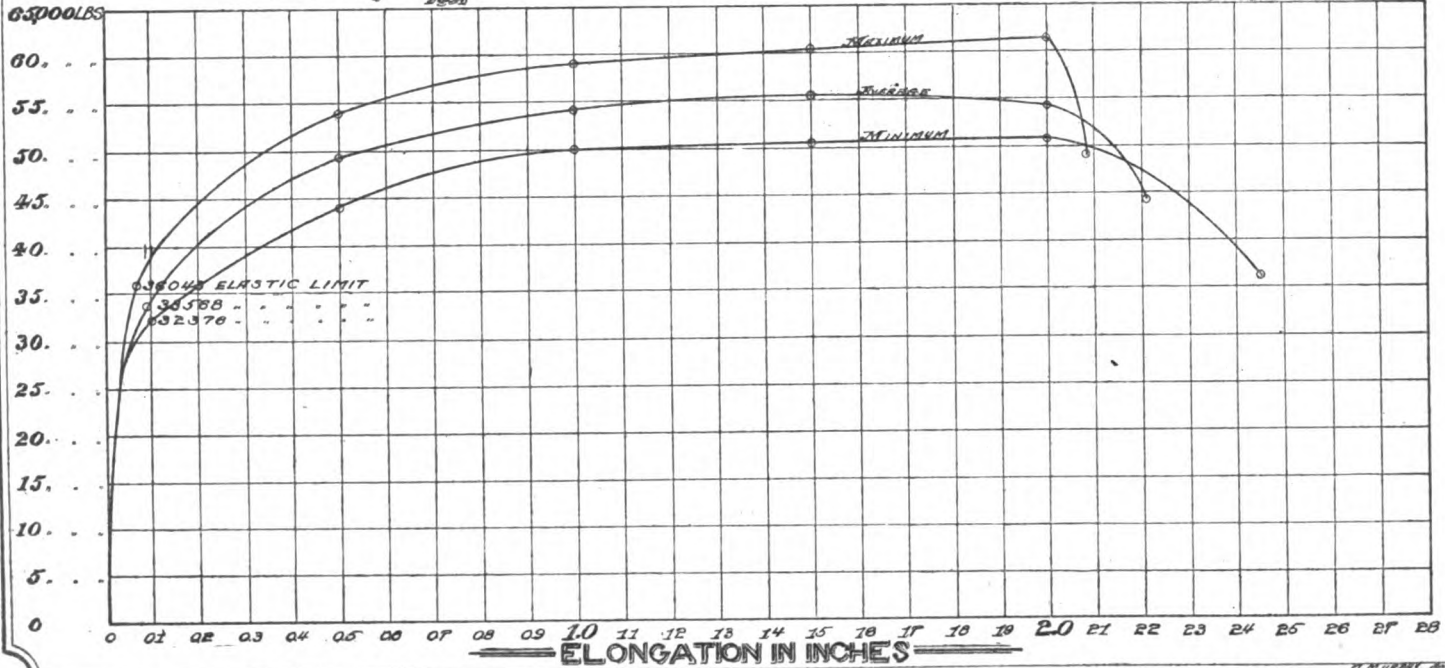


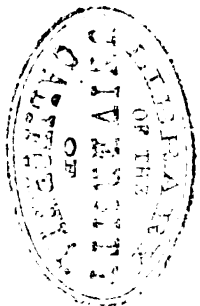
STRAIN DIAGRAM OF STEEL SHELL PLATES USED IN NEW BOILERS SPRING GARDEN PUMPING STATION

BUREAU of WATER
1891


DEPARTMENT of PUBLIC WORKS

JOHN L. OSDEN
CIVIL ENGINEER





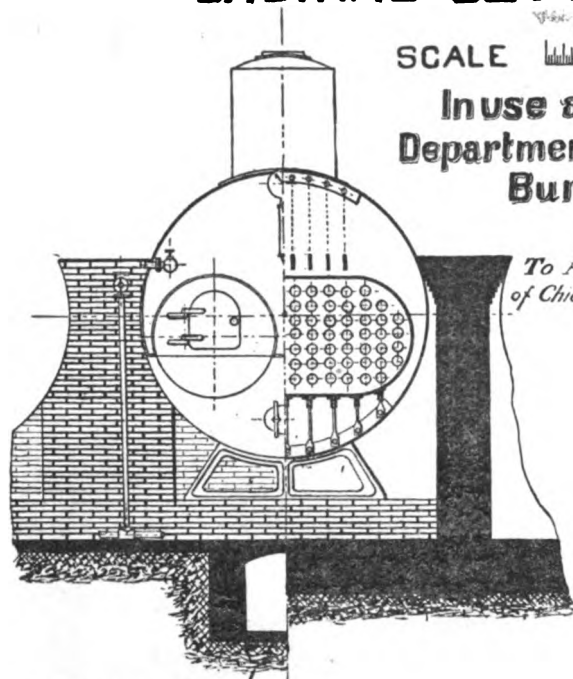
FURNACE FLUE AND TUBULAR BOILER SHOWING SETTING IN BRICK WORK

SCALE 

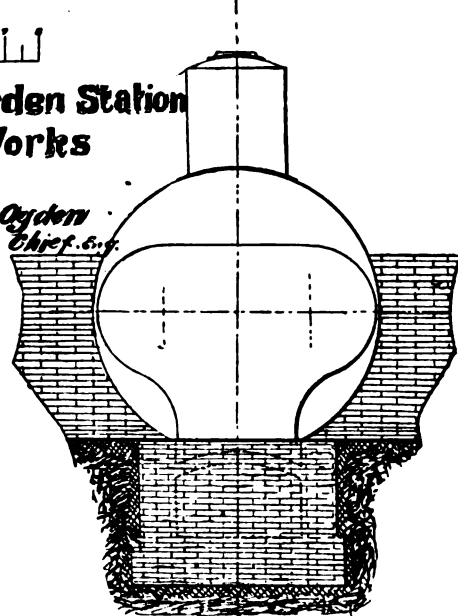
In use at Spring Garden Station
Department of Public Works
Bureau of Water

John L. Ogden
Chief. 6. 6.

