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ANNUAL REPORT
PHILADELPHIA
—
1889

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EIGHTY-EIGHTH ANNUAL REPORT
OF THE
BUREAU OF WATER,

For the Year Ending December 31st, 1889,

AND

THIRD ANNUAL MESSAGE

OF

EDWIN H. FITLER,

Mayor of the City of Philadelphia,

WITH

ANNUAL REPORT

OF

LOUIS WAGNER,

Director of the Department of Public Works.

ISSUED BY THE CITY OF PHILADELPHIA.

1890.

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1890.

HARVARD UNIVERSITY

THIRD ANNUAL MESSAGE.

MAYOR'S OFFICE.

Philadelphia, April 7, 1890.

To the Select and Common Councils
of the City of Philadelphia.

GENTLEMEN:—In transmitting my Third Annual Message, I take pleasure in thanking you for the trust and confidence you have reposed in me. When I entered upon the duties of Mayor, on April 4, 1887, the people confidently believed that a much higher standard of efficiency in the public service, and fidelity to public interests would be secured under the new law, and it can be honestly said, that it has been the constant aim of all the Departments to meet that just expectation.

The laws of the Commonwealth and the ordinances of the city have been faithfully executed, and all in the employ of, or having contracts with, the city have been held to strict attention to duty and to the fulfillment of their contracts.

In my inaugural, reference was made more particularly to the financial policy of the city; to the necessity for storage reservoirs; to our unclean and badly paved streets; to the danger from steam railways crossing our public highways at grade, and the over-head electric wires, and your Honorable Bodies were requested to unite with me in an earnest endeavor to adopt measures that would result in promoting the public welfare in all these directions.

In my succeeding annual messages, I have called your attention to the cancellation of the loans held by the Sinking

Fund, but there seems to be an apprehension of legal difficulties, which, it is said by some, cannot be overcome, and yet railroad and other large corporations have taken the ground that the purchase by them of any one of their bonds, to which a Sinking Fund clause is attached, cancels it, and they have invariably ceased their appropriations for the Sinking Fund of bonds so bought without experiencing either trouble or litigation with the holders of bonds still outstanding.

If a course like this was adopted by Councils, and anyone holding city bonds should object, appropriations could be made to carry out the Sinking Fund for the bonds held by the party objecting, or if the objector preferred it, the bonds so held could be paid off at their current market value. By the adoption of this plan, nearly two millions of dollars less would need to be appropriated to the Sinking Funds and to the interest payable upon the city debt, adding that amount to the sum available annually for current expenses and for new work.

We have recently borrowed \$4,600,000 in order to meet our present wants. This amount is not sufficient to pay for all that is actually needed in the way of improvements and to keep pace with the rapid growth of the city. Since January 1, 1880, we have, by direct taxation, paid off nearly \$15,000,000 of the city debt, expended \$7,565,000 on the new City Hall, and have also erected new school houses, police and fire stations, and have built bridges, gas holders, water reservoirs, constructed main sewers, laid many miles of large gas and water mains, and paved and repaved, with improved pavement, many miles of our streets, and we can safely compare our present condition with the management of any of the great cities of our country. We are annually building up 640 acres of land, about one square mile, with new buildings, necessitating the opening and paving of streets, the laying of additional water and gas pipes, the building of sewers, the lighting, policing, and keeping in good repair and properly cleansed an extent of territory capable of housing more than

55,000 people. All this shows that we are not only paying the debts of our predecessors and our own current expenses, but also large sums for work which will be of advantage to the generation following us.

“Pay as you go” is a most excellent rule, but it is hardly fair that the present generation should be required to pay for the improvements made by our forefathers, our own current expenses, and also do the work which will benefit those who are to follow us more than it does the taxpayer of the present day.

For all these reasons the loan above referred to had my prompt approval, but this loan exhausts our right to borrow under the laws at present existing, and for the future all the money needed for payment to sinking fund and interest upon the funded debt, for current expenses and for new work, must come from either increased receipts from the money-earning departments, or from increased assessments of property and from increased taxation, or through a reduction of the sinking fund and interest by the cancellation of the securities held.

DEPARTMENTS.

PUBLIC SAFETY.

The efficient management of the Department of Public Safety has been continued by its resolute Director, whose protection of life and property commands my approval. His report gives a concise statement of his views upon the affairs of this department.

With the rapid growth of our city he would have been justified in asking for an increase of the police force, but, owing to the condition of our finances, he refrains from doing it. It must not be forgotten, however, that twelve thousand buildings, with their miles of streets and alleys, were added to the city during the past year, and as many more will, doubtless, be erected during this year, and that these must have fire and police protection.

The total arrests were 4,000 less, and those for drunkenness 4,826 less, in number during the year 1889 than they were in 1888. Drunkenness in licensed saloons has been almost wholly suppressed, and the 20,000 persons arrested for that offense were mainly those who had become drunk and disorderly by drinking outside the city limits, by using liquors taken home or else obtained in the so-called "clubs" and "speak-easies" that infest our city.

It is not difficult to prevent breaches of the peace in saloons regularly licensed, but when the police are compelled to climb over roofs or go down into cellars to arrest the "President," "Secretary," or "Steward" of an eight-by-ten "club house" there is little prospect of suppressing the unlicensed sale of liquors or of preventing the resultant drunkenness and disorder, unless the efforts of the police force are earnestly upheld by the Courts.

With the limited number of saloons now licensed, and because of the enormous profits in the sale of liquor, "speak-easies" will continue to increase, unless our patrolmen are protected as witnesses, and convictions promptly follow the arrests of those engaged in this growing business, offensive both to the laws and to society.

Attention is again called to the great danger to human life from overhead wires and from heavy cables charged with high tension currents, and the passage of an ordinance which will cause this danger to be removed is suggested. This suggestion has my approval.

The Chief of the Electrical Bureau seems to have solved the problem of an underground system, and the manner of conveying the high tension currents for arc lights combined with telephone and incandescent wires. His long experience renders any suggestion or recommendation made by him worthy of careful study and consideration.

Under the liberal appropriations made by Councils the fire defences of the city have been greatly improved.

The efficiency of the Silsby engines proves the wisdom of

their selection. Five more will be added during the present year, and it is hoped that this class of engine will be adhered to until all in use by the Department will be of the Silsby pattern.

Before accepting these engines a thorough test was made under the direction of Messrs. Jacob Naylor, engine builder, Coleman Sellers, of William Sellers & Co., and James Moore, of the Bush Hill Iron Works. They, in their report, pronounced them fully up to the contract and specifications. Some of them have been in service for over three years, and they have never failed to do satisfactory work at less cost for repairs than any other engine in the service.

The efficiency of the Bureau of Inspection of Steam Engines and Boilers is attested by the fact that since its organization only one boiler inspected by it has exploded. More than three thousand boilers are inspected annually. The receipts of the year were \$5,703.90 in excess of the amount expended.

Under the recent increase of the number of Building Inspectors from three to seven, and the reorganization of the Bureau, intelligent and effective work has been accomplished.

The number of permits for buildings to be erected and for alterations during the year 1889 was 11,965. This is a marvelous growth in a single year, and represents a larger city than any of the following, as shown by the census of 1880: Hartford, Conn.; Camden, N. J.; Reading, Pa.; Wilmington, Del.; Toronto, Ont., or Charleston, S. C.

The magnitude of the building operations of last year is better appreciated by stating that the registry plan books of the Bureau of Surveys show an average of about one hundred buildings to each full square, and that the 12,000 structures for which permits were issued in 1889 would cover the territory embraced between Third and Broad streets and extending from Market street to Fairmount avenue, a full square mile.

The receipts of the Bureau of City Property during the year amounted to \$92,825.60.

The total number of persons using the public baths exceeded 1,000,000 in 1889, a larger number than in any previous year.

The Morgue at Front and Noble streets is not only inconveniently located, but, by reason of steam railway tracks surrounding it on all sides, dangerous of access, and the recommendation of the Director for its removal to a more suitable place has my approval.

The Bureau of Health is now managed by five citizens, appointed by the Mayor, with the Director of the Department of Public Safety as President of the Board. The members give their services to the public without compensation, and are entitled to thanks for earnest devotion to duty.

They ask for a much needed increase in the number of milk inspectors, and it is hoped that their appeal will receive your favorable consideration, so that this important branch of the public service may be made so effective that "slop milk" and milk from diseased cows will be excluded from our city.

The removal of the Municipal Hospital must sooner or later engage your attention. It is a blight spot in an improving neighborhood. The purchase of a larger tract of land in a location suitable for such an institution and the erection of proper buildings could doubtless be effected out of the proceeds of the sale of the present property, and such sale would add to our revenue by receipts from taxes, water rents, etc., from the improvements which would be made at once on the more than fifteen acres of land now occupied by the Hospital.

PUBLIC WORKS.

The Director of the Department of Public Works has been untiring in his work, and the result is best attested by the facts contained in his official report, which gives an exhaustive statement of the operations of this Department.

During the year 1887 the receipts of the Department of Public Works amounted to \$5,937,376.23; the current expenses to \$5,308,664.10, leaving a surplus of \$628,712.13.

For 1888 the receipts were \$6,109,016.05, current expenses \$5,000,632.68, surplus, \$1,108,383.37. In 1889 the receipts aggregated \$6,046,621.03, current expenses, \$4,633,413.95, leaving a surplus of \$1,413,207.08, or a total surplus of \$3,150,302.58 above the current expenses during the first three years existence of the Department, all of which was expended for permanent improvements.

The tests made by Dr. Charles M. Cresson and Professor Lemuel Stephens show that the candle power of the gas furnished during last year was much above that of any previous year. In 1887 it was equal to 17.65 candles; in 1888, to 18.54 candles, and in 1889 it equalled 20.07 candles.

It cannot be denied that at certain hours of the evening in some portions of the city the low pressure of the gas causes unsatisfactory lighting. The only remedy for this is the construction of additional gas holders in different parts of the city, and the laying of larger mains, but this cannot be done without the expenditure of large appropriations to be made by Councils for that specific purpose.

When the gas-pipes now in use were laid, the daily consumption was 5,000,000 cubic feet, and they were ample for that output, but with a daily maximum consumption of 15,000,000 cubic feet, they are wholly insufficient to supply the demand, and complaints of the gas must necessarily continue until these remedies are applied.

With the \$581,312.58 appropriated during the years 1887, 1888 and 1889 for these purposes, we increased our manufacturing capacity 7,000,000 cubic feet per day, and the illuminating power of the gas 2.42 candles; the storage capacity 3,000,000 cubic feet. About 100 miles of pipe were laid, and the cost of manufacture and distribution of the gas was reduced from \$1.40 per 1,000 cubic feet to 89 cents per 1,000 feet.

The receipts in the Bureau of Gas during the year 1889 were \$3,658,224.83, and the current expenses were \$2,558,873.43. There were expended for permanent improvements \$292,146.08,

leaving the sum of \$807,205.32 in the hands of the City Treasurer as the net cash results of the year's operations. This does not, however, show the full and complete revenue, for 546,999,601 cubic feet of gas were used during the year in lighting the buildings in use by the city, street lamps, etc., the value of which was \$820,499.40, and if added to the cash turned into the City Treasury this shows a profit of \$1,627,704.72 in excess of the \$292,146.08 used for betterments.

Over 42 miles of streets were repaved with improved pavement. For repaving with Belgian blocks streets occupied by passenger railways \$196,106.80 was expended, and bills for the collection of the same from the companies are now in the hands of the City Solicitor.

Your attention is particularly called to the views of the Director respecting the character of pavement best adapted to a city like ours. It is a serious matter how best to provide for the heavy traffic of our manufacturing and commercial interests, as well as for light traffic and vehicles used in driving for pleasure.

The Director's classification of the different kinds of pavement is properly made, and for the main streets, especially for those occupied by passenger railway tracks, Belgian blocks should be used, and intermediate streets should be paved with sheet asphaltum.

Broad street, throughout its entire length, should be paved with asphalt. This cannot be done too soon, indeed it has already been too long delayed. This street is now the great highway used for civic and military displays, and from its central position, its width and its entire freedom from passenger railway tracks, it is particularly adapted for pleasure driving and for light traffic.

The plotting of underground works, only recently begun, is proceeding as rapidly as the limited appropriations made by Councils will admit.

The valuable privileges granted by the city to the electric companies ought to be made to yield some return, and the

recommendation made by the Director that they be compelled to light the streets used by them, free of cost, has my approval, and I sincerely trust it will meet yours also.

The satisfactory manner in which the work of cleaning the streets and of removing the ashes, garbage, and other offal, is being done is attested by the great falling off in the number of complaints of all kinds. During 1887 they reached 4,539; in 1888 they fell to 3,395, and in 1889 they were only 1,937. The number of loads of offal, ashes, street dirt, etc., removed during the year was 727,796, and the number of squares cleaned was 473,829. More frequent removals of garbage and cleaning of portions of the city have been exacted from the contractors for the year 1890.

Very satisfactory work has been done in the matter of abolishing grade crossings. During the past three years the following over or undergrade crossings have been completed:

On the lines of the Philadelphia & Reading Railroad:

Spencer street, in the Twenty-first Ward.

Ontario street.

Somerset street and Glenwood avenue, in the Twenty-eighth Ward.

Poplar street.

Willow avenue, Twenty-second Ward.

On the lines of the Pennsylvania Railroad:

Chester avenue and Fifty-seventh street.

Sixth street.

Frankford avenue.

Kensington avenue.

K street.

Church street, Twenty-third Ward.

Rittenhouse street, Twenty-second Ward.

Other changes are now under way on the lines of the Pennsylvania Railroad, at Twenty-second street and at Thirty-fourth street, and on the line of the Philadelphia and Reading Railroad, at Second street above Lehigh avenue.

Under an ordinance approved March 29, 1887, the Bureau of Surveys was authorized to revise the lines and grades of the city plans along the Philadelphia and Trenton Railroad, from Tacony street to Pennypack creek, in the Twenty-third Ward, so that all grade crossings on the line of that railroad would be removed. These plans have just been completed and the officers of the Pennsylvania Railroad Company, lessees, have approved the same and agreed to make the necessary change at their sole cost and expense, except for land damages, constructing all overhead or undergrade bridges, and all other work incident to these changes. When work under this agreement has been completed there will remain but one or two other grade crossings on the line of this railroad, between their station at Broad and Market streets and the City line, and these will no doubt have the attention of Councils and of the Railroad Company at an early day.

The total length of main sewers on the first day of January, 1887, was 56.27 miles, and of branch sewers 221.02 miles. During 1887, 1888, and 1889, the Bureau of Surveys constructed 10.25 miles of main, and 80.29 miles of branch, sewers. Not only have we built during the past three years nearly 16 per cent. of all the main sewers, and over 26 per cent. of all the branch sewers constructed since the building of the first sewer, but it is undeniable that with the practical business methods in force, the material and work now being put into sewers are of a character to justify the belief that they will not break as frequently as those heretofore constructed.

The Intercepting sewer, built for the purpose of carrying below the Fairmount Dam the sewage that formerly flowed into the Schuylkill river and mixed with the drinking water of the city, is accomplishing the work for which it is intended. Already twenty-nine factories, giving employment to 10,000 persons, and 328 other buildings have been connected, and nearly all the parties notified have taken out permits.

Five new bridges were begun during the past year, one of which was the much needed structure across the Schuylkill

river on the line of Walnut street. Four bridges were finished, three were authorized, and two more were planned.

Three years ago the storage capacity of our reservoirs was 195,000,000 gallons of water, equal only to two days supply; on the first of January last, this capacity had been increased to nearly 900,000,000 gallons, nearly eight days supply—a very satisfactory increase.

The clearness and purity of the water now distributed to a very large portion of our city proves conclusively the correctness of the policy of subsidence, and the work of building storage reservoirs should be continued until their capacity is at least doubled.

The most pressing needs of the Bureau of Water are four large reservoirs, larger distributing mains in many sections of the city for the purpose of supplying the older portions with subsided water and of giving water to the thousands of new buildings annually erected, and new pumping engines at several of the stations.

Having had interviews with many scientific men of our country respecting a purer supply of water for our city, and having given this important subject much consideration, I have reached the conclusion that any attempt at filtration upon a scale large enough to purify by that method the enormous quantity of water used is at present impracticable, and the condition of our finances for many years to come will not warrant the adoption of any of the many proposed schemes of bringing our water supply from the Delaware river, the Perkiomen, or from Lake Erie, or of any extended filtration, and all that can be done at present for a supply of purer water consists in the immediate increase of our subsiding and distributing capacity.

When in the future the water we use is brought from other sources than our present supply, it will be necessary to have storage basins, and those now constructed will be required in connection with any plan that may be hereafter adopted, and as the purification of the water by subsidence is rapid and cer-

tain we should not delay such constructions, and work upon them cannot commence too soon.

CHARITIES AND CORRECTION.

The President and Directors of the Department of Charities and Correction make a full and careful report of the management of the institutions under their supervision.

The members of the Board serve the city without compensation, and they are earnest and attentive to their duties; not only supervising, but also personally directing the workings of the great institutions under their control. The money appropriated to this Department has been carefully and judiciously expended, and the labor of the inmates of the House of Correction and of the Almshouse has been utilized to assist in their support.

The works at the House of Correction, built for the purpose of supplying that institution with gas, have been over-taxed by the demand from outside consumers. After the improvements are made, out of the appropriation for 1890, it is expected that the handsome balance standing to its credit will be increased by the growing demand for gas from the neighborhood. The inmates of the institution manufacture all the gas. The revenue from the works, derived principally from the sale of gas to private consumers was, in the aggregate, \$10,753.60. These receipts are greater than the cost of the coal and lime, and the salaries of the superintendent, guard and lamplighters; also lighting the institution and public lamps in Tacony, Holmesburg, and Collegeville, which, if paid for at the price at which gas is furnished to private consumers, \$1.50 per 1,000 cubic feet, would have amounted to upwards of \$11,000 additional, making the receipts \$21,753.60.

By Ordinance dated March 22, 1889, your Honorable Bodies appropriated one hundred and fifty-thousand (150,000) dollars, and set aside fourteen acres of land adjoining the quarry at the House of Correction, and directed the Mayor to erect a new Almshouse, and gave him authority to employ an architect.

Mr. James H. Windrim was selected to draw plans and to make estimates of the cost of the different buildings needed for such an institution. The estimated cost exceeded the appropriation, \$150,000, an amount requiring the appropriation of the balance now standing to the credit of the Almshouse fund, realized from the sale of the land last year, to complete the buildings, making a total of over \$300,000. This would not have been an insuperable obstacle, but upon careful examination it was found that there was not sufficient land for the buildings, and for extensions needed in the future. It was also found that by occupying this land, the quarry would be curtailed, and that one of the most profitable truck patches belonging to the House of Correction would be taken from it. As the quarry alone paid for the eighty acres of land purchased in 1875, at a cost of \$40,000, with an earned balance over and above that amount of \$30,429.81, besides furnishing other valuable material used by the city in connection with their buildings, and as the fourteen acre truck patch yields a crop estimated at \$2,000 per annum, it was not deemed advisable to commence the erection of the buildings without further consideration of the subject.

The Board of Directors do not deem the separation of the Almshouse and Hospital advisable, and assert that if the Almshouse is removed it will be necessary to build an additional Hospital in connection with the new buildings, to accommodate the cases of sickness that constantly occur in that institution. They state that the removal of the Almshouse to Holmesburg would greatly add to the cost of conducting the two institutions, separated, as they would be, by nearly ten miles. It is necessary that the Almshouse should be convenient to the city, so that the sick and poor can be conveyed there with the least delay and expense, which would not be possible if the long journey was required.

The separation of the Almshouse from the Philadelphia Hospital is attended with consequences that are probably not appreciated by any who have not actual experience of the

working of these institutions, and very few are aware of the bearing of this question on that most excellent institution, the House of Correction. Until that came into existence there was no place where the class for which it is designed could be cared for, except the prison and the Almshouse. but at present nearly all the occupants of the Almshouse are proper subjects for Hospital care, and they should be treated as patients and not as prisoners, while the vagabonds and drunkards and all that class which require police supervision are cared for at the House of Correction.

It can readily be seen that the erection of an Almshouse ten miles distant from the Hospital would cause not only a large expenditure of money for the erection of new buildings, but would make necessary large additional fixed expenditures for management with great inconvenience and injury to the patients required to be removed from the one to the other. It is important that these institutions should be near each other, and it will then be easy to divide the old and new buildings into departments, giving the insane, the sick, the convalescent, and the poor, additional accommodations, which are so badly needed, and all this can be done without a duplication of staff or machinery.

After careful consideration and personal examination I have reached the conclusion that the proper place to build a new Almshouse is at Blockley. We have ample vacant ground, and it can be done without crowding the present buildings, with space enough left to accommodate the growth of the institution for the next fifty years. In a future message plans will be submitted for your consideration, which will, I trust, have the approval of your Honorable Bodies.

The establishment of a school for nurses at the Philadelphia Hospital and Almshouse, under its present competent head, not only proves itself a great blessing to the poor and sick inmates of these institutions, but it is also of great benefit to sick and suffering mankind generally, by supplying skilled nurses who, after rendering faithful services gratuitously to the city, graduate with honor, properly prepared for their life-work.

Permit me to call your attention to the efficient services rendered by the medical staff of the Hospital, and also by the resident physicians and the faithful corps of nurses, all serving the poor and the sick, trusting to the future for their advancement and reward. To all these the thanks of our citizens are due.

The Annual Reports of the Departments of

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

are herewith transmitted for your consideration, and for such action as the statements contained in them may require.

During the past year several changes have taken place in the different Boards appointed to conduct the Civil Service examinations prescribed by law, and they are now composed of the following gentlemen :

SCHEDULE "A "

Includes all persons exempt from examination under Act of June 1, 1885, and supplements thereto.

SCHEDULE "B."

Clerks, copyists, bookkeepers, auditors, recorders, stenographers, typewriters, storekeepers, and all others performing clerical services.

Stockton Bates (*Ch'n*), Theo. E. Wiedersheim, John Shallcross.

SCHEDULE "C."

All members of the police force, park guards, and of the Bureau of Fire, guards at the House of Correction, pilots, and city ice boats employés.

Francis W. Murphy (*Ch'n*), John C. Kelley, Horatio N. Fitzgerald.

SCHEDULE "D."

Class 1.—Civil, mechanical, and other engineers, architects, surveyors, draftsmen, and skilled mechanics.

Wm. Sellers (*Ch'n*), Joseph N. Wilson, C. E., Walter Wood.

Class 2.—Assistant Commissioners of Highways, purveyors, general foremen, sanitary, market, and other inspectors, overseers, and all others requiring similar technical qualifications.

John Y. Huber (*Ch'n*), Joseph K. Davison, Robert B. Beath.

SCHEDULE "E."

Class 1.—Physicians, surgeons, and resident-physicians.

Henry C. Chapman, M. D. (*Ch'n*), Wm. F. Waugh, M. D., Roland G. Curtin, M. D.

Class 2.—Chemists and druggists.

Chas. Bullock (*Ch'n*), Benj. H. Shoemaker, James Buckman.

Class 4.—Superintendents, moral instructors, nurses, heads of training schools, matrons, housekeepers, helpers, and attendants at House of Correction, Almhouse, and Philadelphia Hospital.