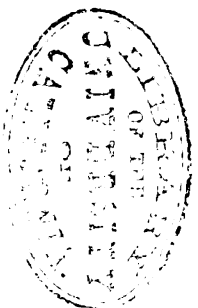
*To Accompany Report
of Chief Druggsman.*



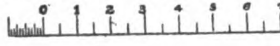
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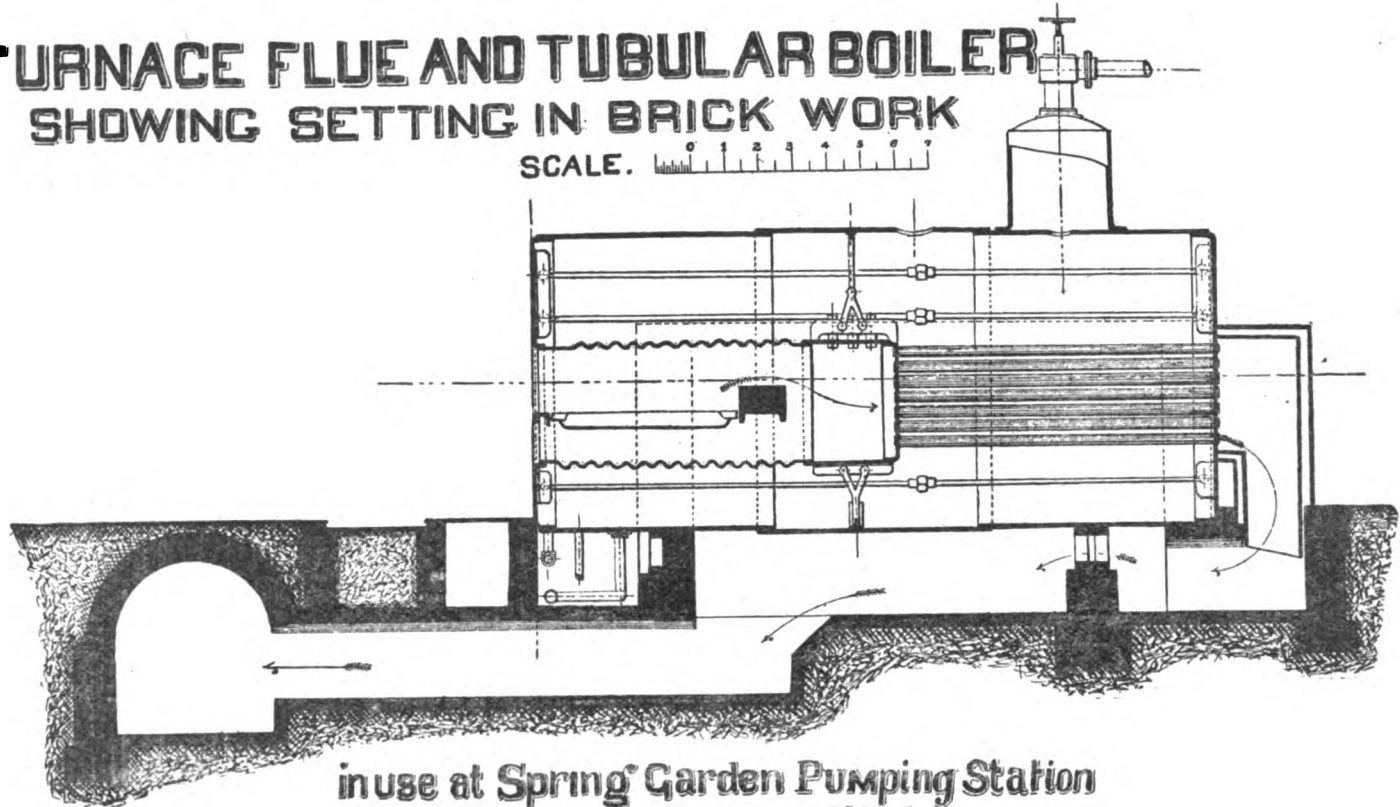


BACK END



FURNACE FLUE AND TUBULAR BOILER SHOWING SETTING IN BRICK WORK

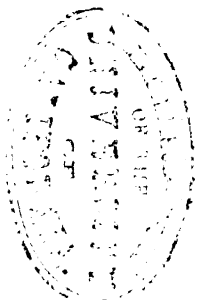
SCALE. 



in use at Spring Garden Pumping Station
Department of Public Works Bureau of Water

To Accompany Report of Chief Draftsman.

John I. Ogden Chief &c.



APPENDIX H.

PROPOSED SYSTEM OF WATER SUPPLY FROM SOUTHERN NEW JERSEY.

Philadelphia, May 13, 1891.

To JOSEPH WHARTON, Esq.,

SIR:—In accordance with your instructions to examine and report upon the quantity of water available from the several branches of Mullica River and of the Rancocas, near Taunton, New Jersey, and means for delivering the same to Camden and Philadelphia, I have the honor to report as follows:

These streams belong to a class peculiar to the Atlantic slope of the United States, which have been designated Sand-hill streams by Prof. George F. Swain in his Report upon Water Power for the Tenth Census, which designation I have adopted as descriptive of marked peculiarities of flow which I shall point out hereafter.

The Gathering Grounds.

The water sheds of the upper Rancocas and Mullica River lie in the great pine belt of New Jersey. The soil here is of the Tertiary formation, consisting of sand and gravel, supporting a light growth of pine and cedar timber, with scanty undergrowth. In many places no vegetable mold whatever is to be found, nothing but a clean, white sand. Population is very scanty. From the Physical Description of New Jersey, published by the Geological Survey, it is found to be but

nineteen to the square mile on the Mullica above Batsto, seven to the square mile on Wading river, and no more on the upper Rancocas.

As a consequence nearly all of the region is a forest. Only from one to five per cent. of cultivated land is found on nearly the whole of the proposed gathering ground.

To those who are familiar with the geography of Southern New Jersey, the region is best described as stretching along the New Jersey Southern Railroad from Winslow Junction to Woodmansie, twenty-five miles northeast, and extending about ten miles on either side. A trip over this line of railroad will give a good idea of the character of the tract.

The nature of the soil is to permit very free percolation of the water which falls upon it in rain. No matter how heavy the fall may be, it is a rare sight to see any surface water flowing; sinking at once into the earth it finds its way gradually through the clean sand and gravel to the streams. The consequence is that there is no carrying of effete vegetable and animal matters into the water courses to lie there and pollute them, such as always occurs when there is a rush of surface waters over steep slopes and impervious soils after heavy showers; nor is there ever the slightest muddiness. Another fact favorable to the continued purity of these waters deserves mention: Once the bed of a reservoir is thoroughly cleaned of its scanty vegetable growth there is little tendency to renew it. A very slight depth of water serves to check it entirely, and the sand remains clean, as upon the seashore. This fact may be observed in many existing shallow ponds. The tendency of water to keep pure and sweet in this region, under conditions which would, in many places, cause serious trouble, has been frequently remarked. Even where great tracts have been flowed to a depth of only a foot or so, without destroying the vegetable growth, miasmatic diseases are unknown.