James C. Wilson, M. D. (*Ch'n*), Robert Dornan, Alex. W. Ransley, M. D.

Vaccine physicians, etc., Board of Health.

Wm. H. Ford, M. D. (*Ch'n*), James W. Latta, Washington P. Ogelsby.

SCHEDULE "F."

Electricians, and telegraph operators.

Board same as Schedule "C."

SCHEDULE "G."

Messengers, doorkeepers, janitors, stablemen, drivers, watchmen, laborers, and all other similar employés.

Board same as Schedule "B."

Special Board of Examiners to examine applicants for building inspectors, appointed May 24, 1889.

James M. Wilson (*Ch'n*), Samuel Hart, Stacy Reeves.

Secretary of the Civil Service Board.

Harry L. Neall.

At the request of the Census Bureau, Department of the Interior, Washington, D. C., there was collected by our Department, for use in the Eleventh Census of the United States, detailed data concerning all branches of our municipal government, which I consider so interesting and valuable that they are appended for your information and for the purpose of a permanent record.

During my term as Mayor it has been my constant aim to protect the interests of the city, and, with the means placed by you at the disposal of the several Departments, to improve her condition in all possible respects.

During the first year much time was consumed in reorganizing the many Departments and in establishing a system under which each was placed under one responsible head, so that the work expected to be done could be simplified, and failure in any direction could be readily located, and the official responsible for such failure be held accountable for his dereliction of duty.

The measures then inaugurated have produced satisfactory results, and the work done during the past two years is an evidence that they produce better work at less cost to the taxpayer than under the modes of transacting public business prevalent before I assumed office. What has been accomplished is set forth in greater or less detail in the Reports of the several Departments and of the Bureaus constituting them, all of which are worthy of careful consideration at your hands.

It has been impossible, because of the limited appropriations made, to do all that we should liked to have done, or all that the people desired, but it is hoped that during the remaining year of my term of office, with the appropriations to

be made from that portion of the \$1,600,000 loan available during the year 1890, much in the way of permanent improvement will be added to that which has already been made, and that the gratifying returns from the money-earning departments of the city government will be largely increased, and their expenses reduced, so that the many pressing needs of the city may be met with but a slight increase of taxes for for the year 1891.

Again thanking you for the confidence shown me during the past year by your Honorable Bodies, and asking a continuance of legislation and of appropriation, by and with which to continue the improvements which the city so much needs, and trusting that the operations of the current year may be satisfactory to our fellow citizens, I am

Respectfully,

EDWIN H. FITLER,
Mayor.

APPENDIX.

CENSUS RETURNS, 1890.

ALTITUDE, TOPOGRAPHY, ETC.

1. What is the altitude of the city above mean sea level, in feet?

At Broad and Market streets, +48.732. Highest, +446; lowest +2; average, +110.

2. Is the city on navigable water?

Yes.

3. If so, give a brief description of the harbor facilities, wharves, etc.

Five miles of wharves and docks on the Delaware river front; channel, 35 to 40 feet in depth at low water; greater depth than 18 feet one-quarter mile wide. Four miles of wharves on Schuylkill river front; channel 18 feet deep at low water; rise and fall of tide, 6.25 feet. United States Navy Yard at League Island at the junction of the Schuylkill and Delaware rivers.

4. Give a brief description of the geological and topographical characteristics of the site of the city, showing (a) character of soil; (b) underlying rock; (c) variations of level; (d) streams and water courses, and (e) if the land for a radius of five miles is open or wooded.

The city contains 129.4 square miles, 108 square miles lying between and north of the junction of the Schuylkill and Delaware rivers, and 21.4 square miles on the west side of the former river.

The Delaware river is navigable for 18 miles.

The Schuylkill river, 16 miles in length, is navigable for 8 miles from its mouth to Fairmount dam, above which it is not navigable.

About 4 square miles of the southern portion of the city is below low tide, and is used for truck farms. From this the surface rises in elevation northwestward, the summit between the two rivers lying near the Schuylkill river (along Ridge avenue) to Laurel Hill Cemetery and along Germantown avenue in the village of Germantown. It is rolling and intersected by many abrupt channels of creeks and small streams. The Wissahickon creek is in a narrow rocky gorge, and the banks of the Schuylkill river above Fairmount are rocky bluffs.

One-fourth of the area, near the north and west boundaries, is farm land, open, very little timber, with many villages. This also applies to all territory within a radius of 5 miles of the City Hall. About 50 square miles is suburban land undergoing city improvements, and 40 square miles of urban territory, the greater portion being north of the City Hall.

In elevation the surface slopes to the northwest from 10 feet above sea level in the southern portion, with mounds rising to 25 and 30 feet, to 49 feet at City Hall, with a height of 12 feet east thereof at the Delaware river and 109 feet west thereof near the city boundary. At the northern boundary, west of the Schuylkill river and near the latter, 260 feet; at the river, 15 feet. The villages of Manayunk and Roxborough on Ridge avenue, 310 feet; Chestnut Hill, 446; Mt. Airy, 370; Germantown, 200 to 300; Nicetown, 130; Branchtown, 226; Pittville, 263; Olney, 135; Frankford, 35 to 60; Holmesburg, 80; Volunteertown, 159; Crescentville, 216; Bustleton, 126; Fox Chase, 240.

The city is upon gneiss rock, rising in elevation with the topography of the surface. In the bend of the Delaware river there is about 60 feet of river mud upon gravel. On the Schuylkill river, at Point Breeze, the surface is gravel and clay, 96 feet to rock; Mifflin street, at the Delaware river, sand and gravel, 40 feet to rock; Smith's Island, in the Del-

aware river, 70 feet of sand, clay and gravel, 161 feet to rock ; Broad and Walnut streets, clay, gravel and sand, 50 feet to rock. The rock appears on the surface at Woodland Cemetery and at the bottom of the Schuylkill river, say 30 feet below the river banks, to Fairmount, where it reaches the surface and rises 40 feet above the river. In the greater portion of the city, west and north of a line from Woodland Cemetery to Frankford, the rock frequently appears on the surface, being only covered by from 10 to 15 feet of clay ; southeast of this line, from Frankford avenue and Beach street, to United States Arsenal at Bridesburg, the formation is a deposit of gravel and sand, about 50 feet in depth near the Delaware river.

CEMETERIES.

1. What is the total number and area of all cemeteries pertaining to the city ?

Total number, 183. Total area (in acres), no record kept by the city.

2. What number of these are located inside the city limits, and what is their total area in acres ?

Number, 183. Area, no record kept by the city.

3. How many cemeteries are there inside the city limits in which interments are no longer made, and what is their total area in acres ?

Number, 2. Area, 6.

4. What is the total number of interments made in all cemeteries to date ?

No record kept by the city.

5. Of this number, how many have been made inside present limits of the city ?

No record.

6. What has been the average yearly number of interments in all cemeteries for the past ten years ?

Twenty-two thousand seven hundred and twenty-seven (22,727).

7. What number of these were made inside city limits ?

Remarks.

The present City of Philadelphia, embracing the County of Philadelphia, was consolidated with numerous townships in 1854; prior to that time, no return of interments was made to the Health Office, and since that time no attempt has been made to ascertain the area of burying grounds within the county limits. The earliest interments commencing prior to 1682.

Interments are regulated by Act of Assembly of January 29, 1818, and March 8, 1860, and rules and regulations of the Health Office, a copy of which accompanies this sheet.

DRAINAGE AND SEWERAGE.

1. What is the total length, in miles, of all sewers laid in the city?

To January 1, 1890, 367.9 miles.

2. Please give the number of miles laid in each of the following diameters:

Main sewers, generally more than 3 feet in diameter,	66.59 miles.
Branch sewers, 3 feet and less in diameter,	301.31 miles,
say 18 miles of these are generally 12 inches in diameter, and two miles of 8 inches diameter; the remainder, 281 miles, are all brick sewers, mostly egg-shaped, and from 3 to 3½ feet in vertical diameter.	

3. What are the diameters of the largest and of the smallest sewer in the city?

Largest, 240 inches; smallest 8 inches.

4. How many outlets are there connected with the system, and where do they discharge?

Eighty outlets. They generally discharge into the Delaware river and into the Schuylkill river, below Fairmount dam.

5. Are the outlets above high-water mark, and if not, to what system are they submerged?

The bottoms of the sewers are generally below high tide, the lowest being at low tide, and therefore submerged 6 feet by the tide.

6. Please enumerate the several parts of the system, as indicated below :

Approximate only. Manholes, 8,000 ; catch-basins, 7,200 ; handholes, none ; lampholes, 5 ; flush-tanks, 1 ; house connections, 100,000. A few vaults connected with sewers ; they are not allowed.

7. Please give the number of miles of sewers laid in each ward, and the number of privies and cesspools, not connected with sewers, in each ward.

The length of sewers in each ward may be obtained from the accompanying map. Have no record of number of privies and cesspools connected with sewers.

8. What has been the total cost of all sewers to date, aside from the cost of maintenance and repairs ?

Eight million fifty-six thousand four hundred and thirty-five (8,056,435) dollars and thirty-seven (37) cents since consolidation in 1855.

9. What has been the average yearly cost of maintenance for the past ten years ?

Twenty-five thousand (25,000) dollars.

10. How much of the above has been expended for cleaning ?

Two thousand (2,000) dollars.

11. What is the total length, in miles, of all covered drains in the city (brick or stone) intended to receive rainfall and soil water only, and not for transmission of sewerage ?

Storm-water conduits, $4\frac{1}{2}$ miles.

Accompanying is a map of the city showing all sewers and storm-water conduits in the city, except old culverts on private property, which the city does not build or keep in repair.

REMARKS.

The combined sewerage system is generally in use, emptying by gravity into the Delaware and Schuylkill rivers.

Above, and at Fairmount, the Schuylkill river is used for water supply, and the separate system is being constructed, the storm-water emptying directly into the river and the sewage conducted by a main sewer $7\frac{3}{4}$ miles in length to below the point of water supply.

FIRE DEPARTMENT.

1. What is the total force of the Department?

Five hundred and nine (509) men.

2. Into how many grades is the force divided, and what is the salary of each grade? (Give number in each grade.)

There are no grades. Hose and Ladder men are paid \$2.50 per day.

3. How many of the above are "regular," and how many are "on call?"

All permanently employed.

4. What is the title of the chief executive of the force, and what is his salary?

Chief Engineer, Bureau of Fire. \$3,000.

5. How many cases of serious injury occurred in the regular force during the year?

Twenty-six (26).

6. How many deaths occurred in the regular force during the year, and from what causes?

Four (4) deaths; 2 killed, 1 consumption, 1 tumor on bowels.

7. Give the apparatus used by the Department, as indicated below:

Steam engines, 40; hand engines, —; fire extinguishers, 20; also, 2 chemical engines; hose carriages, carts or sleds, 44; ladders, number of feet, 2,000; aerial ladders, 7; fire-

escapes, —; hose, number of feet, 73,000; horses, 180; hook and ladder trucks, 10.

8. How many miles of wire and how many alarm boxes are on the fire-alarm system?

Nine hundred (900) miles. 550 boxes.

9. How many fires occurred during the past year?

One thousand and eighty-one (1,081).

10. What was the largest loss at any one fire?

Three hundred and eighty thousand (380,000) dollars.

11. What was the total loss by fire during the year?

One million five hundred thousand (1,500,000) dollars.

12. What was the total amount of insurance involved by the fires during the year?

About \$15,000,000.

13. What has been the average annual cost of the Department for the past 10 years?

About \$625,000.

14. What are the "fire limits" of the city?

One hundred and twenty-nine (129) square miles, as embraced in the county of Philadelphia.

GOVERNMENT.

1. What are the designations of the several classes of city officials elected by the people, with the number in each grade, and the salaries attached thereto?

One Mayor, \$12,000 per annum; one City Controller, \$8,000 per annum; one Receiver of Taxes, \$10,000 per annum; one City Treasurer, \$10,000 per annum; one City Solicitor, \$10,000 per annum; one District Attorney, \$10,000 per annum; three City Commissioners, \$5,000 each per annum; one Recorder of Deeds, \$10,000 per annum; one Sheriff, \$15,000 per annum; one Register of Wills, \$5,000 per annum; one Coroner, \$5,000 per annum; one Clerk Court of Quarter Sessions, \$5,000 per annum; twelve Judges, Courts of Common Pleas and Quarter Sessions, \$7,000 each per annum; four Judges, Orphans' Court, \$7,000 each per

annum; twenty-eight Police Magistrates, \$3,000 each per annum; thirty-four Select Councilmen, no salary; one hundred and ten Common Councilmen, no salary.

2. What is the total number of all city officials not elected by the people, and the total amount paid them yearly as salaries?

Officials not elected by the people, including Prothonotary of the Court of Common Pleas, heads of departments, chiefs of bureaus, and members of boards and commissions, 131. Total amount of yearly salaries, \$90,300.

3. What is the title of the chief health organization?

Board of Health.

4. How many members compose it, and how many of the members must be physicians?

Six members, including the Director of Public Safety (physicians not specified).

5. What has been the average annual expense of the organization for the past ten years?

Ninety-seven thousand three hundred and thirty-two (97,332) dollars and forty-eight (48) cents per year.

6. What are its powers in presence of an epidemic?

(See Philadelphia City Digest.)

LICENSES.

1. Please enumerate the places of amusement in the city, their seating capacity, and license paid, as indicated below:

Class.	Number.	Total Seating Capacity.	Am't of license paid City.
Theatres,	22	36,196	\$25 per annum each
Halls,	4	6,992	" "

Beer gardens not allowed.

2. How many licensed drinking saloons are there in the city?

One thousand two hundred and three (1,203).

3. What is the yearly license paid by each class?

Five hundred (500) dollars.

4. Are dogs licensed? If so, what is the yearly cost of each license?

No; but registered. The cost of registration, which is required but once, is \$1.

5. What has been the average yearly number of dog licenses issued for the past 10 years?

Two hundred and three (203) is the average number of dogs registered.

6. What is the estimated percentage of licensed dogs to unlicensed dogs in the city?

No data from which any definite estimate can be made of percentage of registered to unregistered dogs.

7. How many licensed public passenger vehicles are there in the city (exclusive of herdics, omnibuses, stages, etc., running over advertised routes)?

One thousand and fifty-six (1,056) passenger cars.

8. What license do they pay the city in the several classes?

Two-horse cars, \$50; one-horse cars, \$25 per year; cars crossing certain bridges, \$50 extra per year.

9. What is the average annual receipt to the city for all the above licenses?

During the year 1889, \$531,691.49.

PARKS.

1. Please give in the table below the number, area, etc., of the parks of the city.

Total number of all parks, 11

Total area (in acres), 2,884 $\frac{52}{100}$

Inside city limits:

Number, 11

Total area (in acres), 2,884 $\frac{52}{100}$

Improved:

Number, 11

Total area (in acres), 2,884 $\frac{52}{100}$

Not open to public.

All open to public.

2. How much area in the parks is covered by water in the form of pond, streams, etc.?

Three hundred and seventy-three (373) acres.

3. How many acres comprised in the parks were donated to the city?

One hundred and seventy-seven and seven one-hundredths ($177\frac{7}{100}$) acres.

4. What was the original cost of the land in the parks where it was acquired by purchase?

Seventeen million five hundred and three thousand five hundred and twenty-two (17,503,522) dollars.

5. How much has been expended on all parks for improvements, exclusive of maintenance?

One million eight hundred and twenty-three thousand six hundred and seventy-one (1,823,671) dollars.

6. What is the total length of each class of roads, etc., in all parks?

Driveways, $32\frac{1}{2}$ miles; bridleways, $7\frac{82}{100}$ miles; Footways, $40\frac{77}{100}$ miles.

7. What has been the average annual cost of maintenance of all parks for the past 10 years?

Two hundred and sixty thousand one hundred (260,100) dollars.

Please furnish a copy of the park rules and ordinances, and a map of the city showing location of parks.

Digest of Laws governing parks.

Map of Fairmount Park.

POLICE.

1. Please give the number of men in the force, by totals of grade, and the salary of each grade.

One Superintendent of Police, \$3,000; one Fire Marshal, \$1,800; one Surgeon, \$1,800; four Captains, each, \$1,600; one Chief Clerk, \$1,800; two Assistant Clerks, each, \$1,100; one Clerk to Superintendent, \$1,200; one Assistant Clerk to Superintendent, \$1,050; one Property Clerk, \$1,200; one

Chief of Detectives, \$1,500; eleven Detectives, each, \$1,350; one Vagrant Detective, \$1,100; one Court Detective, \$1,000; one Night Detective, \$912.50; one Superintendent of Vans and Patrol, \$1,200; six Van Drivers, each, \$720; one Hostler, \$720; six Matrons, each, \$600; twenty-eight Lieutenants, each, \$1,275; sixty-seven Sergeants, each, \$1,138.28; seventy-seven House Sergeants, each, \$1,040; twenty-two Patrol Drivers, each, \$952.50; twenty-two Patrol Sergeants, each, \$1,040; twenty-two Patrol Officers, each, \$952.50; four Harbor Pilots, each, \$1,050; four Harbor Engineers, each, \$1,050; four Harbor Firemen, each, \$912.50; one thousand four hundred and twenty-five Patrolmen, each, \$952.50. Total of Force, 1,717.

2. What is the uniform of the force, and what weapons are carried by the patrolmen?

Regulation blue cloth, for winter wear, consisting of double-breasted overcoat, pants, vest, black helmet; and for summer, single-breasted blouse, pants, vest, light colored helmet; baton.

3. How many miles of streets are patrolled by the force?

One hundred and twenty-five square miles.

4. Into how many reliefs is the force divided, and what are the hours of duty?

Two; sixteen hours out of every twenty-four, and subject to all calls.

5. What has been the average annual number of arrests for the past ten years?

Fifty thousand.

6. What has been the average annual number of Station-house lodgers for the past year?

Twenty-five thousand.

7. What has been the average annual value of all lost and stolen property recovered by the force for the past ten years?

One million (1,000,000) dollars; total average about one hundred thousand (100,000) dollars.

8. What has been the average annual cost of the force for the past ten years?

About one million (1,000,000) dollars.

What has been the average annual number of the force for the past ten years?

About fourteen hundred.

10. What has been the total number of deaths in the force during the past ten years?

(a) From disease, one hundred and fifty; (b) from wounds or injuries received in the line of duty, fifteen.

1. Name and official title of the head of the police department or constabulary?

John Lamon, Superintendent of Police.

2. Number of officers and men on the force?

221 officers; 1,476 men; 98 mounted; 12 harbor police.

3. Number of patrol wagons?

11 patrol wagons.

4. What system of electrical communication, if any, is in use?

Gamewell system.

5. Have you a city prison, calaboose, or lockup; if so, how many?

One County Prison, 25 station houses, and 10 sub-stations with cells or lockups.

6. Give the total number of cells in said prison or prisons, and how many they will accommodate without overcrowding.

County Prison, 538; accommodate 2; average cells in station houses, 6; total, 210.

7. How are the sexes separated from each other?

By a wall thirty feet high, termed north and south blocks, in County Prison, and in station houses the cells are divided off by stone partitions.

8. Is there any prison or police matron regularly employed; by whom paid, and what is her salary?

There are 5 matrons in County prison, and 6 police matrons

at police stations; they are paid by city and county, and receive \$50 per month, each.

9. How many arrests were made by the force during the year ending December 31, 1889?

The number of arrests made was 42,673.

10. What was the actual or estimated value of property recovered and restored to its lawful owners?

About \$109,834.88

11. Number of lost children restored to their homes?

There were 3,024.

12. Number of lodgers in station houses?

There were 12,507 lodgers.

13. Number of known suicides?

About 8.

14. Number of houses known to have been burglariously entered?

About 40.

15. Number of known houses of prostitution at close of year?

About 100.

16. Number of pawnshops, and known "fences" other than pawnshops?

Number of pawnshops, 83; none.

17. Number of licensed retail liquor saloons; also, wholesale, and the number of places where beer or spirits are known to be sold without license?

Retail saloons, 1,203; wholesale, 268; none that we know of.

18. What is the amount per annum for a license to sell beer or spirits at wholesale or retail?

Wholesale, \$500; retail, \$500.

19. What were the number of licenses granted during the year, and the total revenue from this source?

Licenses granted, 1,471; total revenue derived, \$735,500.

20. Does the revenue from liquor licenses go into the general fund, or into some special fund; if the latter, to what special purpose is it devoted?

Four-fifths of retail into city treasury, and revenue from wholesale into State treasury; general improvements of the city.

21. Same question as to revenue from fines?

Into city treasury.

22. Please state whether there are any Chinese in your city or town; if so, how many?

About 1,200.

23 Are commitments made by any magistrate, judge, or court of any persons of any age and of either sex to any institution or institutions under the control of any church, sect, or religious order, or to any other private institution of a charitable or correctional nature; if so, please name the institution or institutions?

House of Correction.

24. Is there any city or town almshouse, hospital, or other charitable institution; if so, please give its location and name?

Philadelphia Hospital and Blockley Almshouse.

25. You will confer a great favor upon this office if you will furnish below a list of all private or public institutions for the insane, the idiotic, the blind, the deaf, or for the homeless, the aged, the sick, or the destitute, in your city or town, with the names of the superintendents, in order that we may correspond with them?

Philadelphia Hospital for Insane, George Roney, Superintendent.

Pennsylvania Hospital for Insane, John B. Chapin, Chief and Superintendent.

Friends' Asylum for Insane, J. C. Hall, M. D., Superintendent.

Pennsylvania Institution for the Instruction of the Blind, Edward Townsend, President.

Pennsylvania Industrial Home for Blind Women, James Pollock, President.

Pennsylvania Institution for deaf and dumb, F. Mortimer Lewis, President.

Blockley Almshouse, George Roney, Superintendent.

Germantown Poor House, Christian Donat, President.

Northern Home for Friendless Children, Rev. William M. Baum, President.

Southern Home for Destitute Children, Mrs. J. Elverson, President.

Roxborough Poor House, Shawmont avenue and Wissahickon avenue.

Western Home for Poor Children, Mrs. M. J. Wilson, Directress.

Union Home for Old Ladies, Mrs. I. S. Hinkson, President.

Sheltering Arms for Infants, Ozi W. Whitaker, D. D., President.

St. Joseph's Female Orphan Asylum, 700 Spruce street.

St. John's Male Orphan Asylum, Forty-eighth and Lancaster avenue.

Presbyterian Home for Aged Couples, Sixty-fifth and Vine streets.

Presbyterian Orphanage, Mrs. D. Haddock, President.

Penn Widows' Asylum, Mrs. L. A. Murphy, President.

Old Man's Home, Mrs. B. P. Williams, Directress.

Old Ladies' Home, Mrs. John F. Bailey, President.

Methodist Home for Aged and Infirm Members, Mrs. Bishop Simpson, President.

Jewish Foster Home and Orphan Asylum, I. Benswanger, President.

Home for Aged and Infirm Colored Persons, William Still, President.

PUBLIC BUILDINGS.

1. Please give the number and class of all buildings owned wholly or in part by the city and occupied for municipal purposes, the materials of which built, and cost of construction—giving totals in each class.