It is seen, therefore, that conditions of unusually small population, slight vegetation and a most efficient natural

filtration exist, all favorable to preserve these waters in their present condition of purity and freedom from those deadly animal and vegetable organisms which modern research has shown to be justly dreaded, and nowhere more carefully guarded against than in our public water supplies.

Quantity of Water Available.

The considerations of ready percolation above noted, besides contributing to the purity of the water perform an important office in equalizing the flow. As the water cannot rush over the surface to the streams, great floods are almost unknown. The most casual observer may notice this fact from the limited bridge openings, the long, low embankments of sand thrown boldly across the valleys with slight provision for flood overflow, and the general absence of signs of destructive floods. The water being stored up in the sand and fed out gradually to the streams, the summer flow is well sustained. The streams are far less flashy than those of Northern New Jersey and Eastern Pennsylvania. For instance, in 1878 Mr. H. P. M. Birkinbine found the flow of the Schuylkill at Fairmount to be 307 cubic feet per second, or at the rate of 0.17 cubic foot per second per square mile of watershed, the area at the point of gauging being 1,800 square miles; the flow of Great Egg Harbor River, at May's Landing, from 216 square miles of watershed, never falls below 70 cubic feet per second, or 0.32 cubic feet per second per square mile, being nearly double the dry season flow of the Schuylkill. The latter stream is subject to violent floods.

Having been engaged in studying these stream-flows for the Geological Survey of New Jersey during the past year, the writer has collected some important data as to the amount of water available from Southern New Jersey water sheds. The results appear in the report of the State Geologist for 1890, from which I have abstracted what is necessary for this report. Gauges were set up upon some typical streams and read throughout the year. As these gaugings are the basis for

our estimates of quantity of water, I give herewith the results on Great Egg Harbor River and the Rancocas :

**FLOW OF GREAT EGG HARBOR RIVER AT
MAY'S LANDING, 1890.**

Drainage Area 215.8 Square Miles.

MONTH.	RAIN.	FLOW.	FLOW IN CUBIC FEET PER SECOND.	
	Inches.	Inches.	Greatest.	Least.
January.....	1.70	1.25		
February.....	3.70	1.80	710	322
March.....	6.06	2.39	723	327
April.....	3.37	2.44	734	263
May.....	3.71	1.88	491	270
June.....	2.38	1.26	352	126
July.....	5.13	1.33	302	201
August.....	5.31	1.45	541	97
September.....	6.06	1.05	366	114
October.....	6.30	1.67	346	270
November.....	0.71	1.32	325	207
December.....	4.49	1.52	438	180
Total.....	48.87	19.36		

FLOW OF RANOCAS AT PEMBERTON, 1890.

Drainage Area 111.7 Square Miles.

MONTH.	RAIN.	FLOW.	FLOW IN CUBIC FEET PER SECOND.	
	Inches.	Inches.	Greatest.	Least.
March.....	5.48	3.21	590	161
April.....	2.18	1.93	329	118
May.....	3.20	1.53	189	132
June.....	3.76	1.84	244	129
July.....	5.38	1.37	211	82
August.....	4.49	1.25	144	97

Comparing the same six months on the two streams we have:

Comparison of Flow from March to August.

	Rain.	Flow.
Great Egg Harbor.....	25.91	10.75
Rancocas.....	24.49	11.13

The flow given in inches in these tables represents the number of inches of rain which flowed off in the stream in each case.

It is seen that the Rancocas shows a larger flow than the Great Egg Harbor. There was a leakage at the point of gauging the Rancocas which could not be measured, and which amounted to not less than five per cent. of the flow, so that the above figures do not do this stream full justice. Our streams on the Mullica probably approach closely to the Rancocas; yet to be entirely conservative I have adopted the Great Egg Harbor as a typical stream, and drawn conclusions from its flow. The flow for January is estimated at a rate known to be low, probably considerably within the truth.

It will be noticed that there is no direct relationship between the rain falling and the water flowing in any given month. A careful study of the gauging and comparison with longer series of gaugings on the Croton, Sudbury, and other streams, has shown that when the ground water is full on this stream, at the beginning of a month, the flow will be about 1.25 inches for that month, even if practically no rain should fall. This is illustrated in June and November of the table. In June evaporation is usually four inches, and the rain falling was only 2.33 inches, none of which could have been available to increase the flow. Likewise in November the rain was less than the normal evaporation, but in both cases the flow exceeded 1.25 inches. So I find that the second month of deficient rain-fall will yield a flow of 0.90 inches, by careful examination of the records of daily flow. Careful inquiry develops that at May's Landing the wheel plant in use up to the beginning of 1890 required about 140 cubic feet per

second to run it, and there was always enough water with a little waste over the dam at night. In fact, it was deemed best to increase the wheel plant, and this was done early in 1890. Now this shows the flow of the stream in extreme dry seasons to be 70 cubic feet per second. These gaugings and the study of longer records on other streams lead to the conclusion that from December to May we can depend on the flow amounting to 50 per cent. of rain. The summer flow will be determined by the following rule: When the ground water is full at the beginning of a month, the flow (in case the rain-fall is less than evaporation plus the flow of the stream) will be for that month 1.25 inches; for the second dry month it will be 0.90 inches; for the third, 0.60; fourth, 0.50; fifth, 0.40; sixth, 0.35 inches.

Now the year 1890 was one of average rainfall in Southern New Jersey. The average yearly rainfall at Philadelphia for the period from 1825 to 1887 was 43.03 inches. During 1890 the rainfall at Moorestown was 43.40; at Woodbury, 41.17; and at Rancocas, 45.03 inches. Nearer to the sea the fall is always considerably greater than at Philadelphia.