Class.	Number.	Material used in construction.	Cost.
City Hall.....	1	Marble	\$14,000,000
Independence Hall.....	1	Brick.	
Court Houses.....	6	Brick.....	1,400,000
Jails.....	1	Stone	300,000
Police Stations.....	26	Stone and brick.....	622,000
Engine Houses.....	24	Stone and brick.....	300,500
Markets.....	5	Frame and iron.....	187,500
Hospitals, Asylums.....	1	Stone	1,525,000
Houses of Correction.....	1	Stone	800,000
Poorhouses or farms.....	2	Brick	75,800
Public Baths.....	6	Brick and stone.....	41,290
School Houses.....	211	Brick and stone.....	7,594,288
Real estate for water purposes....	16	Brick and stone.....	6,853,000
Real estate for gas purposes.....	71	Brick and stone.....	2,978,000

2. What buildings are owned in common with the county?
(See No. 3.)

Buildings held in trust by the city, value \$9,598,907.

3. What was the total of the city's portion?

The City of Philadelphia embraces the entire county.

4. What is the annual rental, if any, paid by the city for buildings used for municipal purposes?

Ninety-eight thousand and eighty-three (98,083) dollars.

5. What is the average annual amount paid by the city for the care of its buildings?

For maintenance,	\$245,900
For employes,	190,500

Value of sundry real estate not included in the above schedule, including wharves and landings, unimproved real estate, etc., \$1,545,672.

Total value of real estate owned by the city, \$65,325,479.

STREETS AND ALLEYS.

1. What is the total length (in miles) of all streets and alleys, open and accepted, within the city limits?

One thousand one hundred and fifty-one and six-tenths (1,151.6) miles.

2. Please indicate, in the table below, the number of miles of streets and alleys paved with the following materials:

	Miles.		Miles.
Stone. Cobble.....	392.2	Asphalt. Sheets.....	15.8
Block.....	98.2	Blocks.....	18.3
Artificial stone.....	.5	Coal-tar concrete.....	None
Brick.....	11.2	Wood.....	None
Macadamized.....	96	Rubble.....	117.6

3. Of the unpaved streets and alleys, how many miles are graded and curbed?

About 50 miles.

4. Of the unpaved streets and alleys, how many miles are unimproved?

Two hundred (200) miles.

5. What is the average width (in feet) of streets between building lines?

Fifty (50) feet.

6. What are the widths (in feet) of the widest and the narrowest streets in the city?

Widest, 144 feet; narrowest, 10 feet.

7. Please give the number of miles of paved streets and alleys in each ward?

Six hundred and ninety-nine and twenty-five one hundredths (699.25) miles.

Wards.	Miles of paved streets and alleys.	Wards.	Miles of paved streets and alleys.
First	31.25	Eighteenth	18.80
Second	15.20	Nineteenth	42.66
Third	8.80	Twentieth	26.25
Fourth	9.63	Twenty-first	12.50
Fifth	11.50	Twenty-second	48.90
Sixth	10.00	Twenty-third	14.80
Seventh	13.00	Twenty-fourth	36.00
Eighth	15.00	Twenty-fifth	35.15
Ninth	12.00	Twenty-sixth	38.20
Tenth	11.50	Twenty-seventh	29.40
Eleventh	6.50	Twenty-eighth	39.79
Twelfth	6.92	Twenty-ninth	32.70
Thirteenth	11.07	Thirtieth	18.68
Fourteenth	13.37	Thirty-first	23.37
Fifteenth	27.36	Thirty-second	19.63
Sixteenth	8.82	Thirty-third	20.50
Seventeenth	9.90	Thirty-fourth	20.10

8. What is the average proportionate width of sidewalks to streets?

One-fourth.

9. Please give the number of miles of sidewalks paved with the following materials :

Brick, 1,250; brick and stone combined, 10; stone, 100; asphalt sheets or blocks, 1; wood, 5; all others, 50.

10. To what extent are shade-trees set out along the streets inside of curb line?

Have no system. Planted two feet inside of curb at irregular distances.

11. Are these trees set out by the city or property owners?

Property holders.

12. How many miles of streets have grassed places between the building lines, and what is the average width of same?

A very small proportion, and that only in the suburbs. Not allowed by ordinance.

13. What has been the average yearly cost of all street work, exclusive of cleaning, for the past ten years?

Six hundred and thirty-seven thousand five hundred and fifty (637,550) dollars; cost of construction, \$364,632; cost of repairs, \$272,918.

14. How often are the streets cleaned?

Once per week. In business centre, two, three, and six times a week.

15. Is the work done by hand or by machine?

Machine and hand labor combined.

16. What has been the average yearly cost of street cleaning for the past ten years?

Two hundred and eighty-three thousand nine hundred and seventy-nine (283,979) dollars.

17. What is the final disposal of the street scrapings?

Used in filling low lands in the suburbs of the city.

18. Are ashes and garbage removed by the city or by the householders?

By city.

19. How often are such removals made?

Ashes, once each week; garbage, six times weekly, during six months; three times weekly, during six months.

20. Are the ashes and garbage required to be kept in separate vessels?

Yes.

21. What is the final disposal of ashes and garbage?

Ashes are used in filling, etc.; garbage fed to hogs; residuum used as a fertilizer.

STREET LIGHTING.

1. What is the total number of all street lamps in the city?

Twenty-six thousand and forty-three (26,043).

2. How many of these are private?

Fifty (50).

3. Please give the number of each class of public lamps, and the annual cost to the city of each class of lamps?

Class of Light.	No. of Lamps.	Annual cost to the city of each lamp.	Remarks.
Gas	*18,470	\$22 50	For lamps maintained by the city.
Electric.....	†1,095	48 50	Contract with seven Electric Light Companies.
Vapor, (a)....	6,478	21 00	Contract with Penna. Globe Gas Light Co.

(a) Naphtha, Gasoline, etc.

* Three hundred and eighty (380) of these gas lamps are lighted and repaired by the Northern Liberties Gas Co., under contract of \$22.27 per lamp, per annum.

† Fifty (50) private Electric Arc lights are maintained by the Girard Estate. All lamps burn each and every night and all night.

NOTE.—“The annual cost to the city of each lamp” should include the care, lighting, etc., as the actual total cost of each lamp to the city is desired.

WATER WORKS.

1. By whom are the water-works owned?

The City of Philadelphia.

2. What has been their total cost to date, aside from cost of maintenance and interest on debt?

The cost of the works cannot be accurately ascertained. The Spring Garden, West Philadelphia, Kensington, Germantown and Chestnut Hill Stations, with their supply pipes, were constructed by districts, which, at the time, were not a part of the city, or by private companies, and no complete records of the cost can be obtained; in some cases, no records whatever.

3. Describe the sources of supply, with the area of its drainage basin and character of country lying within it?

Ninety per cent. of the supply is from the Schuylkill river, and the remainder from the Delaware river. The drainage

area of the Schuylkill river is about 1,800 square miles. The upper portion is mountainous and wooded and full of mines of coal and iron. The lower portion is rolling and cultivated, and contains some large towns and villages.

4. What is the total daily capacity of the supply (gallons)?

If this refers to the capacity of the river or source of supply, the answer is: The daily average flow of the river is about 2,000,000,000 gallons. The minimum flow, which ordinarily lasts about one month in each year, is about 250,000,000 gallons.

5. Please state briefly but completely the system of works in use, and what system of filtration, if any, is connected with the system (*i. e.*, gravity, pumping—either direct or to stand-pipe or to reservoir—artesian wells, etc.)?

The systems in use are: Pumping by water or steam-power into reservoirs; pumping by steam-power into stand-pipes, and directly into the distribution pipes.

6. How many reservoirs are connected with the system, and what is their total capacity (gallons)?

There are nine reservoirs, with a total capacity of 891,491,454 gallons.

7. What are the dimensions of, and of what material is the stand-pipe?

The stand-pipe at the Spring Garden Station is of wrought iron, 153 feet high and 5 feet in diameter. The stand-pipe at the Roxborough basin, for high service, is of cast-iron, 30 inches in diameter and 90 feet high.

8 and 9. What is the full daily pumping capacity of the works (gallons)?

One hundred and eighty-five million two hundred and ninety thousand (185,290,000) gallons.

10. What is the average daily consumption (gallons)?

One hundred and sixteen million five hundred thousand (116,500,000) gallons.

11. What is the highest and lowest point of supply in city (feet above mean sea-level)?

Highest, 437 feet; lowest, 5 feet.

12. What is the pressure in the mains (lbs. to sq. in.)?

Fire and domestic, 15 to 175 lbs.

13. Please enumerate the several parts of the distribution system, as indicated below :

Mains: miles of, 930; material of, cast-iron; number of taps, 170,911; number of hydrants, 7,433; number of fountains, 646; number of watering troughs, 343; number of valves, 12,246; number of water meters, 304.

14. Please give the number of miles of mains laid, and the number of wells, public and private, in each ward of the city?

Have no record of the wells in each ward, and no record showing the miles of mains in each ward.

15. What does the city pay annually for each hydrant?

The city owns her water works.

16. What does the city pay annually for water exclusive of hydrants?

See question 15.

17. What has been the average annual cost of maintenance of the works for the past 10 years?

Five hundred and forty-five thousand six hundred and sixty-six (545,666) dollars and fifty-six (56) cents.

18. What has been the average yearly income from water-rents for the past 10 years?

One million six hundred and eighty-eight thousand five hundred and seven (1,688,507) dollars and seventy-six (76) cents. A list of water rates is enclosed.

The assessments are made by inspectors, who periodically visit each house, and by personal examination obtain a list of all appliances for the use of water, which are charged according to the rates fixed by Councils.

There are one or more registers for each ward in the city, in which every house is entered, the appliances described and

the amount of the assessment stated. Two copies of these registers (called duplicates) are made, one of which is delivered to the Receiver of Taxes, who makes out the bills and collects the money. The other duplicate is delivered to the City Controller, for the purpose of auditing the account of the Receiver of Taxes, who is obliged to return, daily, a list of all assessments collected.

ANNUAL REPORT
OF THE
DEPARTMENT OF PUBLIC WORKS,
FOR THE YEAR 1889.

111

OFFICERS
OF THE
Department of Public Works.

Director,

LOUIS WAGNER.

Chief Clerk,

HARRY W. QUICK.

CLERK—WILLIS SHEBLE.

STENOGRAPHER AND CLERK—W. W. ALEXANDER.

STENOGRAPHER—ROBERT M. DOWNING.

TYPEWRITER—HARRY B. LAFFERTY.

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.

THIRD ANNUAL REPORT
OF THE
DEPARTMENT OF PUBLIC WORKS.

LOUIS WAGNER, Director.

Philadelphia, January 2, 1890.

HON. EDWIN H. FITLER,
Mayor of Philadelphia.

SIR:—In accordance with Section 1, Article I, of the Act of Assembly, entitled “An Act to provide for the better government of cities of the first class in this Commonwealth,” approved June 1, 1885, I have the honor to present the report of the Department of Public Works, for the year ending December 31, 1889—the Third Annual Report of the Department.

Several errors of more or less importance found in the comparative statements and summaries submitted with the Second Annual Report, have been corrected in this report, and it is believed that barring accident to type or faulty proof reading, the tables herein printed are strictly correct.

The only material change in the organization of the Department made during the past year was the consolidation of the work of lighting the city into a bureau called the “Bureau of Lighting,” and the transfer of the officers and employes engaged in this important service from the Bureau of Gas to the new bureau. The appropriations for the work, unexpended on July 1, 1889 when the new Bureau entered into official exist-

ence, were transferred by ordinance of Councils from the Director's office and the Bureau of Gas.

The work of the new bureau is referred to in its proper place in this report, and printed in regular order with the reports of the respective bureaus, and covers the full period of one year, although for the first six months of the year the work of lighting was done in connection with other branches of the Department.

The operations of the Department were greatly hindered by the unprecedented rainfall, which not only prevented the regular and systematic prosecution of out-door work of all kinds, but also destroyed much of that partially constructed.

The damage to incomplete new structures was exceeded only by the injury done to the streets and sewers in many parts of the city, which were washed out and broken, rendering the former impassable and the latter dangerous to life and property.

These matters are set out in full detail in the reports of the bureaus having charge of this work, and are referred to here merely as a matter of public record.

The officer in charge of the signal corps stationed in Philadelphia, Sergeant T. F. Townsend, submits the following statement of the precipitation in Philadelphia during the year 1889 :

	Number of days on which .01 inch or more rain fell.	Total precipitation.
January	11	3.75
February.....	10	2.00
March	12	2.58
April	14	3.17
May.....	15	4.32
June.....	13	3.39
July.....	17	8.29
August	12	7.07
September.....	17	4.66
October.....	13.....	3.76
November.....	15	6.76
December.....	10	0.85
Total.....	159	50.60

Yearly average rainfall for Philadelphia :

Signal Office, 1871-89.....	41.30
Pennsylvania Hospital, 1825-88.....	44.58
Central High School, 1852-81.....	45.94

It will be seen that for nearly one-half the year, rain or snow fell in excess of .01 of an inch daily, and that the total fall was 6.02 inches, or nearly 14 per cent., greater than the average from 1825 to 1888, as reported at the Pennsylvania Hospital, and 9.30 inches, over 22 per cent., greater than the average reported by the Signal Office during the years 1871-89.

As a result new work was delayed beyond the time expected, or agreed upon in contracts; much of it had to be repeatedly renewed at a loss to the contractors; whilst the repairing of streets and the rebuilding of sewers took months instead of weeks, and the cost of such repairs was largely in excess of first estimates—in fact, estimates were useless, for when the work of repairs was nearly completed a second or a third or a fourth storm not only carried away the work already done, but extended the breaks almost indefinitely.

The officers and employés in charge of this work should be highly commended for the faithful manner in which they met the unexpected calls for their time and labor, for they worked during all hours of the day and night, often at great personal risk of death or injury, to repair the damage done by the elements, and to this statement should be added the only other pleasing recollection of this season of disaster, that but a single fatal accident occurred.

It is hoped that a similar year of storms will never again visit our city.

The regular work of the Director's office, incident to the current business and to the extensions planned and prosecuted during the year, was largely increased by the washouts and storms before referred to, and this unexpected work was promptly met by the clerks and employés in the most satisfactory manner.

The addition of one clerk and stenographer, already granted, will somewhat lighten their labors during the year 1890.

City Ice Boats.

The three Ice Boats had practically no work to do during the winter of 1888-89, and to date of this report (January 2; 1890) it appears as though they would also be idle during the present season.

The repairs and improvements made were of the usual character, and the boats have been and are in good condition for work when needed.

The most important service of the year was rendered in connection with the removal of the islands from the river Delaware, opposite the city front, by taking the several Legislative and Council Committees, and the Representatives of the Commercial Bodies of the Cities of Philadelphia and Camden, and of the States of Pennsylvania and New Jersey, on an inspection to and around Petty's and Windmill Islands on February 18, 1889.

The dock built for the boats at the grounds of the House of Correction continues to give satisfactory service.

The following summary of the work of the Ice Boats for the winter of 1888-89 shows that no towage was done, and that the only receipts were \$150.87 from the sale of old materials. The current expenditures for 1889 were \$12,203.20 less than during the preceding year.

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 1886-87, 1887-88, and 1888-89.

	1886 and 1887.		1887 and 1888.		1888 and 1889.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Vessels, Outward.....	13	15,724	5	4,842	.....	.....
“ Inward.....	12	9,697	11	6,084	.....	.....
“ Assisted.....	1	240	.....	.....	.....	.....
Total.....	26	25,661	16	10,926	.....	.....

	1886 and 1887.	1887 and 1888.	1888 and 1889.
Amount received for towage and assistance rendered.....	\$7,311 48	\$2,701 73	.....
Amount received from the sale of old material.....	154 84	60 92	\$150 87
Total paid City Treasurer.....	\$7,466 32	\$2,762 65	\$150 87

	1887.	1888.	1889.
Total amount of warrants drawn.....	\$37,029 12	\$38,983 19	\$21,668 21
Deduct cash paid City Treasurer.....	7,466 32	2,762 65	150 87
Deduct cost of dredging and construction of dock at Holmesburg Junction.....	.....	\$36,220 54	2,500 00
Actual current expenditure.....	\$29,562 80	\$33,720 54	\$21,517 34

Bureau of Gas.

The results of the operations of this bureau for the past year are of the most gratifying character. The output of gas was 52,980,600 cubic feet less than in the previous year, but this reduction was not caused by reduced consumption, the quantity sold and paid for, as well as the quantity sold for which bills are not yet due, being greater than ever before.

The following comparative statement of the distribution of the gas made, is of interest in this connection :

	1888.	1889.	Decrease. Cubic feet.	Increase. Cubic feet.
Used at the works.....	.79	.71	3,245,400	
Unaccounted for, leakage, etc.....	12.87	11.08	71,393,720	
Furnished free of cost for public lamps.....	12.35	12.63		3,462,414
Furnished free of cost for lighting Public Build'gs	2.30	1.83	18,219,394	
Sold, but not yet paid for, and in holders.....	12.42	12.96		13,102,406
Sold and paid for.....	59.27	60.79		23,313,094
	<u>100.00</u>	<u>100.00</u>	<u>92,858,514</u>	<u>39,877,914</u>

An increase of 39,877,914 cubic feet, or over one per cent. of the whole output, sold to consumers, and a decrease of 92,858,514 cubic feet, or nearly two and a half per cent., in leakage and in the consumption of gas furnished the city free of cost, produce large figures when they enter into the receipts and expenditures. These figures are increased still more by reason of the increased production of gas per pound of coal carbonized, amounting to 7,548,500 cubic feet.

When, in addition to this, the report shows that 5,241 new meters and 10,076 new services were introduced last year, that 113,474 lights were added and that the number of gas consumers is 128,867, it can be reasonably inferred that the days for the use of gas manufactured by the Department of Public Works of the City of Philadelphia are not yet numbered.

If it is claimed that the quality of all this gas is not of the standard heretofore furnished, a reference to the reports of daily tests made for many years past by Dr. Charles M. Cresson, at his laboratory on Locust street, and by Professor Lemuel Stephens, at the Girard College, should silence, if it will not satisfy, the carping critic.

The average candle power reported as the result of these tests during the year 1889 was as follows :

January	17.97	July.....	20.67
February	18.54	August.....	19.29
March	20.16	September.....	20.63
April.....	20.39	October.....	20.20
May.....	20.67	November.....	20.59
June.....	20.67	December.....	21.08

equal to 20.07 candles,
in 1888 it was equal to 18.54 candles, and
in 1887 it was equal to 17.65 candles.

If it is claimed that some of the gas falls below this standard, it is only necessary to state that all the gas stations are connected by large mains, and that no portion of the city can be supplied exclusively with gas from any particular works.

When the works passed under the control of this department it was found that they were deficient in all that constituted first-class works, of a construction suitable to make good gas and at the lowest prices. Labor-saving machinery had never been introduced, and but two stacks with modern appliances for carbonizing coal had been built. The men numbered 2,257, and the cost for skilled and unskilled labor, especially for the latter, was startling.

The manufacturing capacity was insufficient to meet the demand at the period of greatest consumption, and the pipes and mains were totally inadequate to distribute the gas made. In fact, the works were short of everything but men.

At the close of a little more than two years of the new management, by the introduction of labor-saving machinery, the rebuilding of old stacks with benches of 6's instead of 3's, and with the modern "regenerative" furnaces and appliances, and by the introduction of water gas, the manufacturing capacity has been increased from 13,000,000 to 20,000,000 cubic feet in twenty-four hours; the holder capacity has been increased from 12,000,000 to nearly 15,000,000 cubic feet; and greater length of pipes and mains, especially the latter of

large size, were laid than ever before in the same period of time.

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 Stack.	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.....	3	72	216			
	1	144	144			
	2	120	240	600	4,300,000	15,100,000

The above does not include the plant of the Philadelphia Gas Improvement Company.

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 38	103,000	
"	1874	78 x 44	200,000	303,000
Frankford: Frankford ave- nue and Bockius street.....		50 x 16	31,000	
Frankford: Frankford ave- nue and Bockius street		45 x 16	25,000	
Frankford: Frankford ave- nue and Bockius street.....	1869	80 x 26	130,000	186,000
Bridenburg: 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	1,000,000	2,000,000
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.....				14,908,000

* In process of construction.

14,333 meters and 26,924 new services have been introduced, and the number of lights and of consumers has been increased from 1,886,599 to 2,206,013 of the former, and from 114,386 to 128,867 of the latter. The number of men employed has been reduced from 2,257 to 1,518 during the same period.

All the expenses of the works, including extensions amounting to \$506,312.58 and which would have been charged to capital account in any manufacturing establishment, were paid out of the current receipts, and a balance of \$1,435,796.16 of actual cash remains in the City Treasury.

Because of the improvements already made, and of others contemplated and under contract, the results of the past two years are but a slight indication of the profits to accrue to the City from her gas works in the immediate future.

The following table gives a summary of the receipts and expenditures for 1887, 1888, and 1889 :

	1887.	1888.	1889.
Total receipts first three months.....	\$1,338,818 88		
Total receipts last nine months.....	2,477,822 21		
Total for the year.....	\$3,816,641 09	\$3,875,383 69	\$3,658,224 83
Total expenses first three months.....	\$1,319,957 19		
Total expenses last nine months.....	2,314,911 92		
Current expenses.....		\$3,107,786 24	\$2,558,878 43
Extensions.....		214,166 50	292,146 08
One year's interest and Sinking Fund on Gas Loans.....	290,500 00		
Total expenditures.....	\$3,925,369 11	\$3,321,962 74	\$2,851,019 51

It will be noted that the receipts for 1889 were.....	\$3,658,224 83
And that the expenditures were:	
Current expenses.....	\$2,558,873 43
Extensions.....	292,146 08
	<u>2,851,019 51</u>
Balance in cash remaining in City Treasury as the result of the year's operations.....	\$807,205 32
In 1888 the receipts were.....	\$3,750,383 69
And the expenditures:	
Current expenses.....	\$3,107,796 24
Extensions.....	214,166 50
	<u>\$3,321,962 74</u>
Cash balance.....	428,420 95
Increase for 1889.....	<u>\$378,784 37</u>

The above table shows a decrease of receipts amounting to \$217,158.86, which is accounted for as follows: Received in 1888 from the Schuylkill River East Side R. R. Co. for damages to works, \$125,000, leaving an actual decrease on the operations of 1889 of \$92,158.86.

Whilst the receipts show a net decrease of \$92,158.86 the expenditures were decreased \$470,943.23.

An analysis of the cash account of the Bureau of Gas gives the following as the increase and decrease from the several items of receipts:

Gas (increase).....	\$33,985 67
Sundries (increase).....	7,708 60
Total increase.....	<u>\$41,694 27</u>
Residuals (decrease).....	133,853 13
Net decrease.....	<u>\$92,158 86</u>

the result of the reduction in the manufacture of coal gas because of the purchase of over 900,000,000 cubic feet of water gas, and decreasing to that extent the make of coke, tar and ammoniacal liquor.

In 1889 the receipts for residuals amounted to 14.56 cents — per thousand feet of gas made, and in 1888 to 14.29 cents +.