The river at May's Landing is said to have been lower in 1890 than for three years previous. We may, therefore, assume the above to be an average flow. It amounts to 19.36 inches. To have utilized 18 inches of this, or 1.50 inches per month, we should have needed only a storage capacity equal to one inch on the water shed. The capacity is determined, however, not by average years, but by years of extreme dryness. The years 1880 and 1881 are generally recognized as the severest dry years of the century. I have calculated the flow from Great Egg Harbor water shed for these years by means of a method based upon thirteen years observations on the Croton, five years on Sudbury, and many gaugings of New Jersey streams, and which is described in my preliminary report on water supply and water power, Annual Report of the State Geologist of New Jersey, 1890, to which I have already referred:

*Computation of Flow of Southern New Jersey Water Sheds,
based on Observed Flow of Great Egg Harbor River,
1880 and 1881.*

MONTH.	Rain.	Evapora- tion and Flow.	Excess or Deficiency.	Computed Flow of Stream.
December, 1879 to April, 1880.....	14.59	.....	.....	7.30
May.....	0.54	4.25	-3.71	1.25
June.....	1.67	4.90	-6.01	.90
July.....	8.64	4.60	-0.47	.60
August.....	6.64	4.50	-1.79	1.50
September.....	2.94	4.90	-1.96	.90
October.....	2.75	2.35	-1.07	.60
November.....	4.44	1.75	-1.89	1.55
December, 1879 to November, 1880.....	42.21	.....	.....	14.60
December, 1880 to March, 1881.....	25.21	.....	.....	12.60
April.....	1.30	3.25	-1.95	1.25
May.....	3.53	3.90	-1.83	.90
June.....	4.57	4.60	-1.40	.60
July.....	2.96	4.50	-2.59	.50
August.....	0.65	4.40	-5.69	.40
September.....	2.35	3.35	-5.27	.35
October.....	2.12	2.10	-3.93	.35
November.....	3.08	1.60	-1.47	.35
December.....	3.23	1.35	-0.78	.99
December, 1880 to December, 1881.....	49.00	.....	.....	18.29

These estimates are based upon the observed rainfall at Vineland for these two periods, as this station best represents the average for Southern New Jersey. During the period from the first of December to the beginning of the dry season in the Spring our reservoirs must be filled, and consequently I have begun my years with December 1st. In 1880 the drought began with May, and while the total rainfall was much

lighter than in 1881, it was more evenly distributed, so that a flow of 1.25 inches per month could have been sustained through the dry period, from May to October, with a storage capacity of 1.75 inches on the water shed.

In 1881 more rain fell during the year, but the drought set in in April, and was sustained through November. It was the severest on record. In order to have tided over this period and kept up a flow of 1.25 inches per month we should have needed a storage capacity of six inches on the water shed. The period from December 1, 1879, to November 30, 1880, shows but 14.60 inches of flow, but this is a marked exception, and taking into account the conservativeness of these estimates and the larger yield of the Rancocas, we may safely assume that at all times our gathering grounds will yield fifteen inches of the rainfall with a storage capacity of six inches. In other words, with a storage equal to 14 million cubic feet per square mile of drainage, we can control 713,000 gallons daily per square mile.

An average year, such as 1890, will yield 30 per cent. more than the above figures. We have based our quantities upon the driest year, but in the following table the supplying capacity is given for an average year also.

This table gives the water sheds from which we shall draw our supply, classified by levels in accordance with the proposed plan of utilizing the flow, shown upon the accompanying table:

Water Sheds and their Supplying Capacity.

AREAS DELIVERED BY GRAVITY.	Area in Square Miles.	DAILY SUPPLY IN MILLION GALLONS.	
		Driest Year.	Average Year.
North branch, Cooper's creek.....	10.24		
South branch, Rancocas, above main canal.....	20.48		
Atsion and Mechescatauxin, above seventy feet.....	41.97		
Nescochague, above seventy feet.....	16.73		
Batato, above seventy feet.....	26.67		
Seventy feet level exclusive of Wading river.....	126.08	89.89	116.86
West branch, Wading river.....	56.58		
East branch, Wading river.....	50.86		
Wading river, seventy feet level.....	106.93	76.24	99.11
Friendship creek, upper reservoirs.....	25.62	18.27	23.75
Total for gravity, or seventy feet level.....	258.63	184.40	239.72
<i>Fifty Feet Level:</i>			
Water shed of Taunton reservoir.....	16.94		
Water shed of Friendship canal.....	10.12		
Water shed of Friendship reservoir.....	5.60		
Total of Rancocas at fifty feet.....	32.66	23.29	30.27
Atsion and Mechescatauxin.....	12.00		
Nescochague.....	9.16		
Total for Atsion at fifty feet.....	21.16	15.09	19.62
Total for fifty feet level.....	53.82	38.38	49.89
<i>Good Water, or Thirty Feet Level:</i>			
Hammonnton Brook.....	17.62		
Nescochague.....	6.85		
Atsion and Mechescatauxin.....	17.86		
Batato.....	31.27		
Total on Upper Mullica.....	73.60	52.48	68.22
<i>Thirty Feet Level, Wading River:</i>			
Batato, Harrisia canal.....	12.87		
West branch, Wading river.....	39.94		
East branch, Wading river.....	16.10		
Beaver brook.....	6.06		
Total, Wading river.....	74.96	53.45	69.46
Total for thirty feet level.....	148.56	105.93	137.70

It is seen that we have an available supply of 328 million gallons in the driest year which is ever likely to occur, and for half the years our supply will exceed 427 million gallons. Of the minimum supply, 184 million gallons daily will be delivered by gravity, the remainder being pumped from the fifty and thirty feet levels.

The population of Philadelphia increased 19.3 per cent. from 1860 to 1870; 25.7 per cent. from 1870 to 1880, and 23.6 per cent. from 1880 to 1890. The consumption of water for 1890 was about 116 million gallons daily, or 110 gallons per capita. This is a very high rate, and should not be much exceeded in the future. If we suppose the population and consumption to increase at a rate of 25 per cent. in each decade, we shall have the following consumption:

1890—	116 million gallons daily.
1900—	145 million gallons daily.
1910—	181 million gallons daily.
1920—	226 million gallons daily.
1930—	283 million gallons daily.

This would be the limit of the supply under discussion. Opportunities exist for still further increase to a large amount, but these have not been considered in this report.

It is but just to state that gentlemen of large experience with the utilization of flow of Southern New Jersey streams consider my figures much too low.

I acknowledge that they are very conservative, as I have based them upon the most accurate data obtainable, and when there was any reasonable doubt, have always taken the lowest figures in order to be entirely safe. It would not be surprising, therefore, if the actual yield should prove considerably in excess of these estimates. The large storage in the sand and gravel which controls the flow of these streams renders them much steadier and more constant than streams like the Sudbury, Croton, Schuylkill and others, with which engineers are more familiar.

Method of Utilizing the Supply.

Reference to the accompanying map will make clear the following description of the method by which it is proposed to utilize the above supply of water.

At a point on the north branch of Cooper's Creek, three-quarters of a mile above the bridge on the road from Haddonfield to Moorestown, a heavy embankment will be thrown across the valley, creating a reservoir, with its top water surface 61 feet above mean tide, and having an area of 1,400 acres, and a capacity down to a level of 56 feet above mean tide of 2,000,000,000 gallons. The site chosen is admirably adapted for the erection of an embankment. A natural bank projects from the south side more than half way across the valley; the soil underlying the valley is of a clayey and very retentive nature, well adapted for a foundation, and the water shed immediately tributary to the reservoir, from which we have to anticipate flood flows, is less than five times the area of the reservoir itself, so that even so heavy a flood as four inches upon the catchment area in forty-eight hours would raise the water surface but twenty inches, an amount which could be readily provided for without any waste weir whatever.

No such flood flow as this is to be anticipated on Cooper's Creek, consequently we enjoy complete immunity from danger from this cause.

This reservoir will be subdivided by embankments one mile and two miles above the main dam for further security, although it is intended to make the main bank of the most liberal proportions and of the best material, an abundance of which exists in the vicinity. An overfall will be provided at one side, over the natural surface, and the pipes for drawing off the supply will also be carried through the natural earth, and kept free from the embankment.

Pipe Lines and Conduits.

Three plans are substituted for connecting this reservoir with Camden and Philadelphia. The first is by three lines of

72-inch steel pipe $\frac{3}{8}$ -inch thick to the Delaware river shore at Pavonia, 36,700 feet distant, thence across the Delaware 7,000 feet, 3,400 of which are beneath the river, by three lines of 60-inch steel pipe $\frac{1}{2}$ -inch thick, laid in a dredged trench on the river bed, and covered by three feet of rip-rap, the top of the stone being kept thirty feet or more below the surface of the river. This line will terminate at Kensington Pumping Station. The 72-inch pipe will deliver 53 million gallons daily, each, with a loss of head of 18 inches per mile; while the 60-inch pipes will deliver about the same amount, with a loss of one foot in 1,500. The total loss of head will be for the 7,000 feet of 60-inch pipe 5 feet, and for the seven miles of 72-inch pipe about 11 feet, or 16 feet in all, which will enable us to deliver the water in Philadelphia at 45 feet above mean tide, with a full reservoir, or 40 feet when the water is drawn down five feet.

Any two of the pipe lines will deliver 100,000,000 gallons daily, so that with the large storage of over 800,000,000 gallons in the City Reservoirs, ample time would be given for cutting off one line of pipe for repairs when needed. This system of pipes is designed with a view to supply at first of 150,000,000 gallons daily, to be increased to 200,000,000 gallons by an additional line when needed.

This plan has the merit of allowing a rapid construction of the works, should time be limited, and a ready increase of capacity as the demand increases, and it affords all necessary security and other requisites of an efficient service. The conditions are very favorable to the use of steel pipe. The pressure will nowhere exceed that due to a head of 60 feet, and the grades will be uniform with nearly all of the line below 20 feet above mean tide. The use of such pipe is comparatively recent in the United States, although common in England. Wrought iron has been largely used in a very bold way in our Western Mining Works with complete success. The confidence which competent hydraulic engineers repose in steel pipes is well illustrated in the works now being

installed for the supply of the City of Newark, New Jersey, where the supply will be entirely dependent upon a single line of 48-inch pipe, part of which is under a head of nearly 300 feet. The thickness of this pipe is one-quarter of an inch for heads up to 100 feet, and it is deemed amply secure for the service.

Masonry Conduit and Tunnel.

A second plan proposed for the connection of the reservoir with Philadelphia is by a masonry conduit 31,000 feet in length from the reservoir, passing to the east of Merchantville to a point near Delair Station, thence by 3,000 feet of pipe lines and 3,000 feet of tunnel under the Delaware river to the opposite bank. This is the only practicable route for a masonry conduit, and will enable us to keep the line entirely in excavation, excepting about 1,300 feet northeast of Ellensburg, which will be on an embankment with the bottom of the aqueduct not more than five feet at the highest point above the surface of the ground. The line crosses the river at the best point for a tunnel, and terminates near the Frankford pumping station, which is of much larger capacity than that at Kensington. The loss of head will not exceed ten feet, so that water can be delivered at the west bank of the river at a minimum head of 46 feet above mean sea level.

It would be necessary to build the conduit and tunnel of a capacity of not less than 200,000,000 gallons at once, as this plan does not afford opportunity for gradual increase, with the facility offered by the system of steel pipes. This will necessitate an aqueduct of 14 feet internal width and 13 feet high to the crown of the arch. It will have a covering of not less than four feet of earth. The tunnel will be of cast iron, similar to the one now being driven under the Hudson River by the Greathead system, and will contain a steel tube of nine feet internal diameter and three-eighths of an inch thick, which will be sufficient, as it will not be subject to shock, and has only to sustain the pressure of the water.

This tube will be practically a lining filling the tunnel completely. The plan of several pipes contained in an open tunnel has been considered, but it is believed to be preferable to duplicate the above tunnel at once if necessary, although such a tunnel will deliver 200,000,000 gallons daily, and will be secure from accident or injury.

Pipe Line and Tunnel.

The third proposed plan for connecting the reservoir with Philadelphia and Camden, is by lines of 72-inch steel pipe $\frac{3}{8}$ of an inch thick, from the reservoir *via* Collingswood to a point just south of the old Philadelphia and Atlantic City railroad depot, in South Camden, thence by a tunnel to the western shore of the river. This plan requires 34,800 feet of pipe line and 3,000 feet of tunnel. The water will be delivered with a loss of head of about 13 feet, so that it could be delivered at a minimum head of 43 feet in Philadelphia, or 48 feet with a full reservoir. By this plan three lines of 72-inch pipe would deliver 150,000,000 gallons daily, but the tunnel should be constructed of 200,000,000 gallons capacity, as before. The laying of an additional line of pipe would then be all that would be needed to convey 200,000,000 gallons daily.

Advantages of the Several Lines.

We may compare the plans as follows: The first calls for 36,700 feet of steel pipe line upon land, and 7,000 feet beneath the river and across Petty's Island; or 43,700 feet in all, delivering the water at a head of 40 feet minimum at Kensington pumping station. The second plan requires 31,000 feet of masonry conduit, 3,000 feet of pipe line and 3,000 feet of tunnel, and will deliver the water at the river bank, opposite Delair, at a minimum head of 46 feet above mean tide, convenient to Frankford pumping station.