The following tables give in detail the operations of the Bureau of Gas during the years 1887, 1888 and 1889 :

	1887. Cubic feet.	1888. Cubic feet.	1889. Cubic feet.
Largest production of gas in any 24 hours.....	*12,821,000	†13,191,000	‡13,561,000
Largest consumption in any 24 hours.....	a13,415,000	b14,454,000	c13,949,000

* † ‡ On December 23d, 24th, and 19th.

a b c On December 24th, 24th, and 14th,

	Bushels.	Bushels.	Bushels.
Quantity of coke on hand January 1.....	15,200	2,700	264,845
Made during the year.....	9,467,785	9,378,876	6,224,356
Total.....	9,482,985	9,381,576	6,489,201

	Bushels.	Bushels.	Bushels.
Coke sold during the year.....	5,053,425	4,641,266	3,224,285
Breeze sold during the year.....	480,370	461,500	434,650
Used under retorts.....	3,450,971	3,522,634	2,228,114
Used under boilers and lime-kilns.....	416,594	409,085	323,838
In offices, yards, and in pipe-laying.....	78,925	82,246	60,378
On hand December 31.....	2,700	264,845	212,886
Total.....	9,482,985	9,381,576	6,489,201

	1887.	1888.	1889.
Number of meters introduced during the year.....	4,263	4,829	5,241
Total in use.....	117,546	122,375	127,616
Services introduced during the year.....	8,546	8,302	10,076
Total in use.....	129,788	138,090	148,166
Lights added during the year.....	94,490	111,540	113,474
Total in use.....	1,980,909	2,092,539	2,206,013
Total number of consumers.....	118,664	123,427	128,867
Number of public lamps.....	16,473	17,261	18,074

The most important event of the year, and perhaps in the history of the Philadelphia Gas Works, was the completion of the water gas plant, of which a detailed report was made a year ago. The buildings and machinery were finished and gas was delivered as agreed upon, the first passing into the city's holders on January 22, 1889. The total quantity purchased during the year was 919,647,000 cubic feet, reducing the output of coal gas to 2,231,509,000 cubic feet; total output 3,151,156,000 cubic feet.

The tests named in the contract prove this gas to be of the standard contracted for, and the mixed gas, produced by its passage into the holders simultaneously with the gas made from coal, gives satisfaction to the consumer. It is but proper to state that very few complaints of the quality of the gas furnished, come from those parts of the city in which the largest proportion of this gas is burned.

The new 20-inch main, under contract to be laid from the Twenty-fifth Ward Works to the holder station at Ninth and Diamond streets, and on York street from Ninth street to Ridge avenue, will deliver larger quantities of this gas in the northwestern part of the city.

If gas is needed in excess of the quantity named in the contract, "not exceeding 3,000,000 cubic feet per day," this plant can readily be increased to double these figures.

It is well also to recollect that the city has the option of purchasing these works at any time.

A decrease in the output of coal gas, because of the quantity of water gas used, caused a reduction of 210,666,305 pounds of coal carbonized.

The amount of gas made per pound of coal was 4.717 cubic feet, an increase of .016 cubic feet, an exceedingly small fraction, but when multiplied by the 463,082,430 pounds of coal carbonized, equals a gain over the previous year of 7,548,500 cubic feet.

The following table gives a comparative statement for the years 1887, 1888 and 1889:

YEARS.	Coal Carbonized. Pounds.	Gas per pound of Coal.	Gas made. Cubic feet.
1887.....	671,631,000	4.697	3,154,842,000
1888.....	673,748,735	4.701	3,209,874,000
1889.....	463,082,430	4.717	2,231,509,000

The largest output of gas in twenty-four hours was not, as in previous years, on the day preceding Christmas, but on December 19, with a production of 13,561,000 cubic feet, and on December 13 with a consumption of 13,949,000 cubic feet.

The introduction of labor-saving machinery and the rebuilding of stacks of improved methods for making gas aid in the reduction of expenses and in the increase of the profits from the works.

Two discharging machines have been introduced at the Twenty-fifth Ward Works, and two more at the Twenty-sixth Ward Works, making four at the latter place, and four others will be introduced during 1890, two at the former works and two at the Ninth Ward Works.

The rebuilding at the Twenty-sixth Ward Works of a stack of benches of 3's, with benches of 6's, upon the Fleming half regenerative system, has proven so satisfactory that the other stack in the same retort house will be rebuilt upon the same plan during 1890. The two old stacks had a capacity of 750,000 cubic feet in twenty-four hours; the two new stacks will have a capacity of 2,800,000 cubic feet in the same time, and the latter quantity of gas, 2,800,000 cubic feet, will be made, using two discharging machines, at the same cost for labor as the former quantity—750,000 cubic feet.

The cost to the city of coal gas in the holder has been reduced six cents per thousand feet. The water gas cost thirty-seven cents per thousand feet, and the cost of the two gases mixed averaged fifty-two cents per thousand feet in the

holder. The expenses of delivery added twenty-two cents and of extensions fifteen cents per thousand feet, making the total cost eighty-nine cents as against \$1.02 in 1888.

These calculations are based upon the manufacture of 3,151,156,000 cubic feet, and the fact that the city sold but 60.79 per cent of this quantity does not enter into this statement of the account.

The following table shows the cost for the past six years of 1,000 feet of gas at its several stages of manufacture and delivery :

Year.	Cubic feet.	In holders.	Delivered to consumers.	Extensions.	Total.
1884.....	2,557,678,000	73 cts. —	\$1 09 +	22 cts. +	\$1 31
1885.....	2,757,844,000	70 " —	1 03 +	16 " +	1 19
1886.....	2,946,407,000	70 " —	1 06 +	11 " +	1 17
1887 (3 mos.).....	941,415,000	97 " —	1 30 —	10 " —	1 40
1887 (9 mos.).....	2,213,427,000	67 " —	97 +	07 " —	1 04
1888.....	3,209,874,000	66 " —	91 +	11 " +	1 02
*1889.....	Manufactured 2,231,509,000	60 " +	71 +	15 " +	89 +
	Purchased, 919,647,000	37 " +			
	3,151,156,000	52 " +			

"In holders" represents amount of payments for manufacture of gas.

"Delivered to consumers" represents amount of payments for manufacture of gas and all other payments except extensions.

"Extensions" represents amount of payments for works, mains, and services, less receipts on these accounts.

* In 1889 represents the gas manufactured and purchased.

The final distribution of all the gas made and purchased during 1889 is shown in the following table. It is proper to again call attention to the increase in the quantity of gas sold, and to the decrease in the quantity used free of cost by the city for public lighting, in the quantity used at the works, at the offices of the Bureau of Gas, and in the leakage account. The reduction at the main office, which includes the offices of the Bureau of Water, is nearly 1,000,000 feet. These offices

are lighted free of cost with electric light furnished by the Edison Electric Light Company for the privilege of laying conduits on Filbert street.

Similar free lighting of public buildings and of the streets of the city by this and by other Electric Light Companies, in return for similar privileges granted them, would save large sums of money to the Bureau of Gas, and hence to the city.

The largest reduction is in the lighting of the public squares—25,175,794 cubic feet—the result of the abandonment of the Siemens' lamps.

The following table shows in detail the output of gas and its distribution :

Some of the principal improvements made during the year have already been referred to. They should be summarized as follows:

At the Ninth Ward Works, the old coal sheds long in a disgraceful condition of repair, have been rebuilt of corrugated iron, adding a second story for iron sponge, now used in purifying the gas. A new wagon shed has been built and Twenty-fourth street has been paved with Belgian blocks.

At the Twenty-fifth Ward Works the additional holder of 1,000,000 feet capacity has been completed; two discharging machines have been introduced, and the Philadelphia Gas Improvement Company has completed its plant of a capacity of 4,000,000 feet of water gas in twenty-four hours.

At the Twenty-sixth Ward Works one stack of 3's has been rebuilt as a stack of 6's; two discharging machines have been introduced, and a new roadway from the coke yard to the new Passyunk avenue opened and paved by the city, has been opened and paved with Belgian blocks.

At the Ninth and Mifflin streets holder station, a new three-lift holder, with a capacity of 1,577,000 cubic feet, built with a steel tank on the ground instead of a brick and cement tank below the surface, as all our other holders are built, is under contract to be completed on December 24, 1889. The work, satisfactory as to quality, has been greatly delayed and is still unfinished. The contractor is subject to a reduction from the contract price, of \$25 per day, from the time named in the contract to the date of the completion of the work. A new exhaust engine and boilers and a brick building to hold the same have also been constructed.

The following is a comparative statement of the pipe laid during the years 1887, 1888 and 1889:

	1887.	1888.	1889.
	Feet.	Feet.	Feet.
2 inch.....		55	
3 ".....	13,092	13,036	17,172
4 ".....	89,792	112,532	139,416
6 ".....	48	756	13,948
8 ".....	8	39,624	6,100
12 ".....	18,653	22,880	1,460
16 ".....			4,248
20 ".....		19,636	2,868
30 ".....			9,216
Total.....	*121,593	†208,519	‡194,428

*1887. Equal to 23 miles.

†1888. Equal to 39½ miles.

‡1889. Equal to 36¾ miles.

This total of 36¾ miles could and should have been materially increased, but insufficient appropriation compelled the stopping of work early in October, causing much inconvenience to those desiring to become gas consumers, with a consequent loss to the city.

Of the mains laid, 7.16 miles was pipe of large diameter, and included a 16-inch and a 30-inch main from the Twenty-sixth Ward Works to the Ninth and Mifflin streets holder station.

In submitting the foregoing facts and figures, showing a condition of affairs in the management of the City's Gas Works which must satisfy any reasonable man that the past year has been not only a year of large profit to the city and of general improvement to the works, but also a year of the manufacture of the best gas ever distributed from these works, we cannot shut our eyes to the fact that there is a widespread belief that exactly the opposite of all this is the case; that the

works are badly managed; that the product is poor and getting worse; and that the whole property had better be sold or given to some one who can do these things better than the present officials.

There are those who contend that the gas furnished is bad, and no matter what the place or the occasion, the burden of their tale is the "bad gas" by which, they claim, the people of our city are robbed.

Where this is the result of personal or political ill-feeling caused by disappointed desires for gain of money or of place, it would be a waste of time to even attempt the effort to convince to the contrary—the story has been told so often that the teller actually believes it true; but, where it is the result of an honest misapprehension of the facts as they are, it is due to the citizen, as well as to the officials of this department, that the exact truth should be published.

Without the slightest intention of reflecting upon the Councils of the city, who appropriate all the money within their reach under the existing tax rate, I feel that it should be known:

First.—That this Department cannot spend a dollar, no matter what the earnings of its several bureaus, until it has been appropriated by Councils, and then only for the specific purpose for which it is appropriated.

Second.—That the total amounts asked for in the annual estimates of the Department have always been reduced, and that, therefore, extensions of works of the greatest importance to the people of Philadelphia cannot be made. (These reductions amount to \$1,919,080 in the appropriation for 1890.)

Third.—That when the present administration assumed control of the City's Gas Works, they were found in a condition which would have justified the immediate expenditure of several millions of dollars in the rebuilding of stacks, the construction of gas holders, and the laying of large mains, but

that the total amount expended during the years 1887, 1888, and 1889 for these objects was just \$581,312.58.

Fourth.—That with this sum the manufacturing capacity has been increased 7,000,000 cubic feet per day; the holder capacity 3,000,000 cubic feet; the new pipe laid amounts to 99½ miles, more than one-tenth as much as was laid during the preceding fifty years; that the candle power of the gas has been increased 2.42 candles—nearly 14 per cent.: that the cost of manufacture and distribution has been reduced from \$1.40 per 1,000 feet for the three months preceding the advent of the present administration, to 89 cents per 1,000 feet in 1889; and that the number of men employed has been reduced from 2,257 to 1,518.

Under all these circumstances how can it be hoped, much less expected, that somebody has not been materially injured, either in the loss of profits heretofore enjoyed, or in the non-receipt of profits anticipated when the city would be ready to abandon her ownership of this most valuable property; and that this somebody is satisfied that the gas is very bad, and that he says so or has someone say so for him?

“Bad” gas in particular buildings is always the result of bad piping and fixtures, or of accidents to the meter.

It is impossible for gas, made at the same place, put into the same holder, and delivered through the same pipes, to give in a particular house or street a good light, and in an adjoining house or a contiguous street light of bad quality: and when such complaints are made they are always found to arise from local causes.

“Bad” gas in particular portions of our city, or always at particular hours of the evening, is always the result of insufficient supply or of low pressure, difficulties which can be removed only by larger mains and additional gas holders.

These facts have been stated, and repeated and re-repeated, in the reports of the Bureau of Gas for many years past, and the complaints of the consumer, and of the city's officials supposed to be responsible for the short supply of gas anywhere, will

continue to arise until more holders are erected in various parts of the city, and until the pipes, which were considered ample when the daily maximum consumption of gas was 5,000,000 feet, have been replaced or supplemented by others capable of delivering, with good pressure, the present daily maximum consumption of 15,000,000 feet.

We have ample facilities for making all the gas needed, but most lamentably deficient facilities for sending it to the consumer.

The remedy for this is a very simple one, but one very difficult to secure, viz: large appropriations for holders and pipes.

Bureau of Highways.

The report of the Chief of this Bureau shows in detail the great extent and variety of the work done on the highways and upon the bridges of the city during the past year. The actual expenditures of the year were but \$171,784.60 greater than in 1888, but the amount of work done, both new and in the way of repairs, is very much greater than these figures would indicate.

The extent of streets repaved, or newly paved with improved pavement, is 42 miles 1788.5 feet. About two-thirds of this work is first paving. In 1888 it was 28 miles 4377.11 feet, and in 1887 it was 10 miles 1039.13 feet.

The grading of streets required the handling of 323,076 cubic yards of earth, fifty per cent. more than in the previous year. 46,069 square yards of new sidewalks were laid. All this shows the rapid growth of our city, and the consequent opening of new streets.

The figures relating to the general repairs and maintenance of our highways are equally instructive, and give gratifying evidence of active work, resulting in much needed improvement of the streets. Very much more money must be expended, however, before we shall be able to boast of well paved and well kept thoroughfares in all parts of our city.

The following tables give comparative statements, in detail, of the work done during 1887, 1888 and 1889, 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.

	1887.	1888.	1889.	
New paving.....	45,170.13	150,750.13	192,965.5	Linear feet.
Macadamizing (new)	8,669.00	1,466.98	30,583.00	" "
Grading.....	139,450.00	213,476.71	323,076.00	Cubic yards
New footway paving.....		28,166.8	46,069.00	Square yards.
Repairs to paved streets	535,703.13	573,718.64	506,786.00	" "
Footways repaved.....	3,557.42	7,978.91	15,756.96	" "
Ditches repaved.....	9,120.00	26,234.00	32,258.00	
Gutter stone laid.....	11,860.00	15,295.00	11,175.00	Linear feet.
Crossing stone laid.....	20,919.78	35,583.00	40,043.00	" "
Tramway stone laid.....	2,880.56	106.00	97.00	" "
Curbstone reset.....	7,501.00	162,798.00	283,809.00	" "
Wooden trunks.....	1,981.00	4,337.5	5,555.00	" "
Brick and stone drains	578.5	467.00	883.05	" "
Gutters paved.....	7,809.00	750.00	693.00	" "
Hand railings.....		1,193.00	2,776.00	" "
Broken stone used.....	8,114.64	11,649.04	23,954.14	Cubic yards.
Macadamizing (resurfaced).....		19,083.02	55,797.00	Linear feet.
Footway, curb, and railroad notices served.....	5,057.00	9,124.00	14,073.00	
Block gutters.....		1,466.98		" "

Summary of work done in Improved Pavements. New streets.

	1887.		1888.		1889.	
	Square yards.	Linear feet.	Square yards.	Linear feet.	Square yards.	Linear feet.
Granite blocks.	54,398.08	18,683.00	196,232.23	65,852.61	163,022.30	57,609.00
Sheet asphalt...			16,431.28	5,511.76	15,577.36	5,077.00
Vitrified brick.	8,041.00	2,881.00	75,601.00	22,542.00	88,793.48	26,086.00
Asphalt blocks.	1,587.00	1,054.00	34,464.00	16,629.00	42,779.00	24,658.00
Macadamizing	22,666.00	8,669.00	4,229.96	1,466.98	58,856.00	30,583.00
Slag blocks.....					2,146.00	938.00
Total.....	86,692.08	*31,287.00	326,958.47	†112,002.35	371,174.14	‡144,946.00

Replacing Cobblestone with Improved Pavements. Old streets.

	1887.		1888.		1889.	
	Square yards.	Linear feet.	Square yards.	Linear feet.	Square yards.	Linear feet.
Granite blocks.	29,396.86	10,536.00	65,780.85	24,689.36	127,531.37	56,873.00
Sheet asphalt...	33,813.72	10,971.83	44,354.99	13,365.40	81,848.99	21,729.5
Vitrified brick.	4,000.00	1,044.30	8,274.6	2,160.00		
Total.....	67,210.58	*22,552.13	118,410.44	†40,214.76	209,380.36	‡78,602.5

* 1887. Total amount of new paving 53,839.13 linear feet, equal to 10 miles, 1,039.13 linear feet.

† 1888. Total amount of new paving 152,217.11 linear feet, equal to 28 miles, 4,377.11 linear feet.

‡ 1889. Total amount of new paving 223,543.5 linear feet, equal to 42 miles, 1,738.5 linear feet.

Comparative Statement of Receipts.

Year.	Receipts.	Increase.
1887.....	\$56,472 82	
1888.....	58,544 93	\$2,072 11
1889.....	70,203 53	11,658 60

Comparative Statement of Expenditures.

	1887.	1888.	1889.
Current Expenses.....	* \$611,725 13	\$357,695 71	\$377,290 26
For Extensions.....	399,336 81	537,744 91	690,063 69
Total.....	\$1,011,061 94	\$895,440 62	\$1,067,353 95

* For street cleaning, \$314,672.69.

The Superintendent of Bridges reports general repairs to 42 of the 231 bridges belonging to the city, at a cost of \$26,823.49, and estimates that similar work during next year will cost about \$30,000. He also repeats the recommendation for rebuilding the bridge over the Philadelphia and Reading Railroad on the line of Girard avenue, near Thirtieth street, which is and has been for some years past in a hazardous condition, being now supported on trestles erected by the Railroad Company. To rebuild this bridge with plate girders and buckle plates at its present length would cost about \$16,000; to rebuild it to accommodate additional tracks needed for the railroad would increase this sum to \$60,000. Early action by Councils in this matter is of the utmost importance.

The License Clerk reports that the collections, by the Receiver of Taxes, for licenses issued by him, amounted to \$70,203.53, 20 per cent. more than in 1888, and 42 per cent. more than the average since 1876.

Of the amount appropriated for repaving with improved pavement streets occupied by Passenger Railway Companies, \$196,106.80 was expended in paving with Belgian blocks 6½ miles of streets, and the bills for the work have been sent to the City Solicitor for collection.

The streets repaved are reported in detail by the Chief of the Bureau; they are all in the business part of the city, and were selected, first, because of their bad condition; second, with a view to secure continuous stretches of good pavement by repaving adjoining and contiguous streets; and lastly to

make a distribution of the cost of the work amongst the several companies, based upon mileage of road, so that the legal question involved would affect all companies alike, and that the repayment of the sums expended would not become a hardship financially upon any one corporation.

The appearance of the streets repaved, their increased adaptability for heavy traffic, their greater comfort to those using them, whether in vehicles or as pedestrians, and the facility with which the new pavement is kept clean, speak volumes in advocacy of the continuance of this work, and with the appropriation for 1890, equally satisfactory results should be reached.

It is, of course, impossible to predict the outcome of the suits brought to recover for the city the amount expended during the past year, or the possible time when final decisions will be reached. As they affect not only the liability of the companies for the large sums already expended, but also their still greater liability to repave with improved pavement all the streets occupied by their tracks, the claim of the city will be strongly contested, and only the decision of the Supreme Court will be a final settlement of this vexed question.

If this decision is in favor of the city's claim, the companies will repay the money, which can be again used for highway work, and if adverse to the city, the city's money will have been expended for much needed work for which the city was liable: and during all this time of legal contention, the streets repaved are a comfort to the people using them, and an evidence of civilized government and not the disgrace they were in their ancient cobble stone condition.

Under the appropriation for replacing, with an improved pavement, the cobble-stones on streets not occupied by passenger railway tracks, $2\frac{1}{2}$ miles were paved with Belgian blocks and $3\frac{1}{2}$ miles with sheet asphalt; total, $6\frac{1}{2}$ miles at a cost of \$285,442.61. The streets repaved are reported in detail by the Chief of the Bureau. The work was done on streets designated by Ordinance of Councils, which was prepared by

the Committee on Highways after conference with the Department for the purpose of selecting the streets, with a view to more continuous work and to remedy the difficulties incident to the manner in which work of this character had theretofore been ordered. The results are satisfactory and have been greatly commended by citizens as well as by city officials.

The paving and repaving of streets with sheet asphalt has had much consideration, officially and otherwise, during the past year, and Councils should consider whether it would not be wise, as well as profitable, for Philadelphia to avail herself of the experience of cities having done more paving of this character. This would no doubt result in a modification of the regulations established for this class of work by the ordinance passed in 1885, since which time great changes and improvements have been made in this class of work.

In addition to the large increase of work, because of the very liberal appropriation for maintenance and for new work in 1889, the operations of private corporations of all kinds in building structures of all sorts and for all sorts of purposes, under and upon our highways, have added to the labors and anxiety of the officers of this Bureau.

It sometimes seemed as if it were a matter of deliberation to wait for the final completion of a piece of new pavement, and then to make application for some sort of underground structure or connection, and much ill feeling has been engendered by the very positive and very proper refusal of such permits except in cases of serious emergency.

It is a rule of the Department that notice be served upon all owners or occupiers of property interested, to make all necessary connections with sewers, pipes and conduits before any new paving is commenced, and if it is a hardship to do without such connections, except at the expense of the condition of a newly paved street, the sufferers need blame only themselves.

The washout of roads and streets and the breaking of sewers by the frequent and unprecedentedly heavy rainfalls of the

past year, caused much labor and expense to the Bureau of Highways. It was practically impossible to keep the country roads in even passable condition of repair, whilst the damage done and threatened by the sewer breaks caused serious alarm.

The repairs to what is known as the "Cohocksink" sewer had been commenced at Germantown avenue and Second street, and at Thompson and Third streets by the Bureau of Surveys when the floods began, and the work done there will be reported upon by that Bureau. The repairs of the breaks elsewhere were made by the Bureau of Highways.

It had been impossible, except in the First and Fifth Highway Districts, to make annual contracts for sewer repairs unless at prices deemed excessive, and when the general breaks came it was necessary to make the repairs by days' work.

The most serious of these breaks were in the sewer on Parrish street between Twenty-fifth and Twenty-seventh streets, on Twenty-seventh street from Parrish street to Brown street, and on Brown street from Twenty-seventh street to Twenty-eighth street. This sewer, known as the "Brown street extension of the Pennsylvania avenue sewer," was built many years ago, mostly on the surface and in made ground. It was not covered for many years and was finally buried by dumpage of dirt from 25 to 30 feet deep. Because of the extension of streets and the consequent construction of branch sewers it was taxed greatly beyond its capacity, and when the floods came the breaks came also.