The third plan will require 34,800 feet of steel pipe line and 3,000 feet of tunnel, and will deliver the water at the

river bank in South Philadelphia at a minimum head of 43 feet above mean tide. Mean tide at Philadelphia is about three feet above low water.

The first line is best adapted to a pipe line throughout. Tunnels could readily be substituted for the pipes beneath the river on this line. The north line is the only feasible route for a masonry conduit, and the best for a tunnel also; it gives the greatest head in Philadelphia. The south line is the best for a steel pipe line and tunnel.

On the whole, the choice of plans is to be determined more by the consideration of which will be the most acceptable point of delivery in Philadelphia, then by any slight advantage in the routes themselves.

Connection of Haddon Reservoir with the Water Sheds.

We have seen what water is available above 70 feet elevation. Our first step is to divert this into the Haddon reservoir by constructing a reservoir on Atsion River, at Goshen, with a top surface level of 70 feet, to be drawn down five feet. This reservoir will be connected by a main canal cut across the divide, *via*. Taunton, to the head of Haddon reservoir. This canal will also receive the waters of Kettle Run, Bethany and Barton's Run, all headwaters of the Rancocas. The cross section of the canal will be such that the velocity of flow may never exceed $2\frac{1}{2}$ feet per second. It will pass through sand, and consequently no trouble from growth of vegetation is to be anticipated, as may be seen by numerous examples of canals in these regions, with velocities as low as one foot per second, which keep for decades as clean as when first constructed. The side slopes of canals will be $1\frac{1}{2}$ to 1; the depth of water 8 feet. Goshen reservoir will receive through a canal the waters from a reservoir on the Mechescatauxin, and another canal will draw from a reservoir on the Nescoghague at Iron Mills. On the north a system of canals and reservoirs will control the Batsto and east and west branches of Wading River. Additional storage will be provided as

needed on the upper portions of the several streams, as shown upon the accompanying map. This area will give a minimum supply of 166,000,000 gallons daily, and a supply of 216,000,000 gallons in ordinary years. This will suffice for the present.

This water will all deliver by gravity into Haddon reservoir, and thence to Camden and Philadelphia. In its passage through the several reservoirs and canals at low velocity, it will be most effectually freed from any trifling matter which may be carried in suspension, and will be delivered in a state as near absolute purity as it is possible to realize in natural waters.

Extensions.

The first step which will be taken to increase the supply will be the construction of a reservoir at Burr's Mills, on Friendship Creek, at an elevation of 90 feet, to be drawn down to 80; and a smaller reservoir at 80 feet elevation south of Friendship.

These reservoirs will be connected by canals, and a slight deepening of the stream channels with a canal across the divide will deliver the water of the 26 square miles which they control into Hampton reservoir, of the 70 feet level, increasing the supply to 184,000,000 gallons minimum, or 240 average. For practical purposes we may say 200,000,000 gallons is the limit of the gravity supply, which we have now reached.

By constructing the reservoirs of the fifty feet level at Atsion and connecting them by canals, as shown on the map, we control a further supply of 15,000,000 to 20,000,000 gallons. This will require lifting by a pumping plant 20 feet into Goshen reservoir.

Taunton reservoir and Friendship canal and reservoir, on the south branch of the Rancocas, will furnish 23,000,000 to 30,000,000 gallons more at 50 feet elevation, to be lifted into the canal at Taunton from 15 to 25 feet. This will bring the

supply up to 223,000,000 gallons minimum, or 290,000,000 average.

Next, the construction of Goodwater reservoir and Columbia reservoir will add 52,000,000 to 68,000,000 gallons, to be lifted by a pumping plant and force main at Atison into Goshen reservoir, the lift being about 40 feet.

Finally, a canal to Harrisia and a reservoir on Wading river, at a high water level of $37\frac{1}{2}$ feet, will add 53,000,000 to 69,000,000 gallons, and utilize the full supply of 329,000,000 gallons in extremely dry years, or 427,000,000 in ordinary years.

Engineering Features.

The plan is, on the whole, an extremely simple one. Excepting, perhaps, the Delaware river crossing, the utilization of this supply presents no necessity for difficult constructions or untried methods. The reservoir embankments are all low, and excellent material for their construction abounds. The highest is that at Haddonfield, 48 feet from creek to surface of water in reservoir, but conditions here are such that absolute security is only a question of liberal use of the excellent material at hand in constructing the embankment. The embankment and other constructions on the water-shed proper do not exceed in dimensions existing constructions in that region, which have stood successfully for many years.

In dealing with water-sheds of this character, an entirely different method of treatment from what is met with in ordinary practice becomes necessary. In all of our construction we must take into account the slope of the ground-waters and their movement toward the lower part of the water-sheds. Low embankments and open canals are especially desirable as a means for collecting and retaining such waters. Then, too, the absence of population and its attendant evils, and the clean, insoluble character of the earth, makes especially advisable the adoption of open channels. Another fact which has made the arrangement of canals and reservoirs somewhat

peculiar, is the necessity for drawing off the waters in a direction the reverse of their natural flow. This is the reason for the arrangement of the reservoirs in levels, and the connection of all of a given level by canals.

Conclusion.

I have laid before you estimates of the yield of the watersheds, based upon figures which I can vouch for as trustworthy and conservative; also the peculiarities of these sandy watersheds, which contribute to the purity of their waters and regularity of their flow, having been familiar with these features for many years as they are exhibited throughout the great sandy plains of Southern New Jersey and elsewhere. The engineering works, which are needed for utilizing the supply, have been outlined as closely as will be needed for the purposes of this report, and will be readily understood with the aid of the accompanying map. In their design I have followed engineering precedents closely, even where I have availed myself of the comparatively new possibilities of steel hydraulic constructions. But by whatever method they may be delivered, the great advantages of distance (Haddon reservoir being but nine miles from Philadelphia's City Hall) of uninhabited gathering grounds and complete natural filtration offered by this plan of supply, are weighty considerations in its favor.

Before closing I wish to acknowledge my indebtedness to yourself and Mr. J. A. Braddock, for the general features of the plan which I have developed, and for many valuable suggestions in regard to important details.

Respectfully submitted,

(Signed) C. C. VERMEULE,
Civil Engineer.

APPENDIX I.

Proposed Plan for Supplying Philadelphia with Schuylkill Water from Norristown Dam.

Submitted by the Reading Railroad Company.

Starting at a point on Norristown Dam, where Barbadoes Island, nearly one mile long, divides the river into two channels, and effectually protects the west channel from contamination, it is proposed to build an aqueduct to the City Pumping Stations on Flat Rock and Fairmount Dams.