The work of repairs was greatly hindered by repeated rain-falls and by consequent new breaks, and it was only by establishing a "pumping station" at Parrish and Twenty-seventh streets, and by running day and night, for several weeks, three pumps with a capacity of 6,000 gallons per minute, which kept the broken portions of the sewer nearly free from water, that it was finally possible to complete the rebuilding of the broken work. The water pumped flowed down Parrish street and Twenty-eighth street, to Brown street and Pennsylvania avenue, into the sewer on the latter street.

The officers of the Bureau of Water rendered invaluable service in the work of repairs.

The total cost of this work was \$53,000.

The Bureau of Surveys is now building a new sewer on Twenty-fifth street, from Parrish street to Pennsylvania avenue, which will it is believed, make a similar disaster impossible.

To secure early and frequent knowledge of the condition of our sewers, plans have been perfected for their systematic inspection under the supervision of the Inspector of Sewer Repairs. These plans contemplate the thorough interior examination of all sewers over three feet in diameter at least once in three months, and it is believed that this will lead to the discovery and prompt repair of weak and dangerous places, and result in the saving of much money to the city.

The question of the kind of pavement best adapted for the highways of a city like ours, which has within its 129 square miles of territory streets used for the heaviest business traffic, thoroughfares which should be adapted to driving for pleasure in light carriages, and roads used only for farm purposes, is one of serious concern.

Under the laws governing this matter the first cost only can be charged against the property abutting on the streets to be paved, and the future maintenance of these streets must be defrayed out of general taxation. As a result, the average property owner is always anxious for a first pavement that costs little, because he must pay for it, not caring for the fact that cheap pavements soon wear out and become a source of endless annoyance and expense. When repairs or repaving become necessary, the same average property owner will be satisfied with nothing less than the best, no matter at what price, and whilst doing both these things he imagines that his course is one of good financiering, when, in fact, the first saving causes increased expense to all tax-payers, himself included, in the form of continued, but always unsatisfactory, repairs.

The question becomes still more complicated because of the decisions of the Supreme Court, that no charge for paving of streets can be made against properties in those portions of the city not assessed for taxation at "full city rates," and as a result, in many portions of the city, people have all the advantages of city conveniences and improvements except paved streets, and not these latter, only because they cannot be compelled under the law to pay for them, for the reason that they pay one-third or one-half less taxes than other properties; and then, of course, they complain of the wretched condition of their streets for which they only are responsible. Surely some remedy for this anomalous condition of affairs should be found.

In view of all this, and because of the persistent pressure, on the part of the property owners, for a street pavement that does not cost them much, and of the continued introduction of all sorts of materials which experience elsewhere, or common judgment anywhere, has condemned, or should condemn, as unfit for the making of good and durable roads, would it not be well for Councils to consider, in their many ordinances directing the paving and repaving of streets, the question whether, in a few years, our streets will not be in the same deplorable condition as now, notwithstanding the large amounts of money spent, for what inventors and manufacturers of paving material are pleased to call "improved" pavements.

All writers upon this subject agree that a pavement of stone blocks, such as is known in our city as "Belgian" block pavement, laid upon a proper foundation and not disturbed, except as public travel may disturb it, is the best for the purposes of a large city.

During the past few years paving with sheet asphalt has been introduced, with satisfactory results in this country and abroad, and when such a pavement is laid upon a proper concrete or broken stone base, with the asphalt covering of good quality well laid, it furnishes a surface adapted to light driving, easily kept clean and which does not rapidly wear out.

The pavement next most popular in our city is of a material called "vitrified brick" which, we are told, shows great wearing qualities in cities in the west. The Chief of the Bureau of Highways reports that "the first pavement of this material was put down in this city in 1887, and already shows signs of wear that does not give much promise of its lasting qualities." This report, unfortunately for this class of pavement, is founded upon fact.

What is generally known as "asphalt" blocks, composed of a mixture of bituminous materials such as tar and pitch, and sand and gravel, pressed by heavy machinery into bricks about twice the size of the ordinary brick, was formerly largely used in paving our streets, and it continues to be used to some extent under what is called "contracts for paving private streets" by the owners of properties fronting upon said streets. The results have been uniformly so unsatisfactory that the use of this pavement should be prohibited.

Macadam, or Telford pavement should be laid only in the country districts, and not where it is expected to be the permanent pavement. It is always muddy in wet weather, and dusty in dry weather, and, unless it is regularly and carefully sprinkled and rolled, it wears out more rapidly than any other kind of pavement.

"Slag" blocks, which are made of the refuse of iron furnaces, run in its fluid state into brick moulds, and with which 2,146 square yards of pavement were laid last year, have not been in use long enough to test their wearing qualities. Their condition after even the short time in which they have been used, does not give promise of durability.

The different kinds of pavement, considering all the purposes for which pavements are laid in populous business communities, in connection with their first cost and subsequent expense for maintenance, should be classified as follows :

First, "Belgian" block of good granite.

Second, Sheet asphalt.

Third, "Vitrified brick."

Fourth, "Asphalt" blocks.

Fifth, Macadam or Telford.

Not sufficiently tested: "Slag" block.

No pavements of classes 4 and 5 should be laid in our city at all, and of class 3 only where it is certain that little driving will be done over the streets so paved, and then the joints in the paving should be filled with pitch or paving cement.

Board of Highway Supervisors.

The transactions of this Board and of its employees are fully set out in the reports of the secretary and of the chief draughtsman.

The increased receipts and the number of permits authorized issued show the continued disturbance of our highways, and the outlook for a cessation of such work at an early date is very unpromising.

Underground companies are being organized and are asking Councils for privileges which will, if granted, continue indefinitely the tearing up of street pavements and the interference with the transaction of business by the general public.

In addition to the money expended by the city to make good the damage done, these private companies come into direct competition with the interests of the city in the consumption of gas, and some sufficient return should be exacted for the valuable privileges granted them.

The following is a statement of the number of permits authorized to be issued to the several underground companies during the year 1889:

Penn Electric Light Company	22
Edison Electric Light Company.....	2
Frankford Avenue Merchants' Electric Light Company.....	15
Front Street Merchants' Electric Light Company.....	13
American Telegraph and Telephone Company.....	19
Bell Telephone Company.....	36
<hr/>	
Total.....	107

Why should not the companies which have received or shall hereafter receive the right to occupy the city's streets with their wires, whether overhead or underground, be required to light these streets free of cost? If the company furnishes arc lights, one such light should be maintained at each street intersection, and additional lights at distances not more than 200 feet apart; and if incandescent lights are furnished, a light of not less than twenty candle power should be placed in every lamp-post erected. If the company only owns the conduits and rents them to companies furnishing power for lights, these latter companies should furnish the lights.

At present the city receives no adequate return for the opportunities afforded these corporations to make profits at the expense and to the injury of the city's property.

The recommendation of the executive officers of the Board for an increase in the staff of draughtsmen is worthy of favorable consideration. The year's receipts for work done for parties desiring plans for structures to be built under permission of the Board exceed the expenditures by \$987, very nearly double the profits for the year 1888.

The plans made of underground works, especially in the older portions of our city, are extremely valuable. When pipes were laid and sewers built many years ago the importance of records of the work done was not realized as it is at the present time, and the important information now being gathered should be plotted as rapidly as it is secured.

The appropriation already made is insufficient to employ additional help, and the expenditure of the present income in the employment of competent assistants should be authorized.

The following is a summary of the transactions of the Board, of the labors of the draughting department and of the receipts and expenditures for the years 1887, 1888 and 1889:

Transactions of the Board of Highway Supervisors.

	1887.	1888.	1889.
Permits authorized to be issued for vaults.....	8	8	9
Permits authorized to be issued for railroad tracks, curves and turnouts.....	27	10	51
Permits authorized to be issued for underground pipes.....	2	3	7
Permits authorized to be issued for electrical conduits.....	46	108	107

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

	1887.	1888.	1889.
Street record plans corrected.....	32	38	82
New street record plans prepared.....	49	65	39
Blue print plans placed on file.....	90	110	190

Receipts and Expenditures.

	* 1887.	1888.	1889.
Receipts.....		\$2,811 00	\$3,837 00
Expenditures.....		2,349 89	2,920 00
Profit to the city.....		\$461 11	\$917 00

* No receipts in 1887. Remunerative work not done until 1888.

Bureau of Lighting.

This Bureau was created by Ordinance of Councils approved June 29, 1889, and consists of one chief, one clerk, five district superintendents, one assistant foreman and messenger, five mechanics and laborers, and 248 regular and 25 substitute lamp lighters, the latter receiving pay only when doing duty for regular lighters absent for any cause. The ordinance prescribes that as many lamp lighters as are necessary shall be employed, not exceeding one lighter to every sixty lamps.

The total number of employes at the close of the year was 286.

The lighting of the city, whether by gasoline, by gas or by electric light, has been under the care of this Bureau since July 1, 1889, but the electric lighting is, for technical purposes, under the supervision of the Chief of the Electrical Bureau. The work has been done intelligently and much more efficiently than when, as in previous years, it was distributed among several different branches of the service.

The number of public lights increased with the erection of new buildings and the extension of streets, and the demand for additional light is no doubt stimulated by the many electric arc lights erected all over the city at both private and public expense.

The location, by Ordinances of Councils, of the additional lamps authorized year by year continues in the unsatisfactory condition mentioned in previous reports, and the careless way in which it is done is indicated by the report of the Chief of the Bureau, which shows that 297 lamps, over 15 per cent. of the 1,964 located by the Ordinances of Councils, could not be erected, most of them for reasons that would readily have presented themselves to any official required to make proper inquiry into the many petitions presented for additional lamps. These 297 lamps could have been placed at other points at present unlighted.

A subject of such great importance to the portions of our city newly built up should certainly have the intelligent consideration of Councils at an early day, and the haphazard way of distributing the public lamps should give place to a more rational method.

The following comparative statement shows the number of lamps and expenditures during the years 1887, 1888 and 1889.

	1887.		1888.		1889:	
	No.	Cost.	No.	Cost.	No.	Cost.
Electric Arc Lights.....	524	\$87,974 53	756	\$120,133 52	1,045	\$164,780 33
Gasoline Lamps.....	5,297	116,586 09	5,932	131,301 94	6,476	142,643 28
Gas Lamps Supplied by the Northern Liberties Gas Company.....	472	10,701 45	415	9,429 55	380	8,810 75
Under Charge of Bureau of Gas.....	*16,473		*17,261			
Under Charge of Bureau of Lighting.....					†18,074	†151,417 91
Electric Arc Lights under charge of Board of Directors of City Trusts.....					50	
Gas lamps under charge of Bureau of Correction.....					149	
Total.....	22,766	\$215,262 07	24,366	\$260,865 01	26,174	\$467,652 27

* Not lighted because of proximity to electric lights:

1887	1,062
1888	2,034
1889	2,460

† Until July 1, 1889, under charge of the Bureau of Gas.

‡ Formerly paid out of the appropriation to the Bureau of Gas.

The lighting by gasoline is done under a contract made by Ordinance of Councils, approved December 31, 1878, (a copy of which is appended) with the Pennsylvania Globe Gas Light Company, at a cost of \$21 per lamp per annum, with other charges for erections, repairs, etc., fixed in the annual appropriation ordinances. The company has agreed to erect all additional lamps ordered during 1890 without charge for posts and lanterns, a saving calculated upon last year's prices and the number of lamps authorized to be erected in 1890, of \$10,000. The total number of lamps under the care of this company is 6,476.

The lighting with gas of that portion of the city formerly known as the District of the Northern Liberties, situate between the Delaware River and Sixth Street, and between Vine and Poplar streets, is done by the Northern Liberties Gas Company

at a cost, for gas and maintenance, of \$22.27 per lamp per annum. The total number of lamps under the care of this Company is 380.

The Department of Charities and Correction, in connection with the gas works operated by them at the House of Correction, lights, without expense to the city, 149 lamps erected in and about Tacony and Holmesburg in the Twenty-third Ward.

The lighting by electric arc lights is done under annual contracts with seven different companies, dividing the city into districts suited to the location and the capacity of the power stations of the several companies. The number of lights at the close of the year was 1,045, maintained at a cost to the city, per lamp per night, of from 55 to 45 cents, with an average cost of $48\frac{1}{2}$ cents. The contracts for 1890 have been made at an average cost of $47\frac{3}{4}$ cents per lamp per night for an estimate of 1,245 lamps.

The territory lighted by underground wires has not been extended during the year, but the continued satisfactory service rendered in the districts so lighted during the past years, proves that there are no insurmountable difficulties in the way of putting electric light wires under ground, and they will be so placed whenever ordinances requiring it shall be enacted. A copy of the specifications under which contracts for electric lighting during the year 1890 have been made, is attached.

The following table is a schedule of the prices paid under the contracts for 1887, 1888 and 1889, and of the contract price for 1890, and also a statement of the lamps under the care of the several electric light companies.

	1887.	1888.		1889.		1890.	
		No.	Price.	No.	Price.	No.	Price.
BRUSH ELECTRIC LIGHT COMPANY.							
South from the south side of Washington avenue between the Delaware and Schuylkill rivers.....	59½ & 62½	41	54	61	54	61	52½
From the north side of Market street to the south side of Callowhill street, and the west side of Broad street to the Schuylkill river.....		18	47½	30	47½	30	45
From the south side of Market street to the north side of Washington avenue, and between the Delaware and Schuylkill rivers.....	54	116	50	157	47½		
	50 & 52½	86	47½	102	45	259	45
All west of the Schuylkill river.....	55	69	50	91	50	91	50
UNITED STATES ELECTRIC LIGHT COMPANY.							
From the north side of Market street to the north side of Poplar street, and from the east side of Broad street to the Delaware river.....	50, 55, & 57½	94	50	140	49	110	48
PHILADELPHIA ELECTRIC LIGHT COMPANY.							
Bounded by the north side of Callowhill, the east side of Broad street, Erie avenue, Nicetown lane, and Fairmount Park.....	50 & 55	86	47½	133	45	133	45
North side of Callowhill street to the north side of Poplar street, east side of Broad street to the east side of Eighth street.....	52½	26	49½	39	47½	39	47½
NORTHERN ELECTRIC LIGHT AND POWER CO.							
From the west side of Thirteenth street to the west side of Second street north of (not including) Poplar street to Venango street.....		55	152	49	195	48	195
East side of Second street to the Delaware river, and north from south side of Poplar street to Venango street.....							47½
WISSAHICKON ELECTRIC LIGHT COMPANY.							
Between Leverington avenue, Twenty-first Ward, and Allegheny ave., Twenty-eighth Ward, and from the Schuylkill river to the Township line..	No lights.	17	55	27	55	27	55
FRANKFORD ELECTRIC LIGHT AND POWER CO.							
Harison to Mill street on Frankford avenue, Leiper street to Tacony road on Orthodox and Church streets, from Frankford avenue to Mill street on Paul street, or other streets in Frankford and vicinity.....	½ night	40	24	55	31	55	31
GERMANTOWN ELECTRIC LIGHT COMPANY.							
On such streets in Germantown as electric lights are now located, and such adjoining territory as the Department of Public Works may request us to light.....		55	27	55	39	55	39
1887, 524 lights, average price.....	54½						
1888, 756 lights, average price.....	50½						
1889, 1045 lights, average price.....	48½						
1890, 1245 (estimated) lights, average price....	47½						

The subject of testing the candle power of the lights furnished had the continued and careful consideration of the Chief of the Electrical Bureau, and of his able and painstaking assistant.

Repeated tests confirmed the belief that none of the lights were of 2,000 candle power, the standard called for by the contracts, and, further, that it was impossible to make such tests of practical utility in the daily work of the department. The very able report of Chief Walker and of his assistant, Mr. Sager, suggested the adoption of tests for voltage and amperage as the best and most readily attainable; and in accordance with their recommendation, these were named as the mode of ascertaining compliance with or failure in the new contracts on the part of the contracting companies. The reports referred to are made a part of this report.

In addition to the electric lights paid for by the city, fifty lights of similar power are maintained by the Board of Directors of City Trusts, along the River Delaware and on Front street between Vine and South streets, under the will of Stephen Girard, who bequeathed \$500,000 to the City of Philadelphia for improving the facilities for conducting the commerce of this port, limiting, however, the expenditures for this purpose to the income from the fund, and to the Delaware river, in that portion of our city which was known, in his day, as the "City of Philadelphia."

The largest portion of the work of this bureau, both as to territory lighted and as to the number of lamps, is the care of the 18,074 lamps, for which gas is furnished free of cost by the Bureau of Gas, and which consumed during the past year the enormous quantity of 455,423,195 cubic feet of gas.

The 273 lamplighters are required to clean these lamps, and to light and extinguish them according to the time schedule adopted by the bureau. The number of miles travelled in doing this work during a year would make a startling exhibit, which could be made more impressive by the fact that the work must be, and is, done in all sorts of weather. It is generally well done, and the lamps are kept in good order.

The report of the chief of the bureau shows that the glass in 30,212 lamps was broken and repaired during the year, a convincing proof that the mischievous boy is much abroad in our city.

The total expenditures for lighting the city for the year 1889, charged during the first six months against the appropriation to the Director's Office and against that of the Bureau of Gas, and during the latter half of the year against the appropriation to the Bureau of Lighting, were \$467,971 78

To this sum should be added the value of the gas furnished free by the Bureau of Gas, 455,423,195 cubic feet, and which would have been sold to private consumers, had it not been used for lighting the city at \$1.50 per 1,000 feet, for

	683,134 79
	<hr/>
Total,	\$1,151,106 57
During 1888,	1,096,615 50
	<hr/>
An increase of	\$54,491 07

These large figures will increase yearly, because of the annual increase of say 300 electric, 1,000 gasoline, and 1,000 gas lamps.

As a part of this report is printed herewith :

First. The Report of the Electrical Bureau of their tests of the electric lights.

Second. The specifications for electric lighting during the year 1890.

Third. The ordinance approved December 31, 1878, with supplement thereto, approved June 3, 1887, authorizing the contract with the Pennsylvania Globe Gas Light Company.

Philadelphia, December 20, 1889.

GENERAL LOUIS WAGNER,

Director, Department of Public Works.

DEAR SIR :—By direction of W. S. Stokley, Director of Department of Public Safety, I have had tests made of the light furnished the city by the Electric Light Companies, and herewith hand you a complete report of J. C. Sager, Manager in this Bureau, of the result of measurements made at different times. It is full in all its details, and I have no doubt it will give you valuable information. I concur with Mr. Sager in his recommendation as to the best method of arriving at the amount of light to be furnished the city by the contractors. I suggest that the specifications for public lighting be so drawn as to require the companies to state the amperage and voltage proposed to be furnished, and that at least one test station be furnished in each circuit, where the amount of current furnished can be ascertained. The voltage can be taken at will from any lamp without any alteration or addition to the conductors.

Respectfully,

D. R. WALKER,

Chief, Electrical Bureau.

Philadelphia, December 19, 1889.

D. R. WALKER, ESQ.,

Chief.

DEAR SIR :—In compliance with your instructions, and in conjunction with Mr. M. D. Law, General Superintendent of the Brush Electric Light Company, I have endeavored to obtain some data as to the candle power of the electric arc lights. With this end in view, frequent attempts were made to obtain satisfactory results from a portable photometer made after a pattern furnished the Bureau about a year ago, and said to

give very satisfactory readings, but owing to the inclement weather, the flickering of the candle by the wind, the uncertainty as to the accuracy of the result of using so low a candle power as two (2) sperm candles against light of such high intensity, and numerous other causes, it was deemed advisable to look in other directions for the information desired.

Through the courtesy of the Public Building Commission, permission was given to use a large room on the sixth floor of the south side of the New City Hall, which being without plaster and showing but a dead brick wall, was admirably suited for the purpose of making photometrical measurements. A loop was run into the room from a Brush and one from a United States electric lighting circuit, to supply current for the tests: a photometer of a standard make was set up and a volt and ammeter to obtain the electrical readings were secured. On November 22, a preliminary experiment was made with a standard of two (2) sperm candles, and a Brush arc lamp suspended at a height of 20 feet from the floor; a silvered-back mirror, placed at an angle of 40° from the arc of the lamp, was used to throw the light from the lamp on to the photometer screen. These tests were not considered satisfactory, owing to the low power of the standard (two candles) used: being unable to obtain other means of illumination of sufficient intensity to be used as a standard, a large oil lamp was secured, and on November 25, an experimental series of tests was made using it as a standard, which were of a more satisfactory nature.

On the following evening a series of experiments was entered into with a view of finding the best altitude from which to take the measurements, and it was finally decided to take them with the arc of the lamp 20 feet from the floor, as that is about the mean height at which the city lamps are placed, and at an angle of 40° from the arc to the mirror.

On December 3, a new Thompson-Houston lamp, just as it came from the factory, was placed in the circuit, no attempt being made to adjust the arc. As may be seen by the table,

the readings in volts were very high, taking a range of from 47 to 57 volts; the amperes during these readings were almost constant 9.6; the results show a mean of 1,318 candles for the Thompson-Houston lamp.

On December 4, the same lamp was used in the tests, but the conditions were changed in so far as the length of the arc was adjusted, so that the voltage took a range of from 43 to 49; the current during this test varied considerably as the ampere readings will show. The mean result, 940 candle power, hardly shows the proper intensity, as the arc continued to travel around the carbon in such a manner as to keep it almost constantly away from the mirror. Brown glass screens were introduced during this test and were used with a view of destroying the blue figure shown on the disk by the arc light, and proved so very satisfactory that all future readings were made with them interposed between the lights and the disk.

On December 6, with the voltage and amperage almost constant, a very satisfactory series of tests was made with the Thompson-Houston lamp. Readings were first taken with the arc unobstructed, as were all the tests previously made, and then a dirty globe which I had brought in from the street was interposed between the arc and the mirror; the results show a loss of about 27 per cent. of light. A Brush lamp was introduced and tested under the same conditions, first with the arc unobstructed and then with the dirty globe interposed. The result, as with the Thompson-Houston lamp, was a loss of 27 per cent. A peculiar feature of the tests with the dirty globe was the focussing of the arc through a ring in the glass, the intensity of the light being so great as to give the same candle power as before the introduction of the globe. On turning the globe, however, different conditions resulted giving the loss shown.

On December 10 a test of a United States (Weston) lamp was made, resulting in a mean of 479 candle power. This was the most unsatisfactory test of the series. The first lamp

used could not be made to feed; the second lamp, while apparently in good order, gave but the small candle power mentioned above.