The proposed gate-house or inlet, with suitable regulating gates, would be located on the west bank about 600 feet above the dam, fronting on the main channel in deep water, free from the dam, fronting on the main channel in deep water, free from sedimentary deposit. From this point the water would be carried in two riveted steel pipes $8\frac{3}{16}$ feet diameter, with a grade of one in five thousand, and with a capacity when running full but not under pressure of 254,000,000 gallons in twenty-four hours, to the mouth of Arrowmink Creek, on the southern border of the village of West Conshohocken. Provision would be made at the inlet gate-house for putting the pipes under a head of two and a half feet at low water, and thus increasing their capacity if required. The pipes would end in a gate-house at Arrowmink Creek, in which provision is made for a waste-weir and blow-off, as well as for regulating gates for the next section of aqueduct.

It is not practicable, from Conshohocken to Philadelphia, a distance of about nine and a half miles, to follow the river with a conduit of large size. The existing railroads, manufacturing establishments and other improvements, would make such a location exceedingly costly. The preferable route is through the hills by an aqueduct line entirely in tunnel, from the gate-house at Arrowmink Creek to a similar one in the West Park, near Belmont Glen, a distance of 40,680 feet, or $7\frac{7}{10}$ miles. Modern science has provided means for tunneling in solid rock comparatively easy and cheap, so that this feature of the line should not be regarded as extraordinary. The Croton Aqueduct of the City of New York, lately completed, is mainly in tunnel, and the City of Baltimore also has an aqueduct in tunnel, seven miles long, carrying the Gunpowder river supply.

The section proposed as far as Mill Creek Valley would be twelve and a half ($12\frac{1}{2}$) feet diameter, horse-shoe shape, with a grade of one in six thousand, and a capacity when running full but not under pressure of 300,000,000 gallons per twenty-four hours. From Mill Creek Valley to Belmont, there would be another section of twelve and a quarter ($12\frac{1}{4}$) feet in diameter, horse-shoe shape, with the same grade and a capacity of 284,000,000 gallons per twenty-four hours. The excavation along the entire line of tunnel would be mostly in gneiss rock, of which it is estimated only thirty per cent. would require lining.

In Mill Creek Valley a gate-house would be provided, from which a branch line in tunnel is proposed to carry 40,000,000 gallons per 24 hours to Roxborough Pumping Station.

From the gate-house at Belmont provision would be made for the supply of Belmont Pumping Station by means of one or more 48-inch cast-iron pipes as required.

The crossing of the River Schuylkill at this place is proposed to be made by riveted steel pipes 50 inches in diameter, carried on a stone bridge of ten arches and one iron plate girder span, the latter over the East Park drive. This plan pro-

vides for a bridge 70 feet wide on top, with ample room for driveway and footwalks. The location would be in line with Diamond street, on the north side of the East Park reservoir, and this extension of Diamond street by means of the bridge would open up a much-needed and attractive avenue of communication between the east and west sections of Fairmount Park for the northwest section of the city.

On the east side of the river, south of the Edgley ravine, gate-house No. 5 would be located, forming the inlet with regulating gates to the tunnel section of aqueduct extending from Rockland to Spring Garden, a distance of 5,015 feet.

The cross-section proposed is eleven and a half ($11\frac{1}{2}$) feet in diameter, horeshoe shape, with a grade of one in six thousand, and a capacity when running full but not under pressure of 237,000,000 gallons in 24 hours. This section would cross both the Philadelphia and Reading Railroad and the New York Division of the Pennsylvania Railroad under grade, and deliver the water into a gate-house and distributing chamber located on the rock bluff adjoining the Spring Garden Pumping Station, this gate-house to be connected with the Fairmount Water Works by a 48-inch main.

The elevations at which water would be delivered to the pumps at the several pumping stations, and the saving in lift over the present system is as fol.

Roxborough,	42.00 feet above City Datum, saving 11.1 feet lift.
Belmont,	36.92 feet above City Datum, saving 31.8 feet lift.
Spring Garden,	37.16 feet above City Datum, saving 32.0 feet lift.
Fairmount,	35.07 feet above City Datum, saving 29.9 feet lift.

Based upon the present pumpage at the above works the saving to the City in cost of pumping should approximate fifty thousand (50,000) dollars per annum.

The estimated cost of the main line of aqueduct complete from Norristown Dam to Fairmount, a distance of 74,150 feet or 14,004 miles, is in round numbers \$6,500,000. This includes branches to Roxborough and Belmont Pumping Stations with necessary gate-houses and fixtures, and right of

way, except over City property. The time required to build such a work would necessarily be lengthened by the amount of tunnel work to be performed. It is estimated at four years.

The proposed aqueduct described above is planned to meet the requirements of the existing pumping stations on the Schuylkill River. These locations, with the exception of the Roxborough Works on Flat Rock Dam, were chosen many years ago, when there was a comparatively small population north of Girard avenue. Considering the rapid extension of the City northward, and especially the growing movement in Philadelphia, and in fact in all cities, to locate private residences on higher ground than was the custom a quarter of a century ago, it certainly would be good engineering to place any future large reservoirs north of the City and at a higher elevation than has been proposed.

The low service distribution is controlled by the East Park Reservoir, at an elevation of 133 feet above City datum. This is within easy distance of the Spring Garden Pumping Station, and, under existing conditions, the location can scarcely be improved upon. The high service distribution is now controlled by the Roxborough Reservoir, at an elevation of 366 feet above City datum, but will in a short time be fed by the new Roxborough basin, of much larger capacity and at an elevation of 419 feet above City datum. Between the high service, 419, and the low service, 133, there exists a pressing necessity for an intermediate distributing reservoir, at an elevation, approximately, of 250 feet above City datum. Provision has, indeed, already been made for this by the Department of Public Works, in the proposed location of a large reservoir in the neighborhood of the Scheutzen Park, at Falls of Schuylkill, Twenty-eighth Ward. The distance from Spring Garden pumping station is three miles, and under existing arrangements the proposed basin can be supplied from that station only. It does not appear reasonable to convey water by expensive aqueduct lines to a point as far south as Spring

Garden, to be pumped back again through three miles of pipe to the point of distribution.

Looking, then, to the growth of the City northward, and especially in the event in the building of an aqueduct to bring in the Schuylkill or its tributaries from a point beyond the City limits, it would certainly be more economical to establish a new pumping station near Flat Rock Dam to pump by water or steam power into a reservoir for intermediate service. An excellent location may be found on ground owned by the City at the Roxborough Poor House, on Shawmont avenue, north of Crease's lane. Here it is possible to construct a large basin at an elevation, approximately, of 275 feet above City datum, and within easy reach of the City by way of Wissahickon avenue. The distance from Flat Rock to the proposed site, by way of either Domino lane or Cinnaminson avenue, depending upon the location of the pumps, is about 7,000 feet.

The saving to the pumps, in lift, in connection with the increased elevation afforded by the proposed aqueduct would be 36 feet, as compared with the elevation at the Spring Garden Station. The advantage of using water power at both Flat Rock and Fairmount is too manifest to need argument. As to the use of both steam and water power, under the most favorable circumstances, the average cost for 1888 and 1889 was for water power \$1.34 per one million gallons raised 100 feet high; for steam power at Spring Garden, Belmont and Roxborough, \$4.60 per one million gallons raised 100 feet high.

The effective power at Flat Rock, based upon the average of nine years, 1880-1888, neglecting the year 1889, which was one of exceptionally large stream flow, and also making proper deductions for the water diverted at Norristown to feed the aqueduct, is as follows:

Average minimum three months of the year.....	1,025 H. P.
Average ordinary flow three months of the year.....	2,000 H. P.
Maximum six months of the year.....	2,400 H. P.

At \$20 per horse power per annum, this power is worth \$39,125 per annum.

The location proposed for the new reservoir is also near enough to the Roxborough Pumping Station to use steam power at that station as an auxiliary during the summer season, should the water-power at Flat Rock be below the requirements.

In conclusion, the Schuylkill has been a gift to the City for many years. Nothing has been expended upon it except to build one dam (Fairmount) to create a pool to pump from. Other cities—New York, Boston, Brooklyn, Baltimore, and many more—have expended large sums of money to protect their sources of supply. Philadelphia has, until very recently, done nothing but pump and sell its Schuylkill water, taking it as it flows past its doors without hardly knowing where it comes from or what it contains.

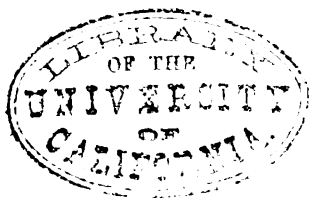
When the Schuylkill Navigation Company was in full operation, with as many as fourteen hundred boats engaged in the coal trade, and the Company exerted itself to the utmost to store water in the mountain districts, and let it down daily during the summer season to move a large tonnage, the river was kept in the best possible condition, and the standard of purity was raised by the inflow of water from the up-river dams. With the decline of the boating interest the City will certainly lose the beneficial effect of the Navigation Company's care of the river.

Surely, when we consider the great wealth and population of the City, the cheapness of its water supply in the past, and especially the desirability of retaining, with some modification, its present system of water works, it will be to the interest of the City to go beyond the suburban towns to take water from the river, and also to control the stream with its dams and improvements by ownership, or otherwise, to its headwaters.

This plan would insure good water to the City of Philadelphia for a century to come. Not the least of its advantages

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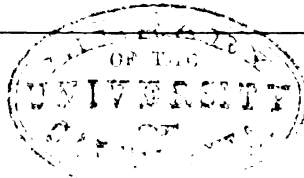


would be the saving to the City of the present pumping stations, which are admirably adapted to their work, and are the result of many years of labor and a large expenditure of money. To go to any other source of supply will involve sacrificing this plant, the pride of Philadelphia in the past, which, if supplemented by the construction of the proposed aqueduct, may continue to be the pride and satisfaction of the City for another century.

ESTIMATE OF COST

Of a proposed aqueduct to convey the water of the Schuylkill river from Norristown dam to the several pumping stations of the City of Philadelphia on the Schuylkill side.

For two 8 $\frac{1}{2}$ feet diameter riveted steel pipe conduits from inlet and gate-house at Norristown dam and Arrowmink creek, near Conshohocken, length 22,000 feet, 17,600,000 pounds of steel $\frac{3}{8}$ -inch thick, including excavating and filling trenches, pumping, bailing, and extra labor.....	\$1,116,550 00	
For stream crossings on pipe line at Swedeland, Gulf creek and Matson's Ford, and crossing main line of Philadelphia and Reading Railroad at West Conshohocken.....	29,500 00	
For aqueduct in tunnel from Arrowmink creek to Mill creek valley, 16,520 feet lineal, 12 $\frac{1}{2}$ feet diameter, horseshoe shape. Thirty per cent. with brick lining and 70 without.....	968,942 00	
For branch conduit from shaft in Mill creek valley to Roxborough Pumping Station, 4,450 feet in tunnel, including river crossing, shafts, gate-houses and 350 feet of 48-inch cast-iron pipe connection between conduits and pumps.....	138,000 00	
For aqueduct in tunnel from Mill creek valley to west side of River street, Belmont, 24,300 feet lineal, 12 $\frac{1}{2}$ feet diameter, horseshoe shape. Thirty per cent. with brick lining and 70 per cent. without.....	1,402,110 00	
For ten vertical shafts on Conshohocken-Belmont tunnel line, of aqueduct, 1,735 feet lineal.....	203,365 00	
For branch conduit to Belmont Pumping Station, 2,900 feet lineal of 48-inch cast-iron pipe.....	36,250 00	
For Schuylkill river crossing from Belmont to Edgley, stone bridge, ten arches, 70 feet span, and one iron plate girder span over Park drive. Bridge 70 feet wide out to out, including 50-inch riveted steel pipe conduits from gate-house at Belmont to gate-house at Edgley. Distance 1,700 feet.....	872,505 00	
For stone arch bridge 30 feet span over ravine at Edgley in East Park	26,246 00	
For aqueduct in tunnel from Edgley to Spring Garden, 5,015 feet lineal, 11 $\frac{1}{2}$ feet diameter, horseshoe shape, lined throughout, including three shafts and extra work at railroad crossings.....	419,200 00	
For conduit from Spring Garden gate-house to Fairmount works, one 48-inch cast-iron pipe under pressure, 4,700 feet lineal.....	61,100 00	
For inlet and gate-house at Norristown dam, and gate-house at Arrowmink creek, Belmont, Edgley and Spring Garden, with necessary regulating gates and valves, etc.....	322,215 00	
For land and water right damages, and engineering and superintendence.....	458,500 00	
For contingencies, 7 $\frac{1}{2}$ per cent.....		\$6,049,483 00
		453,711 00
		\$6,503,194 00



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