December 11 was decided on as the final night for testing, and the percentage of loss between a clear and dirty globe the subject for the night's experiments, but owing to the unsettled condition of the arc, which was constantly changing its relations to the mirror, the results obtained were decidedly unsatisfactory in so far as photometrical measurements were concerned. The light from the electric light (a Brush lamp) appeared unusually brilliant, and the current strength indicated by the volt and ammeters gave promise of a series of high-reading candle power measurements, but, on completing the computations, the results proved a disappointment. A glance at the first candle power reading of the series shows but 475, while from the volts and amperes and the brilliant appearance of the arc a candle power of two or three times that amount might have been expected. A second reading giving 633 candles was made, and the lamp turned, thus presenting a different side of the arc. The result was to increase the indications to 757 candles; a second reading giving 865 candles was made and the lamp lowered for the purpose of placing a clear globe on it. On restoring it to position readings were taken which gave 925 candles: a second taken while the arc was in the same condition shows 1,025. The lamp was then turned, and the result of two readings from this position gave 669 and 775, the arc being changed in its relation to the mirror. The clear globe was removed and a dirty one substituted, through which, on the first two readings, a candle power of 650 and 803 was obtained. The lamp was then turned and 559 and 572 candles were the result. The difference between the first two and the second two of the readings with the dirty globe in position would indicate that the lamp was furnishing a candle power of the same magnitude from one point of view, while from another it was considerably reduced. The general effect noted in the room was one of

great brilliancy, while the result as obtained on the photometer would indicate a contrary condition.

The results of all the measurements taken have been condensed into tables herewith attached. A grand mean of all the candle power indicated by the photometer shows for the Brush lamp 715.8 candles, for the Thompson-Houston 1,146.6, a grand mean for these lamps on the circuits carrying 9.6 amperes of 936.2 candles, and for the United States (Weston) lamp a mean of 479 candles, all of which were taken from the lamps suspended twenty feet from the floor.

From these tables seven readings were selected, which gave an individual reading of 9.6 amperes and from 47 to 48 volts, equalling .603 horse power and a grand mean of 1,160.7 candle power as a standard.

From these observations I am of the opinion that the taking of the candle power of an electric arc light by photometrical measurements is, to a great extent, approximal, and suggest, until a more certain method be formulated, the adoption of the following as a standard: For the United States (Weston) lamp a current of $18\frac{1}{2}$ amperes and from 32 to 35 volts per lamp; for the Brush and Thompson-Houston lamps a current of 9.6 amperes and from 47 to 50 volts per lamp. This, according to the computation made for the seven results mentioned above, would give about 1,000 candle power for the last-named lamps.

In order that these readings may be taken from time to time as may be deemed necessary, I recommend that the various companies be required to place a cut-out box on each circuit, into which the circuit shall be looped through a spring-jack or other device, to facilitate the taking of the amperage.

Owing to the limited time that could be allowed from my duties and occurring at the time of the transfer of the Bureau from the old to the new office, I was unable to cover as much territory as could have been desired, and was therefore prevented from making tests of the lamps of the Northern, Frankford, Germantown and other companies.

In conclusion, allow me to express the desire that you officially thank Mr. M. D. Law for his most able and valued assistance and for the loan of the photometer and electrical instruments.

With the sincere wish that the suggestions mentioned may prove serviceable toward obtaining a perfected system of public lighting, I remain

Yours most respectfully,

JOHN C. SAGER,

Manager.

TABLE 1. *Result of Tests for "C. P." of Electric Lights.*

Date.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMPS.		Remarks.
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.	
November 22	Brush.....	40°	469	9.5	9.4	51.5	48	470.2	.68	Two sperm candles used as standard.
	Brush.....	40°	615	9.45	9.4	52	49	490.1	.657	
	Brush.....	40°	572	9.45	9.45	45	52.5	460.1	.616	
	Brush.....	40°	467	9.45	9.45	51	50	491.4	.658	
	Brush.....	40°	508	9.1	9.4	52	50.5	481.7	.645	
	Brush.....	40°	468	9.55	9.5	52	46	466.8	.624	
	Brush.....	40°	797	9.45	9.1	50	50	471.2	.631	
	Brush.....	40°	813	9.4	9.45	50	47	457	.612	
Grand Mean.....			588					473.5	.634	Forty-seven lamps in circuit.

TABLE 2. *Result of Tests for "C. P." of Electric Lights.—Continued.*

Date.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMPS.		Remarks.	
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.		
November 25	Brush.....	40°	609	9.55	9.55	45.	47.	439.3	.588	Large oil lamp used as standard.	
	Brush.....	40°	501	9.5	9.5	42.	45.	413.2	.553		
	Brush.....	40°	551	9.5	9.5	46.	43.	422.7	.566		
	Brush.....	40°	446	9.5	9.5	44.	47.	432.2	.579		
	Brush.....	40°	760	9.5	9.5	45.	46.	432.2	.579		Lamps turned.
	Brush.....	40°	694	9.5	9.5	47.	49.	456.	.611		Lamps turned.
	Brush.....	40°	805	9.5	9.5	49.	49.	465.5	.624		Lamps turned second time.
	Brush.....	40°	615	9.5	9.5	46.	47.	441.7	.590		Lamps turned second time.
	Brush.....	40°	294	9.5	9.5	48.	47.	451.2	.604		Lamps turned third time.
	Brush.....	40°	179	9.5	9.5	48.	46.	446.5	.598		Lamps turned third time.
Forty-eight lamps in circuit.											
Grand Mean.....			545					440.	.589		

TABLE 3. Result of Tests for "C. P." of Electric Lights.—Continued.

Date.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMPS.		Remarks.
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.	
November 26	Brush.....	40°	346	9.6	9.6	49.75	48.	469.2	.628	Large oil lamp used as standard. Forty-eight lamps in circuit.
	Brush.....	40°	351	9.6	9.6	49.	48.	461.2	.616	
	Brush.....	38°	533	9.5	9.5	51.	50.	479.7	.643	
	Brush.....	38°	798	9.5	9.5	47.	47.	447.6	.6	
	Brush.....	34°	603	9.5	9.5	49.	47.	454.8	.609	
	Brush.....	34°	915	9.25	9.25	49.	48.	448.6	.601	
	Brush.....	31°	717	9.5	9.25	50.	50.	467.5	.626	
	Brush.....	31°	809	9.5	9.25	50.	49.	464.1	.621	
	Brush.....	27°	643	9.5	9.5	49.	47.	472.4	.606	
	Brush.....	27°	765	9.5	9.5	49.	51.	472.5	.633	
	Brush.....	25°	700	9.4	9.4	48.	49.	455.9	.611	
	Brush.....	25°	732	9.4	9.4	49.	50.	465.3	.623	
	Brush.....	Horizontal	367	9.4	9.4	50.	48.	460.6	.617	
	Brush.....	Horizontal	412	9.4	9.4	47.	49.	451.2	.604	
Grand Mean..										

TABLE 4. *Result of Tests for "C. P." of Electric Lights.—Continued.*

DATE.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMPS.		Remarks.
				Before.	After.	Before.	After.	Watts (Mean).	Horse Power.	
December 3...	Thompson-Houston....	40°	1150	9.6	9.5	48.	51.	477.5	.64	Standard (oil lamp).
	Thompson-Houston....	40°	1357	9.5	9.6	54.	52.	506.1	.678	New lamp just received from shop, no adjustment.
	New lamp..	40°	1333	9.6	9.6	55.	54.	523.3	.701	
	New lamp..	40°	1016	9.6	9.6	52.	52.	499.2	.669	Lamp turned.
	New lamp..	40°	1289	9.6	9.5	47.	48.	453.6	.608	Lamp turned second time.
	New lamp..	40°	1259	9.6	9.6	49.	48.	465.6	.624	
	New lamp..	40°	1698	9.6	9.6	54.	54.	518.4	.694	
	New lamp..	40°	1208	9.6	9.6	56.	48.	499.2	.669	
	New lamp..	40°	1410	9.5	9.5	49.	57.	503.	.674	
	New lamp..	40°	1464	9.6	9.6	56.	55.	532.8	.714	Forty-eight lamps in circuit.
Grand Mean...			1318						.667	

TABLE 5. *Result of Tests for "C. P." of Electric Lights.—Continued.*

Date.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMP.		Remarks.
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.	
December 24..	Thompson-Houston....	40°	760	9.6	9.9	43.	50.	453.9	.608	Lamp adjusted to read 45 to 50 volts.
	Thompson-Houston....	40°	974	9.7	9.6	50.	41.	439.3	.588	
	Thompson-Houston....	40°	923	9.7	9.5	44.	46.	431.9	.678	Lamp turned.
	Thompson-Houston....	40°	1028	9.6	9.5	48.	47.	453.6	.608	
	Thompson-Houston....	40°	880	9.5	9.4	49.	48.	458.3	.614	Lamp turned second time.
	Thompson-Houston....	40°	1079	9.45	9.5	49.	45.	415.2	.596	
			Forty-eight lamps in circuit.							
Grand Mean.....			940							.615

TABLE 6. *Tests made for Percentage of Loss of Dirty Globe.*

Date.	Lamp.	Angle.	Candles.	Amperes		Volts.		ENERGY IN LAMPS.		Remarks.	
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.		
December 6.....	Thompson-Houston....	40°	1295	9.75	9.7	46.	45.	442.5	.593	Lamps turned.	
		40°	1219	9.7	9.7	49.	47.	470.6	.630		
		40°	1240	9.6	9.7	49.	48.	473.	.634		
		40°	1010	9.7	9.6	45.	44.	429.4	.575		
		Grand Mean...	1182						.608		
		40°	830	9.7	9.7	44.	50.	455.9	.611		Dirty globe taken from lamp in street.
		40°	893	9.6	9.6	53.	52.	504.	.676		Forty-eight lamps in circuit.
Grand Mean.....		861					.643	Loss 27 per cent.			

TABLE 7. Tests made for Percentage of Loss of Dirty Globe—Continued.

Date.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMPS.		Remarks.	
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.		
December 6	Brush.....	40°	1293	9.5	9.5	48.	47.	451.2	.604	Lamps turned.	
	Brush.....	40°	1231	9.5	9.5	47.	47.	446.1	.598		
	Brush.....	40°	1077	9.5	9.5	49.	46.	451.	.604		
	Brush.....	40°	1139	9.5	9.5	48.	51.	470.	.63		
				1184					.609		
				1199	9.5	9.5	48.	48.	456.	.611	With globe taken from street, arc
				1076	9.5	9.5	49.	46.	478.7	.641	focusing through ring in globe.
				1137					.626		
				861	9.5	9.5	45.	47.	437.	.585	Lamp turned.
				861	9.5*	9.5	47.	47.	446.5	.598	Dirty globe. Forty-eight lamps in circuit.
Grand Mean.....			861					.591	Loss 27 per cent.		

TABLE 8. *Tests made for Percentage of Loss of Dirty Globe.—Continued.*

Date.	Lamp.	Angle.	Candles.	Ampere.		Volts.		ENERGY IN LAMP.		Remarks.
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.	
December 10	U. S.(Weston)	40°	460	19.	19.	32.5	31.5	608.	.815	Arc unsteady.
	U. S.(Weston)	10°	501	19.	19.	32.	30.	589.	.789	
	U. S.(Weston)	40°	397	18.9	19.	31.5	30.	582.	.78	Lamp turned.
	U. S.(Weston)	40°	588	18.9	18.9	30.5	31.	581.	.778	
	U. S.(Weston)	10°	418	18.9	18.9	32.	30.5	590.6	.79	Lamp turned second time.
	U. S.(Weston)	40°	511	18.9	18.9	30.	31.5	581.	.778	
										Thirty-two lamps in circuit.
Grand Mean.			479						.788	

TABLE 9. Tests made for Percentage of Loss between Clean and Dirty Globe.

Date.	Lamp.	Angle.	Candles.	Amperes.		Volts.		ENERGY IN LAMP.		Remarks.	
				Before.	After.	Before.	After.	Watts (mean).	Horse-power.		
December 11.	Brush.....	40°	475	9.25	9.25	50.	49.	457.	.612		
	Brush.....	40°	633	9.25	9.	50.	47.	442.7	.593		
	Brush.....	40°	757	9.	9.25	46.5	52.	449.7	.601		
	Brush.....	40°	865	9.25	9.25	48.5	49.	450.7	.603		
		Grand Mean.		682						.604	
				925	9.25	9.25	53.	52.	485.6	.651	Clear globe.
				1025	9.25	9.25	53.	53.	490.2	.657	
				669	9.25	9.25	52.	54.	490.	.656	Lamp turned.
				755	9.25	9.25	54.	54.	499.5	.669	
		Grand Mean.		843						.658	
				650	9.5	9.5	55.	54.	517.7	.694	Dirty globe.
				803	9.5	9.5	55.	54.	517.7	.694	
				559	9.5	9.5	54.	56.	522.5	.7	Lamp turned.
				572	9.5	9.5	51.	55.	503.5	.673	Forty-eight lamps in circuit.
	Grand Mean.....			646						.690	Loss 23 per cent.

CITY OF PHILADELPHIA.
DEPARTMENT OF PUBLIC WORKS.
BUREAU OF LIGHTING.

CLASS F.

PROPOSALS

For furnishing electric arc lights during the year 1890.

To the Director of the Department of Public Works :

SIR:—The undersigned offers to furnish, during the year 1890, electric arc lights, as described in the following specifications, which are hereby made a part of this proposal, for the following prices per night, viz :

1. For each light by overhead wire on poles in the following districts :
 - cents per light per night.
2. For each light attached to underground cables owned by the city on the following streets :
 - On Broad street, north of Callowhill street,
cents per light per night.
 - On Broad street, south of Market street,
cents per light per night.
 - On Diamond street, west of Broad street
cents per light per night.
 - On Spring Garden street, west of Broad street,
cents per light per night.
4. The lights to be subjected to the following tests :
 - A current of ampers and volts per
lamp, at one or more testing stations to be established in each
circuit.
5. Quarter frosted globes only to be used, and kept clean.

Name

Address

Philadelphia,

1890.

SPECIFICATIONS.

1. Bids must be submitted in sealed envelopes, addressed to the undersigned, and endorsed "Proposals for electric lights."

2. No bid will be considered unless made upon this blank.

3. Bids must be described by street-bounds the part of the city to be covered, and they will include the lights already authorized by ordinance, and all others that may be located in the district covered by the contract made.

4. The Director reserves the right to reject any or all bids, or to accept any portion of a bid, as he may deem best for the interest of the city.

5. The lights must be electric arc lights, of the kind and power named in the bid.

6. The Director of the Department of Public Works shall have the right to have tested any light or circuit of lights, and to reject any not up to the standard named in the bid, making proper reduction in the monthly bills on account of any lamps rejected.

7. No lights beyond the registered capacity of the dynamo shall be attached to the wires furnishing the city lights.

8. The erection, position and maintenance of all electric lights shall be subject to the approval of the Director of the Department of Public Works.

9. The lights must burn from sunset to sunrise. Lights burning less than nine hours per night from September 1 to March 31, or less than six hours per night from April 1 to August 31, will not be paid for.

10. The failure of the lights for two nights, except for unavoidable causes, of which the Director shall be the judge, or any other violation of these specifications, shall be sufficient cause for the annulment of the contract.

11. Payments will be made monthly upon sworn statement of the services rendered, and after approval of the bills by the Chief of Electrical Bureau.

12. Bonds as prescribed by the ordinances of the city will be required for the faithful execution of the contract.

LOUIS WAGNER,

Director Department of Public Works.

Philadelphia, December 21, 1889.

AN ORDINANCE

To provide for lighting, extinguishing, cleansing and repairing public lamps of the Maloney Company Patent.

SECTION 1. *The Select and Common Councils of the City of Philadelphia do ordain*, That upon the passage of this ordinance the Trustees of the Philadelphia Gas Works shall be authorized and required to contract for a period not exceeding one year, in accordance with the provisions of this ordinance, on behalf of the City of Philadelphia with the Maloney Company, for the lighting, extinguishing, cleansing and doing the necessary ordinary repairs for all the public lamps of the Maloney Company Patent, including the supply of the materials necessary, as follows: For furnishing naphtha to and lighting all and every night, extinguishing, cleansing and repairing, at a price not exceeding twenty-one (21) dollars per annum for each lamp, and at the same rates for any lamps that are now erected; and for the erection of lamps of the said patent at a price not exceeding ten (10) dollars for each lamp. Bills for the amount due under said contract shall be presented and paid monthly as herein provided. The contract herein provided for to continue from year to year, unless Councils otherwise direct by ordinance.

SECT. 2. To carry into effect this ordinance, there shall annually be appropriated a sufficient sum to carry out its provisions.

SECT. 3. Upon the presentation of bills under the contract by the Maloney Company, the Mayor of the City shall forth-

with be required to draw his warrants on the Treasurer of the City in favor of the said company, for the payment of the same, or for the payment of bills for any lamps, now erected: *Provided*, The correctness of said bills is duly certified by the Committee on Gas.

SECT. 4. Monthly statement of the number of lamps in use and of the introduction of all new lamps, are hereby required to be furnished to the Committee on Gas, which Committee shall examine said statements and report thereon to Councils.

SECT. 5. All ordinances or parts of ordinances inconsistent herewith be, and the same are, hereby repealed.

A SUPPLEMENT

To an ordinance entitled "An Ordinance to provide for lighting, extinguishing, cleansing, and repairing public lamps of the Maloney Company Patent, approved December 31, 1878."

SECTION 1. *The Select and Common Councils of the City of Philadelphia do ordain*, That hereafter the Director of the Department of Public Works shall have supervision of the lighting, extinguishing, cleansing, repairing, etc., of the public lamps of the Maloney Company Patent, under their contract with the city, and all bills for said lighting, etc., shall be presented to said director, and upon the approval thereof, by him, he is authorized and directed to draw warrants therefor upon the City Treasurer. Monthly statements of the number of lamps in use and of the introduction of all new lamps are hereby required to be furnished to the Director of the Department of Public Works, who shall examine said statements and report thereon to Councils; and Sections 3 and 4 of the ordinance to which this is a supplement be, and the same are, hereby repealed.

Bureau of Street Cleaning.

This Bureau continued during 1889 the good work so satisfactorily done in the previous year. The streets are cleaner than they have been for many years past, and the garbage and other offal have been removed promptly. The number of complaints for the non-removal of garbage was 3,237 for nine months in 1887, 1,162 in 1888, and 763 in 1889. The total complaints, of all kinds, has been reduced from 4,539 in 1887, and 3,395 in 1888, to 1,937 in 1889; a gratifying improvement attributable partly to the prompt enforcements of the penalties named in the contracts, but still more to a conscientious endeavor for honest service by the contractors, who, with a single exception, and that exception relating only to the non-collection of garbage, did their work well.

The very large amount of repaving of streets with improved pavement, the laying of gas and water pipes, the building of sewers, and the construction of conduits for telegraph, telephone, and electric wires, together with the erection of nearly 12,000 new buildings, has rendered the work of keeping the streets clean more difficult than usual.

The expenditures for salaries remain as during the preceding year, whilst the actual expenditures for cleaning, etc., was \$422,147.00—\$10,169.58 less than during the year 1888, notwithstanding the fact that the territory within which the streets should be cleaned at least daily was largely increased.

The number of squares cleaned has increased from 320,455 in 1888, to 473,829 in 1889, but the number of loads of dirt and offal of all kinds removed has decreased from 894,861 in 1888, to 729,796 in 1889, the result of the many heavy rains which reduced the labors of the street cleaners to the extent noted.

The number of crossings cleaned has decreased from 205,048 in 1888, to 27,161 in 1889, because of the absence of snow and ice during the winter of 1888-89.

The total Work done during the Year 1889, is as follows :

511

DISTRICTS.	CLEANED.					REMOVED.			Number of Complaints of all Kinds.	
	Squares	Inlets.	Crossings.	Market Houses.	Snow from Fire Plugs.	No. of Dead Animals.	NUMBER OF LOADS.			
							Dirt.	Ashes.		Garbage.
First.....	92,295	30,377	5,591	537		932	52,713	72,083	8,222	137
Second.....	96,325	43,547	7,372	553	386	1,930	35,748	68,327	8,280	488
Third.....	73,083	45,170	2,297	1,381		1,717	31,436	72,810	11,863	313
Fourth.....	153,165	41,746	4,526			6,404	109,541	154,457	19,761	452
Fifth.....	58,961	19,924	7,375			410	27,134	45,954	11,467	547
Total.....	473,829	180,764	27,161	2,471	386	11,393	256,572	413,631	59,593	1,937
Total, 1888.....	320,455	195,132	205,043	2,218	2,398	16,355	306,722	490,479	88,660	3,395

65

The following is a comparative summary of the expenditures for street cleaning for the years 1887, 1888, and 1889.

Years.	Amount.	Decrease.	Increase.
1887.....	\$304,021 00		
1888.....	441,514 50		\$137,493 50
1889.....	434,067 00	\$7,447 50	
1890 (appropriation).....	\$444,137 00		

The specifications for 1890 have been modified and improved as was deemed wise by the experience gained by the past year's work; the territory to be cleaned at least daily has again been increased; more frequent cleaning of portions of the city not so cleaned is prescribed, and all contracts provide that this work shall be done by machinery.

The required removals of garbage have been increased, and the Department has reason to expect that the Bureau will render satisfactory service to the public during the year 1890.

The appropriations for the ensuing year are:

For salaries.....	\$11,920 00
For cleaning, etc.....	432,217 00
Total.....	<u>\$444,137 00</u>

Tabular statements of work done in 1889, and the specifications under which the work is to be done during 1890, are printed with the report of the Chief of the Bureau.

Bureau of Surveys.

This Bureau built more lineal feet of branch and of main sewers during the year 1889 than in any previous year, and the sum of money expended for the work by the city, and by the property owners through assessment bills, was greater than

in any one year, except for branch sewers in 1888, and for main sewers in 1876. The following is a summary of the work :

YEARS.	BRANCH SEWERS.		MAIN SEWERS.	
	Feet.	Cost.	Feet.	Cost.
1876	43,560	\$109,336 99	9,714	\$491,365 94
1887	101,999	255,674 01	13,750	235,753 10
1888	159,890	498,553 95	14,705	215,920 42
1889	162,037	432,414 91	25,640	348,206 49

YEARS.	BRANCH SEWERS.		MAIN SEWERS.	
	Miles.	Cost.	Miles.	Cost.
Total sewers built to 1890.....	301.31	\$3,755,163 67	66.59	\$4,301,371 50
Built in 1887, 1888, and 1889....	80.29	1,186,642 87	10.25	799,880 01

or over 26 per cent. of all the branch sewers, and nearly 16 per cent. of all the main sewers in the city.

Work of greater or less extent, as the appropriation made by Councils for the purpose permitted, was done upon the following main sewers, but only the sewer on Lombard street, from Ninth street to Thirteenth street and on Thirteenth street to South street, was finished to the full extent of the work needed and planned.

LIST OF SEWERS ON WHICH WORK WAS DONE DURING THE YEAR 1889.

Allegheny avenue, from Seventeenth street to west of Twenty-third street.

Bainbridge street, west to Port Warden's line on the Schuylkill river.

Bridge street, from east of Pennsylvania Railroad west to Torresdale avenue.

Clearfield street, from Ninth street west to the Connecting Railroad.

Gunner's Run, northwest from D and Rosehill streets.

Lombard street, from Ninth street to Thirteenth street; and on Thirteenth street, from Lombard street to South street.

Reed street, from the Schuylkill River East Side Railroad east to Patton street.

Somerset street, from the foot of Williams street, through the Richmond coal wharves, west to Spring street.

Seventeenth street, from Clearfield street to Allegheny avenue.

Tasker street, from the River Delaware to Front street.

Tasker street, from Front street to west of Fifth street.

Twenty-fourth street, north from Clarence to above Lehigh avenue.

Twenty-fifth street, from Pennsylvania avenue to Parrish street.

Washington street, in the Twenty-third Ward.

Wingohocking sewer, in the Twenty-second Ward.

All of these, and many others not yet begun, are of vital importance to the health and cleanliness of our city, and large appropriations are desirable for their immediate extension and speedy completion.

In addition to completing the contracts for work on the above sewers, the following contracts, all of them for the extension of main sewers heretofore partly built, except the one on Norris street and on Susquehanna avenue, are authorized and some of them executed. Work under many of them is begun, and it is expected that all will be finished during the year 1890:

Clearfield street, from Thirteenth street east to the Connecting Railroad.

Norris street, from Ninth street east to Susquehanna avenue (three contracts).

East Susquehanna avenue, from East Norris street to the Delaware river (two contracts).

Somerset street, from Spring street west to the Aramingo canal.

Wingohocking sewer, eastward from Penn street, Twenty-second Ward.

Extensions of the connections of the intercepting sewer, in the Twenty-first Ward.

The above exhaust the appropriation made for this class of work, and the many other pressing demands for main sewers elsewhere must be held in abeyance until additional funds are placed at our disposal.

The early passage of the ordinance authorizing the expenditure of the amount set apart in the annual appropriation for main sewers, enabled this Bureau to begin operations in the spring, and most of the work was done during that season of the year in which the weather was favorable for operations of this kind. The work authorized for 1890 is in still greater state of advancement, the distribution of the money having been made in the appropriation ordinance itself.

The building of connections with the Intercepting sewer is being steadily pushed; the amount appropriated and expended during 1889 being \$25,000.

The advantages of this work are becoming more and more apparent, no less than 29 mills, with over 10,000 employés, and 328 other buildings having already made connections with this sewer, as required by law. 629 original notices to make connections have been served, and permits have been taken out by nearly all the parties notified.

The arrest of two men dumping refuse into the river from one of the mills, and of the owner of 27 dwelling houses in the lower part of the Twenty-first Ward, who failed to make connections with the sewer when notified to do so, and the expressed determination to press for the conviction of these and of all others similarly offending, has satisfied the owners of property on the line of the sewer that violations of law in this respect will be no longer tolerated, and as a result

plumbers and bricklayers have been kept busy making the connections ordered.

One hundred and ninety-eight connections were made with the intercepting sewer and 5,075 with other sewers during the year 1889.

Many specific complaints of drainage running over footways into gutters and thence to the nearest inlet, creating nuisances in winter by the accumulation of ice, and in summer by foul stench, have been made to the Department, and a great many charges of neglect of duty on the part of the officers of the Bureau of Surveys have been made because these nuisances were not abated.

Under the ordinances governing this matter, these officers can only report on the necessity for carrying this waste and foul water by underground drains into the public sewers, but they cannot compel such connections except after the approval of their reports by the Committee on Surveys of City Councils. The details of the present ordinance cause so much delay that it is respectfully suggested that it be amended and the responsibility for the work be placed where it properly belongs.

During the year 297 "gutter" complaints were received and disposed of as follows :

Connections made.....	103
Sent to the City Solicitor for prosecution.....	24
Dismissed	11
Held.....	2
Pending.....	157
Total.....	297

The work upon new bridges has been as follows :

Finished.....	4
Begun	5
Authorized.....	3
Planned.....	2

Those finished were :

One on Lansdowne avenue over Cobb's creek.

One on Chester avenue across the West Chester Railroad.

One across Sixth street on the line of the Connecting Railroad (all referred to in the report for 1888), and

One across Willow avenue on the line of the Chestnut Hill branch of the Philadelphia and Reading Railroad, in the Twenty-second Ward.

Those begun were :

Three on the line of the Connecting Railroad, across K street, Kensington avenue and Frankford avenue, all of them structures of great importance to the safety of travellers upon both the railroad and upon the streets crossed. They will be finished early in the spring and will cost the city \$85,750. The cost to the railroad company, which is responsible for the completion of the work, for actual construction of bridges and for the consequent changes of grade of tracks and streets, will very largely exceed this sum.

One on Poplar street, across the main line of the Philadelphia and Reading Railroad Company, is being built by the Union Passenger Railway Company to enable its cars to enter Fairmount Park at that point, as well as for general travel, and

One across the River Schuylkill on the line of Walnut street.

Work on this long-discussed and much-desired structure has been begun under plans approved by Councils and with sufficient appropriation to construct the necessary piers.

The river piers, two in the river making three spans, the one in the center 100 feet wide and the two on the east and west of somewhat less width, all of them giving clear passage for navigation of twenty-one feet at mean high tide in their center, and one each on the east and west shores of the river, are under contract to be completed by September next at a cost of \$120,000.

The trestle piers on the line of Walnut street, 111 in number, are under contract to be completed on April 2, 1890, for the sum of \$55,000.

The superstructure will be of iron, and the bridge and approaches will be 3,215 feet long, extending from sixty feet east of Twenty-third street to about 140 feet east of Thirty-third street, and the estimated cost of the whole structure is \$900,000.

No appropriation except for the construction of the piers has been made.

The report of the Chief Engineer and Surveyor gives detailed and interesting descriptions of the work planned, and of its progress under the contracts already made.

Those authorized to be built are :

One on Second street across the Richmond branch of the Philadelphia and Reading Railroad.

One across Twenty-second street on the line of the Connecting Railroad, and

One on Thirty-fourth street across the many tracks of the Pennsylvania Railroad.

When this latter structure is completed the undergrade crossing at Thirty-fifth street will be abandoned, and the railroad company will be able to make important changes in the, at present, very dangerous arrangement of tracks and cross-overs at this point.

The cost of these bridges will be largely in excess of the amounts appropriated by Councils for their construction, but the Pennsylvania Railroad Company has already contracted with the city for the erection of those at Twenty-second street and at Thirty-fourth street, and it is expected that the Philadelphia and Reading Railroad Company will do likewise for the one on the line of Second street.

Those planned are :

One for the cable cars on Columbia avenue near Ninth street, across the tracks of the Philadelphia, Germantown and Norristown Branch of the Philadelphia and Reading Railroad.

One on the line of the Connecting Railroad at Broad street.

The latter is to be a stone structure of four arches, and its erection will add greatly to the appearance of the street and the safety of the crossing. The proposed plans contemplate more headway than is given by the present bridge, and also some important changes of the grades of adjoining streets.

The following is a comparative statement of the operations of this Bureau in the active construction of the work during the years 1887, 1888 and 1889.

Summary of Bridges, Main, Branch, and Private Sewers, built during the years 1887, 1888, and 1889.

	1887.		1888.		1889.	
	No.	Linear feet.	No.	Linear feet.	No.	Linear feet.
Bridges.....	9		2		4	
Intercepting sewer (section).....	2		1			
Intercepting sewer connections.....					5	
Wissahickon Valley sewer (section).....	2	17,213.62	2	13,710.28	2	25,640.53
Storm water conduit, Falls Village.....	1					
Main Sewers.....	6		16		15	
Branch sewers.....	130	84,709.00	250	149,765.83	254	151,752.00
Private sewers.....	63	17,290.00	40	10,124.00	51	10,285.00
Total.....	204	*119,212.62	309	†173,600.11	327	‡187,677.53

* 1887, equal to 22.578 miles. † 1888, equal to 32.879 miles. ‡ 1889, equal to 35.544 miles.

Much of the time the officers of this Bureau, during the latter portion of the year, was taken up in the work of sewer repairs, or rather of sewer reconstruction.

Under the item of appropriation "for the examination and reconstruction of old sewers," contracts had been made for work on the sewer on Willow street, at St. John street and at Eighth street, and for the "Cohocksink" sewer on

Germantown avenue near Second street, and on Thompson street near Third street, with the intention of continuing the work on other portions of these sewers if the amount appropriated would permit.

Work was progressing satisfactorily when the heavy rains, for which the year 1889 will be noted in history, came, destroying the new and literally tearing the old work to pieces, justifying the several reports of the condition of these sewers made to Councils.

The work of repairs was prosecuted with all the despatch possible under such adverse circumstances. It was practically a building of a new sewer on Germantown avenue, from Van Horn street to west of Second street, on Thompson street from east of Third street to Charlotte street, and on Willow street from St. John street to Second street, and on Willow street for several hundred feet east and west of Eighth street.

This work cost over \$75,000, and a large portion of the sum is still unpaid, awaiting an appropriation by Councils for its settlement.

A contract for continuing the repairs on the Cohocksink sewer has been made and work resumed on Thompson street, west of Charlotte street.

The permanent remedy for all these difficulties was named in last year's report: "The building of other main sewers on lines parallel with those already built," so that the old structures might be relieved from the great flow of waters for which they were not originally planned.

This remedy is now being applied for the relief of the "Cohocksink" sewer, by the construction of a large sewer beginning at the foot of Susquehanna avenue (Otis street), thence on Susquehanna avenue to East Norris street, and on Norris street to Ninth street, tapping the old sewer at the latter point. This work is under contract to be finished in 1890 at a cost of \$305,000. It will be a relief to the entire drainage system of the north-eastern part of the city, and in addition to this, will be a great benefit to the people of the old

Kensington and the adjoining districts, by compelling the abandonment of the Kensington Pumping Station of the Bureau of Water.

The building of the large twin sewer through the Richmond coal wharves, from the foot of William street and thence west on Somerset street to Spring street, is rapidly approaching completion. The extension of this sewer to the Aramingo Canal, and to a junction with a sewer built from the west to that point many years ago, will give to the people living in this portion of our city a partial relief from the dangers and nuisances resulting from the present insufficient drainage.

The condition of this whole territory, known as the Aramingo Canal District, demands large and immediate expenditures for the construction of other main sewers emptying direct into the Delaware river, so that the open ditch, dignified with the name of "canal," may be filled up and obliterated, thus removing an ever-present menace to public health and a barrier to public improvement. The sewer on Westmoreland street, at present discharging its foul contents into the open air west of Frankford avenue, should have early attention.

The construction of these sewers would also permit a physical change of grades planned for the improvement of the low lands of this vicinity.

The work of the Registry Bureau, attached to the Bureau of Surveys, has largely increased during the past year, as shown by the following summary of its operations :

	1887.	1888.	1889.
Number of certificates registered owners issued.....	11,175	10,375	8,158
Number issued for use of the law department.....	400	209	337
Receipts from certificates of registered owners.....	\$2,803.25	\$2,617.00	\$2,039.50
Number of original lots plotted.....	9,039	8,508	11,868
Number of transfers registered.....	19,774	19,564	21 370
Number of plans made for use of city departments, bureaus, etc.....		57	157
Number of examinations of registry plan books made by the public.....		18,717	19,547
Number of descriptions of property filed for registry.....	21,944	18,717	22,034
Number of titles perfected.....	1,512	1,665	2,091
Number of certificates of legal opening of streets, issued to bureaus, etc.....	879	2,739	3,465
Number of certificates of registered owners in municipal lien cases for law department.....	526	412	1,383

The Chief Engineer and Surveyor refers fully to these matters, and it is merely necessary to name here, the completion of the records of the legal opening of streets from the year 1695 to date, covering 6,218 entries, and making two large volumes of important information, heretofore obtainable only by long searching of the records of the Court of Quarter Sessions.

The completion of the Index of streets opened, is a work of great advantage to those interested in the transfer of real estate and in building operations.

Reference is also made to the fact that Land Title Companies reduce the receipts of this branch of the Bureau of Surveys, by issuing "certificates of registered owners," making the city's record the basis of their certificates.

The Board of Surveyors is gradually coming under the immediate control of this Department by the appointment of the District Surveyors composing this body, as the terms of those elected by the people expire, or as those elected die or resign.

The First, Fourth, Eighth, Eleventh, and Thirteenth Districts have already been so filled, and the Second, Third, and Sixth Districts will be on April 1st, next. The remaining five

districts will not become vacant by expiration of term of service by election, until April 1, 1891.

The financial results of these changes are of advantage to the city, the fees received and earned in the districts already affected (four during the whole year and one during four months of 1889), exceeding the salaries and expenses, \$14,639.07.

The following statements show the receipts and expenditures by districts for 1889, and also, comparatively, for the years 1887, 1888, and 1889 :

	1887.	1888.	1889.
The total receipts of the districts working under the new law were.....	*\$5,229 46	†\$32,350 99	‡\$48,480 04
The total expenses were.....	4,290 00	21,504 74	33,840 97
Profit to the city.....	\$939 46	\$10,846 25	\$14,639 07
* 1887. 1 District.	† 1888. 4 Districts.	‡ 1889. 5 Districts.	

The amount and the importance of the work of the Bureau of Surveys can be gathered from the report of the Chief Engineer and Surveyor, of which the foregoing is necessarily a brief extract.

The following comparative summaries of the receipts and expenditures for the years 1887, 1888 and 1889 show that the former have steadily increased, and that the increase in the latter is not so great as the increase in the work for which they were incurred :

Comparative Statement of Receipts.

Year.	Receipts of Bureau.	Receipts of District Surveyors.	Total.	Increase.
1887.....	\$22,808 73	\$4,891 46	\$27,700 19	
1888.....	26,236 45	28,350 83	54,587 28	\$26,887 09
1889.....	29,914 32	42,060 44	71,974 76	17,387 48

Comparative Statement of Expenditures.

	1887.	1888.	1889.
Current expenses.....	\$63,704 05	\$86,658 23	\$132,289 61
For extensions.....	569,428 11	482,910 70	560,649 36
Total.....	\$633,132 16	\$569,568 93	\$692,938 97

Bureau of Water.

In view of the continued agitation of the question of the city's water supply, it is difficult to make an abstract of the many interesting and important facts contained in the report of the Chief of that Bureau.

The points first to be considered are the totals of the work done, of the cost of doing the same and of the income derived by the city through the operation of this branch of her service.

All this is shown in the following comparative summary of the operations for the years 1887, 1888 and 1889 :

	1887.	1888.	1889.
Receipts from water rents.....	\$1,721,488 83	\$1,798,432 38	\$1,848,542 49
" " fractional rents.....	115,939 21	118,550 16	148,394 73
" " water pipes.....	106,602 48	133,667 85	149,611 63
" " City Solicitor's office.....	29,504 04	22,846 97	33,043 09
" " penalties.....	24,453 03	28,584 86	24,247 96
" " delinquent rents.....	19,040 87	18,995 04	23,407 22
" " Chief Engineer's office.....	7,287 61	7,742 45	11,363 70
" " searches.....	3,412 75	4,158 25	5,056 25
" " delinquent penalties.....	2,705 79	1,948 54	3,332 78
Total.....	\$2,030,434 61	\$2,114,926 50	\$2,241,999 85

	1887.	1888.	1889.
	Gallons.	Gallons.	Gallons.
Pumped to reservoirs.....	32,426,779,765	37,068,763,428	42,518,919,781
Equal to gallons pumped 100 feet high.....	51,289,948,331	59,483,831,199	69,034,118,434
Cost per 1,000,000 gals. pumped 100 ft. high...	\$8 99	\$4 49	\$3 87

	1887.	1888.	1889.
	Gallons.	Gallons.	Gallons.
Pumped by water power.....	10,105,736,633	11,241,113,108	11,413,836,469
Pumped by steam power.....	22,321,043,132	25,827,650,320	31,105,083,312

	1887.	1888.	1889.
	Gallons.	Gallons.	Gallons.
Largest quantity pumped in 24 hours.....	118,604,079	138,674,777	148,966,334
Smallest quantity pumped in 24 hours.....	61,232,735	53,636,138	47,642,722

Year.	Average gallons per capita per day, estimating the population at*	Increase of	Increase per capita per day.	Reduction in cost of pumpage per 1,000,000 gallons.
	Gallons.	Gallons.	Gallons.	
1887	89	3,767,813,196	9	14 cents.
1888	100	4,651,983,663	11	†50 cents.
1889	110	5,440,156,353	10	62 cents.

* 1887— 995,000.
1888—1,020,083.
1889—1,050,000.

† Increase in cost of pumpage.

Expenditures.

	1887.	1888.	1889.
Current expenses	\$781,501 50	\$702,776 39	\$708,847 53
For extensions.....	295,440 09	491,131 01	605,658 57
Total.....	\$1,026,941 59	\$1,193,907 40	\$1,314,506 10

Comparing the results of the first year of this administration with those of the third year, we find the consumption of water has increased 10,092,140,016 gallons per annum, or nearly 33 per cent.; that the current expenses have decreased \$22,653.97, or nearly 3 per cent; and that the receipts have increased \$211,565.24, or more than 10 per cent.

These figures indicate careful and economical management, if nothing else.

The quality of the service is improved in even greater proportion.

Muddy or impure water purifies itself by subsidence, rendering much storage capacity of vital importance. In 1887, our reservoirs contained, when full, 195,414,200 gallons of water; at the close of 1889 869,288,814 gallons of water,

an increase of 673,874,614 gallons, or over 350 per cent.

This per cent., however, does not show the total advantages of increased reservoir capacity, for in 1887 it was only equal to two days' supply, whilst in 1889 it was equal to eight days' 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.	East Fairmount Park.....	Reservoir No. 1.....	1815 1821 1827 1835 1836 1836	94	26,850,800.
		" " 2.....			
		" " 3.....			
		" " 4, Section 1.....			
		" " 4 " 2.....			
" " 4 " 3.....					
Lehigh. Fairmount.	Sixth and Lehigh avenue.....	Section 1.....	1852 and 1871	114	26,894,000
		" 2.....			
		" 3.....			
Spring Garden.....	Twenty-sixth and Master streets.....	1844	120	12,000,000	
Corinthian.....	Corinthian avenue and Poplar street.....	1852	120	37,941,400	
East Park.	East Fairmount Park.....	Section 1.....	1887 1888 1889	133	62,737,632 306,400,622 304,736,360
		" 2.....			
		" 3.....			
Frankford.....	Oxford Turnpike and Comley street.....	1877	167	36,046,000	
Belmont.....	West Fairmount Park.....	1870	212	39,758,000	
Mount Airy.....	Allen's lane and Mower street, Germantown.....	1851	363	4,546,000	
Roxborough.....	Ridge and Shawmont avenues.....	1866	366	12,838,000	
Manatawna tanks—2.....	Manatawna and Ridge avenues.....	1878	442	100,000	
Chestnut Hill tank.....	Hartwell avenue and Chestnut Hill Railroad, Chestnut Hill.....	1860	481	40,000	
Total.....					869,288,814

The increase in our pumping capacity has, unfortunately, not kept pace with either the storage capacity or the consumption, and additional engines must be provided for at an early day. In 1887 we had 27 engines and turbine wheels, capable of pumping 165,290,000 gallons in twenty-four hours, and in 1889 we had 28 engines and turbine wheels, with a capacity of 185,290,000 gallons in twenty-four hours, an increase of only 12 per cent. +, as against an increase of storage capacity of 350 per cent. + and an increase of consumption of 33 per cent. —

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

PUMPING STATION.	Designated number 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	
	New Station.....	9 Worthington Duplex.....	15,000,000	
	"	10 " "	15,000,000	90,000,000
Belmont.....	1 Worthington Duplex.....	5,000,000		
"	2 " "	5,000,000		
"	3 " "	8,000,000	18,000,000	
Roxborough	1 Cornish Overhead Beam.....	2,250,000		
"	2 Worthington Duplex.....	5,000,000		
"	3 " "	7,500,000	14,750,000	
Roxborough Auxiliary..	1 Knowles' Pump.....	500,000		
" "	2 " "		500,000	
Mt. Airy.....	1 Davidson Pump.....	1,000,000		
"	2 " "	1,000,000	2,000,000	
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	
Kensington	Worthington Duplex.....	6,000,000	6,000,000	
FAIRMOUNT.	New House.....	1 Turbine Wheels.....	2,000,000	
	"	3 " "	5,330,000	
	"	4 " "	5,330,000	
	"	5 " "	5,330,000	
	Old House.....	7 " "	5,100,000	
	"	8 " "	5,100,000	
"	9 " "	5,100,000	33,290,000	
Total.....				185,290,000

The increase in the consumption of water is a subject which must soon have consideration by City Councils, either in the way of large appropriations for additions to our pumping machinery and our reservoirs, or for the purpose of adopting measures by which the present waste of water may be stopped or at least materially reduced.

The average daily consumption during the year 1889, calculated upon 1,050,000 as the estimated population of our city, is 110 gallons per capita, an increase over 1887 of 21 gallons per capita per day, and over 1880, of 42 gallons or over 62 per cent.

These figures must convince anyone that very much of the immense quantity of water distributed daily is criminally wasted, and that like increase of consumption per capita, added to the natural and regular increase because of growth of population and of manufactures, will render it difficult to keep the supply equal to the demand.

The final completion of the East Park Reservoir marks an epoch in the history of the water supply of our city. Work for the completion of the third and last section was begun on February 27, under a contract covering the whole work of clay puddling and of brick and concrete lining for the slopes and the bottom. The work was completed and water let into the basin on October 8.

178,826 square yards of concrete, and 29,628 square yards of brick work were laid, and it is estimated that 112,000 cubic yards of earth and clay were handled in the prosecution of the work.

The total cost of completing this basin was \$361,667.69.

The bottom of the basin is 109 feet above city datum; it is 28 feet deep and has a capacity of 304,736,360 gallons. The water surface, when full, is 199,976 square yards. The distance around the top of the inside slope is 5,479 feet.

The completed reservoir has three sections of unequal dimensions, which can be used separately or as a whole. The pumping mains are so arranged that water can be pumped

into any one of the sections, but it can be distributed from only two of them. The extent of the work is best appreciated from a personal inspection, but some idea can be formed of its magnitude by the statement that it will hold nearly 700,000,000 gallons of water, and that the distance around the inside slopes is 13,210 feet, very nearly two and one-half miles.

On October 8 an examination of the work was made by Councils and other city authorities, accompanied by many distinguished gentlemen, both from Philadelphia and from abroad, interested in structures of this character. All were pleased with what they saw, and with the advantages to accrue to the water supply of our city by the completion of this reservoir.

Thus, after more than twenty years from the inception of this work, after much adverse criticism of the plans, and more of the manner in which the work under them was prosecuted, and which brought about a total cessation of work for many years and almost its entire abandonment, one of the largest reservoirs built with artificial banks from bottom to top was finally finished, ready for use, in a little more than two years from the time when the work passed under the control of this Department.

Its importance in the water system of Philadelphia permits the publication, at this time and place, of a letter from Mr. Fred. Graff, the gentleman who, as the Chief Engineer of our Water Department, planned, located and begun this important structure. The present results and the still greater advantages to be derived from it in the immediate future, justify this letter, and also the lengthy reports made of the progress of the work in this, and in the first and second annual reports.

Philadelphia, October, 24, 1889.

TO LOUIS WAGNER, ESQ.,

Director of Public Works of the City of Philadelphia.

DEAR SIR:—I proposed and designed the East Park Reservoir immediately after the unprecedented drought in 1869, when the safety and comfort of the city was so seriously imperiled; the urgent necessity of providing means of avoiding so great a disaster as the city was then threatened with, became painfully evident. At that time the combined contents of all the reservoirs then in use on the east side of the Schuylkill, was only equal to about one and two-tenths days of the required supply: it will therefore be seen how imperative was the demand for additional storage.

I made the first special report to Councils on the subject of enlarging the capacity of the works, November 30, 1869, and finally the site for the reservoir was decided upon. The first map showing its form, size, and position was published in the annual report of the Water Department for 1871. The reasons for this selection were, that it was desirable that a reservoir should be constructed of the largest possible capacity—my desire being to get a storage of 750,000,000 or more, which could, at the same time, be situated as near as possible to the existing pumping works, those at “Schuylkill Works” (now Spring Garden Works) being within two thousand five hundred feet could be made available, thereby avoiding the necessity and expense of erecting a new pumping station, which would necessarily have to have been situated higher up the river, at a point nearer to the pollutions at that time discharged at Manayunk. It was also desirable that the reservoir should be placed as convenient as possible to the points of its intended distribution.

It was evident that no reservoir of anything like the size which would fill the above requirements could be built outside the limits of the Park, without the vacation of very many streets running in both directions, which, of course, would have been very objectionable.

In addition to this, the ground in the Park was already the property of the city.

When careful calculations indicated conclusively that at least 88 per cent. of the whole population of the city, then estimated at 673,726 souls, could be adequately supplied from a reservoir so placed, and which could be large enough to contain a supply sufficient for from fourteen to twenty days of the maximum demand at that time, I had no hesitation in recommending the site for, and designing the reservoir where it now stands. Since that time the population has materially increased, and the demand for water has been greatly augmented by more extravagant use and waste of it. The height of the houses and stores is gradually getting greater, and therefore the relative capacity of the reservoir, and the demand upon it, have materially changed in the past twenty years, yet I feel confident, that with a proper enlarged system of distributing mains, more than 75 per cent. of the present population can be properly supplied from the East Park Reservoir.

In this opinion it is a satisfaction to be confirmed by the reports of the Board of experts, who have, at different times, investigated the condition of the water supply of the city. The board of 1875 reported that 75 per cent. of the population could then be supplied from the reservoir, and that 70 per cent. could be properly supplied from a storage reservoir with a water-level of 120 feet, or thirteen feet lower than will be carried in the East Park Reservoir.

The area of high ground needing water which could not be supplied from Roxborough or Chestnut Hill Works was comparatively small, and it did not appear to be good economy to pump the total supply required for the entire city to so great a height, simply that a small area of high ground, then with a limited population, could get water, particularly when this had to be raised by expensive steam power. Therefore, as 88 per cent. of the population could be supplied by East Park Reservoir, it was considered best that the remaining 12 per cent. should be supplied from other sources.

A site could have been obtained (and surveys and estimates were made for it) in the Park at Strawberry Mansion, in which a water-level of 148 feet could have been carried, but the area of the ground available would have only been sufficient for a capacity of 89,000,000 gallons, which I did not consider large enough for the purpose, and, therefore, with the reasons given above, accepted a somewhat lower level.

When I left the work February 28, 1873, the whole of the black top soil had been removed from the ground, the puddle trench made to unite the new work with the ground, and the embankment raised to an average height of 7.37 feet all around, nearly one and a half miles. New Park roads were made at several places to take the place of those covered by the embankment. Most of the original black soil, which was from 15 to 20 inches deep, had to be hauled to spoil bank on Thirty-third street, half a mile or more away.

You will recognize the very great importance of having the foundation of the work (so to speak) done with the utmost care and attention, and its consequent increased cost, over the mere hauling, sprinkling and rolling of the earth put upon the embankment afterward.

The sum expended upon the work during my connection with it was \$249,252.13, which included the purchase of water-carts, rollers, tools of all kinds, granite and building stone for the gate houses, as well as other materials, most of which were made available later on.

Hoping that the above may supply the information asked for in your favor of October 11, 1889, I remain,

Very respectfully and truly yours,

FRED^C GRAFF.

First report made by me to Councils on the subject, November 30, 1869.

Ordinance making appropriation, passed Councils, June 29, 1871.

Ordinance vetoed by Mayor Fox, August 22, 1871.

Passed by Councils over his veto, September 5, 1871.

Injunction granted by Judge Thompson to restrain me from going on with the work, September 19, 1871.

Injunction withdrawn and appropriations finally passed by Councils, October 26, 1871.

Bill finally signed by Mayor Fox, November 6, 1871.

Work commenced under my direction, November 9, 1871.

F. GRAFF.

The most pressing needs of the Bureau of Water at this time are

First.—Large storage reservoirs.

One at Roxborough, to supply Roxborough, Manayunk, Tioga, Chestnut Hill and Germantown.

One at an elevation of say 220 feet in the north-western part of the city, to supply the Falls of Schuylkill and that portion of the city comprising the Fifteenth, Twenty-eighth, Twenty-ninth and Thirty-second, and portions of the Twentieth and Thirty-third Wards.

One to connect with the Wentz Farm Reservoir, to supply that portion of territory comprising the Twenty-third, Twenty-fifth and Thirty-first, and a portion of the Sixteenth, Seventeenth, Eighteenth, Nineteenth and Thirty-third Wards, and

One in Fairmount Park to supply West Philadelphia.

Second.—Larger distributing mains in many parts of the city to increase the supply of subsided water to the older portions, and to supply the many thousand new houses erected annually.

Third.—New pumping engines :—

One at the Frankford Pumping Station, and

One at the Spring Garden Pumping Station.

The amount of pipe laid during the past year was 147,171 feet, or 27 miles 4,611 feet. Total pipe in use, about 929 miles. Small pipe replaced by pipe of larger dimensions, 21,577 feet.

The following is a comparative statement of the total pipe laid and of other work done during the past three years.

YEAR.	PIPE LAID.			* PIPE RELAID.	FIRE HYDRANTS PLACED IN POSITION.			SUBSTITUTED FOR DEFECTIVE HYDRANTS.			Fire Hydrants in use.	Water Attach- ments.	
	EQUAL TO.				Feet.	New Style	Old Style.	Total.	New Style	Old Style.			Total.
	Feet.	Miles.	Feet.										
1887.....	122,790	23	1,350	7,858	420		420	150	72	222	6,715	8,532	
1888.....	133,562	25	1,552	19,026	559	21	580	187	102	289	6,929	8,788	
1889.....	147,171	27	4,611	21,577	513	8	521	213	69	282	7,433	9,544	

* Adds nothing to feet in ground.

Because of insufficient appropriation the work of pipe laying, and of the extensions, practically ceased in October last, greatly to the inconvenience of builders who were unable to secure water for the houses they had erected, and also to the financial loss of the city from the non-receipt from water rents and from the laying of pipe.

The most important mains laid were the 36-inch main from the East Park reservoir to the Spring Garden pumping station, by which 30,000,000 gallons of subsided water can be pumped to the northwestern part of the city.

A 30-inch main, 13,258 feet long, from Roxborough to Mt. Airy for the better supply of Germantown, and

A 48-inch main from the East Park reservoir to York and Sixth streets, and from that point to York and American streets reduced to 36 inches.

This latter main will be completed about May 1, 1890, and through it the Kensington and Richmond district will be supplied with water entirely from the East Park reservoir, instead of partially from that point and partially from the Delaware river through the Kensington pumping station, at the foot of Susquehanna avenue (Otis street) as at present.

This station is now being dismantled, and the pumping machinery will be transferred to the Spring Garden pumping station.

The arrangements for supplying the northwestern portion of the city with water from the East Park reservoir, instead of by direct pumpage from the Schuylkill river, and which have been described in previous reports, have been finally completed and work satisfactorily. The difficulties encountered and overcome are set out in detail in the reports of the Chief and of the General Superintendent of the Bureau, and a study of them will prove of service to those engaged or interested in hydraulics.

The final result is a full supply of clear water to the district heretofore compelled to use the water direct from the river, no matter what its condition, and this supply can be

continued, barring accidents, until a reservoir for this district is built.

The water consumers in Kensington and in Richmond will be supplied from the same source as soon as the pipe now being laid is completed, and those in the southwestern part of the city whenever sufficient funds are provided for similar mains in that territory.

The cost of pumpage of 1,000,000 gallons 100 feet high was \$3.87, a decrease of 62 cents from 1888, and lower than in any previous year. Some of this reduction arises from the low price of coal, which cost 52 cents per ton less than in the previous year.

Many of the old and decaying trees at the several reservoirs have been replaced with young and thrifty ones, and this work will be continued at other points.

Several plans for the filtration of the water have been presented to the Committee on Water of City Councils and referred by that Committee to the Department for examination, but not in time for consideration in this report.

This matter is one of much moment, and it will have the earnest attention of the engineers of the Bureau of Water, even before appropriations for the possible cost of the work will be made.

The question of the future water supply for Philadelphia has engaged the attention of the officers of the Bureau for many years past. Much information has been secured and many valuable statistics have been collated, and whenever the city's finances will admit of the consideration of plans for furnishing water from sources other than the Schuylkill and Delaware rivers, these records will aid in reaching correct conclusions.

The report of the Chief of the Bureau upon the hydrographic work of his office, shows that regular and systematic returns of the rainfall and of the water flow are received from twenty-one observers residing at various points in the vicinity

of our city. Nine of these receive some compensation for their services, and are located as follows :

Rainfall Stations.

1. Seisholtzville, Berks County, Pa.
2. Frederick (Spring Mount P. O.), Montgomery County, Pa.
3. Ottsville, Bucks County, Pa.
4. Smith's Corner, Bucks County, Pa.
5. Point Pleasant, Bucks County, Pa.
6. Doylestown, Bucks County, Pa.
7. Lansdale, Bucks County, Pa.
8. Forks of Neshaminy (Rush Valley P. O.), Bucks County, Pa.
9. Thirty-second and Spruce streets, Philadelphia.

Stream-Gauge Stations.

Frederick.

Point Pleasant.

Forks of Neshaminy.

Those rendering such valuable service without pay deserve the thanks of the city. They reside at the following places :

1. United States Signal Service, Philadelphia.
2. Pennsylvania Hospital, Philadelphia.
3. Germantown, Philadelphia.
4. Lebanon, Pa.
5. Reading, Pa.
6. Pottstown, Pa.
7. Browsers, Pa.
8. Hamburg, Pa.
9. Easton, Pa.
10. Moorestown, Burlington County, New Jersey.
11. West Chester, Pa.
12. Quakertown, Pa.

The tables submitted are too voluminous to be printed twice in this report, and too important to be mutilated in an attempt to make an abstract of the figures and statements tabulated. They show that the city's officials have been successful in their endeavors to secure accurate information necessary for the perfecting of plans involving large expenditures in connection with our water supply, and it is hoped that the results of their efforts in this direction will be utilized when the time for action arrives.

As it will not only take large sums of money but also many years of time to complete the necessary structures by which water may be brought from any point other than our present sources of supply, it is a satisfaction to know that the records of the Bureau show that these sources are ample for years to come.

The pumpage of the year 1889 was the largest of any year, and amounted to 38,743,220,525 gallons from the River Schuylkill.

Based upon the observations taken at the Fairmount dam three times daily, it is estimated that there was used in 1889, at the canal locks 2,500,000,000 gallons, for pumping at Fairmount 342,000,000,000 gallons, and wasted over the Dam 492,000,000,000 gallons.

It is true that the year was one of extraordinary rainfall as well as of unusual consumption of water, but it is also a fact that the records show but two years in which there was not enough water for the city's supply, as well as for the uses of the Navigation Company: and that there has never been a time when there would not have been an ample supply for all purposes if pumping had been by steam power only.

The quality of the water has been greatly improved by the construction of sewers, diverting the filth heretofore emptied almost into our pumping stations into the river below the dam, and by the purchase and improvement of the lands constituting the Fairmount Park.

Mills, factories, slaughter houses, breweries, stables and

other places of like character, discharging foul and noxious matters of all sorts into the water courses emptying into the river have been removed, and the water has been kept purer to the extent of these removals.

The details and cost of this work are as follows :

For Fairmount Park.....	\$6,500,000 00
Pennsylvania avenue sewer.....	65,701 00
Thirtieth street branch.....	38,569 00
Twenty-eighth street branch.....	12,994 92
Mantua creek sewer.....	138,661 33
Intercepting sewer, main line.....	479,040 96
Branches and storm water conduits.....	86,393 12
Wissahickon valley branch.....	290,519 73
Monoshone branch.....	7,999 93
Total	\$7,619,879 99

This does not include the amount paid by property owners for sewers.

These improvements are, of course, confined to the limits of the Park, but the limits of protection for the purity of the water, by excluding offensive discharges from manufacturing establishments located on the banks of the river, extend as far as Flat Rock Dam.

Under an agreement made, under date of June 14, 1824, between the Schuylkill Navigation Company and the City of Philadelphia, relating to the construction of Fairmount Dam and to other matters in connection with the use of the water of the Schuylkill river, that Company covenanted with the City not to sell or lease water-power except with the condition that no dye stuffs or any noxious, fetid, or injurious articles or matter whatsoever should be allowed to flow, pass, or fall into the river from the establishments of the parties to whom such water was leased or sold.

This agreement has been but lately brought to the attention of the department, and early steps will be taken to compel the Navigation Company to perform its part of this important matter.

With the improvement of the water already secured by the construction of sewers; by the changed condition of the shores of the river within the Park limits (which it is proposed to extend to Flat Rock Dam); by the increased opportunities for subsidence in the reservoirs already built and by those planned for construction at an early day, it is believed that the reputation for good water which Philadelphia enjoys everywhere except at home, will continue well-deserved for many years yet, and until we shall have money enough to execute proper plans for a better supply.

The operations of the past year have been so varied, and the work done so much in excess of that of previous years, that it was deemed proper to make fuller abstracts than usual of the reports of the Chiefs of the several Bureaus, but the complete record is found only in the reports themselves, which are hereto attached, and which are worthy of a careful perusal of those desiring to become familiar with the many details of our city government, in so far as these pertain to the Department of Public Works.

What has been done is set out with greater or less detail; what should be done is also named, but what the officers of the Department hoped to be able to accomplish has no proper place in an official document.

The results show that we have not been idle; not willfully negligent. The financial exhibits, giving in detail the money paid for the work done, must satisfy any one that our duties have been discharged with an eye single to the interests of the taxpayers, and to secure for them the largest return honestly possible, for the money expended.

The appropriations, expenditures and receipts of the Department for the year 1889 are set out in the following table in detail by Bureaus, and also in totals for the years 1887 and 1888.

SUMMARY OF APPROPRIATIONS, EXPENDITURES, RECEIPTS, ETC., OF THE DEPARTMENT OF PUBLIC WORKS,
PHILADELPHIA, IN 1887, 1888, 1889.

BUREAUS	Appropriation for 1889.	Balance available from previous years.	Additional appropriations and transfers.	Total.	Number of warrants drawn.	AMOUNT OF WARRANTS DRAWN.			Transfers from.	Balance available in 1890.	Total.	Amount merging.	Receipts.	Number of employes on December 31st.
						Current expenses.	Extensions.	Total.						
Director's Office.....	\$13,820 00		\$891 28	\$14,711 28	124	\$14,710 53		\$14,710 53		\$14,710 53	75		6	
City Ice Boats.....	38,300 00			38,300 00	108	21,668 21		21,668 21	\$16,275 00	37,943 21	\$356 79	\$150 87	5	
* Lighting the City.....	322,082 94			322,082 94	54	150,579 79		150,579 79	171,497 48	322,077 27	5 67			
Gas.....	2,900,988 00	\$107,051 57	100,000 00	3,108,039 57	1,481	2,558,873 43	\$292,146 08	2,851,019 51	201,614 42	\$24,405 49	3,077,039 42	\$1,000 15	3,658,224 83	1,518
Highways.....	1,064,754 00	253,313 22	58,077 17	1,376,144 39	3,704	377,290 26	690,033 69	1,067,353 95	5,000 00	295,216 51	1,367,570 46	8,573 93	70,203 53	57
Board of Highway Supervisors. †													3,857 00	3
* Lighting.....			237,590 75	237,590 75	128	235,087 59		235,087 59	2,275 00	237,362 59	228 16	210 19	286	
Street Cleaning.....	411,920 00		25,042 00	436,962 00	239	434,067 00		434,067 00	2,895 00	436,962 00			8	
Surveys.....	774,332 00	353,240 87	309,377 87	1,436,950 74	1,920	132,289 61	560,649 36	692,938 97	70,686 08	664,583 67	1,428,208 72	8,742 02	29,914 32	61
District Surveyors..... †													42,060 44	13
Water.....	1,288,064 67	18,562 61	77,307 15	1,383,934 43	2,203	708,847 53	603,658 57	1,314,506 10	2,500 00	57,979 20	1,374,985 30	8,949 13	2,241,999 85	496
Total.....	\$6,814,261 61	\$732,168 27	\$808,286 22	\$8,354,716 10	9,961	\$4,633,413 95	\$2,148,517 70	\$6,781,931 65	\$472,742 98	\$1,042,184 87	\$8,296,859 50	\$57,856 60	\$6,046,621 03	2,453
Total 1888.....	\$6,404,874 61	\$588,565 13	\$736,194 24	\$7,729,633 98	11,568	\$5,000,632 68	\$1,741,094 54	\$6,741,727 22	\$61,210 04	\$732,168 27	\$7,535,105 53	\$194,528 45	\$6,109,016 05	3,108
Total 1887.....	6,237,811 03	346,987 70	796,376 37	7,381,175 10	15,644	5,308 664 10	1,273,774 00	6,582,438 10	33,671 57	588,565 13	7,204,674 80	176,500 30	5,937,376 23	3,170
Appropriation for 1890, \$6,058,940 00												April 1, 1887.....	3,543	

* Total cost of lighting, \$385,667 38+by Bureau of Gas, \$81,984 89=\$467,652 27.
† Included in the appropriation and in the expenditures of the Bureau of Highways.
‡ Included in the appropriation and in the expenditures of the Bureau of Surveys.

This table establishes the curious but nevertheless gratifying fact that the cash receipts of the Department of Public Works largely exceed the current expenses, and that the Department is not only self-sustaining, but that it contributes large sums annually toward the "Extensions" (new work) authorized by Councils.

Considering the variety of the work done and the extent of the territory covered, in connection with the popularly accepted notion that this branch of the public service is necessarily a serious drain upon the funds exacted from the tax-payers, it is proper that the receipts and expenditures for the past three years be grouped here to show that the claim that the Department is self-supporting is well founded.

	Receipts.	Current Expenses.	Surplus.
1887.....	\$5,937,376.23	\$5,308,664.10	\$628,712.13
1888.....	6,109,016.05	5,000,632.68	1,108,383.37
1889.....	6,046,621.03	4,633,413.95	1,413,207.08
	<u>\$18,093,013.31</u>	<u>\$14,942,710.73</u>	<u>\$3,150,302.58</u>

The expenditures for "Extensions," or new work, were as follows :

	Expenditures.	Surplus from Receipts.	Amount from Taxes.
1887.....	\$1,273,774.00	\$628,712.13	\$645,061.87
1888.....	1,741,094.54	1,108,383.37	632,711.17
1889.....	2,148,517.70	1,413,207.08	735,310.62
	<u>\$5,163,386.24</u>	<u>\$3,150,302.58</u>	<u>\$2,013,083.66</u>

The receipts average \$6,000,000 per year, and the expenditures are decreasing annually at the rate of nearly \$300,000, notwithstanding the great increase of work done. The sum spent for permanent improvements has increased over \$400,000 per year, aggregating for the three years \$5,163,386.24. Of this amount \$2,013,083.66 is contributed from taxes, a very small sum certainly for so much new work.

Notwithstanding the extent of these permanent improvements, the extension of gas and water-pipes, the building of main and branch sewers, the increase in the pumping capacity

of our water-works and the manufacturing capacity of our gas works, the construction of bridges and the grading and paving of streets, as detailed in this report, do not keep pace with the growth of the city.

Unless it is desired to cripple our building interests and to discourage the immediate extension of the city, more funds for work of this kind must be supplied. How this is to be done is beyond the province of the Department of Public Works even to indicate. We can make known our wants, which are the wants of the people, and it belongs to the good judgment of the tax-levying authorities to say how these wants are to be satisfied.

It is not necessary to recapitulate at the close of this report the work done during the year just closed, and it is easy to say what is contemplated beyond the current work of the current year. The appropriation for 1890 is nearly \$800,000 less than for 1889, nearly \$400,000 less than in 1888, and it is even \$500,000 less than the expenditures for 1887. This tells the whole story and under the unfortunate condition of our finances, and the peculiar laws governing the levying of taxes, and the creation of loans, regrets are useless.

The cloth has been furnished the Department, and it will cut its coats accordingly.

A copy of the ordinance making appropriations to this Department for the year 1890 is attached to this report. The following is an abstract of that ordinance, with a statement of balances available from previous years for work ordered, and for which contracts are executed.

Bureau.	Annual appropriation for the year 1890.	Balance available from previous years.	Total.
Director's Office.....	\$15,020 00		\$15,020 00
City Ice Boats.....	37,400 00		37,400 00
Gas.....	2,626,768 00	\$24,405 49	2,651,173 49
Highways.....	940,924 00	295,216 51	1,236,140 51
Lighting.....	516,888 00		516,888 00
Street Cleaning.....	444,137 00		444,137 00
Surveys.....	581,750 00	664,583 67	1,246,333 67
Water.....	896,053 00	57,979 20	954,032 20
Total.....	\$6,058,940 00	\$1,042,184 87	\$7,101,124 87

In conclusion, and for myself and for the officers of this Department, I desire to thank you for the active and continued support you have given us in our efforts to discharge the onerous and often unpleasant duties of our several places.

Pledging myself and them to increased earnestness in our labors, and making the city's interests ours, we hope to receive at the close of the ensuing year your approbation, and to be entitled to the commendation of all good citizens for work well done, and for duty conscientiously discharged.

Very truly yours,

LOUIS WAGNER,

Director.

APPENDIX.

AN ORDINANCE

To make an appropriation to the Department of Public Works, for the year 1890.

SECTION 1. *The Select and Common Councils of the City of Philadelphia do ordain*, That the sum of six million, fifty-eight thousand, nine hundred and forty (6,058,940) dollars be, and the same is hereby appropriated to the Department of Public Works for the year 1890, as follows:

Office.

Of the amount appropriated to this Department, the sum of fifteen thousand and twenty (15,020) dollars is for expenses of office, as follows:

Item 1. For salaries: Director of Department of Public Works, seven thousand five hundred (7,500) dollars; chief clerk, two thousand (2,000) dollars; clerk, one thousand (1,000) dollars; stenographer and typewriter, nine hundred (900) dollars; stenographer and clerk, nine hundred (900) dollars, messenger, seven hundred and twenty (720) dollars; total, thirteen thousand and twenty (13,020) dollars.

Item 2. For keep of horse and carriage hire, five hundred (500) dollars.

Item 3. For printing, stationery, incidentals, etc., fifteen hundred (1500) dollars.

City Ice Boats.

SECT. 2. Of the amount appropriated to this Department, the sum of thirty-seven thousand four hundred (37,400) dollars, is for the expenses of the City Ice Boats, as follows:

Item 1. For repairs and equipments of boats, and machinery, ten thousand (10,000) dollars.

Item 2. For fuel, ten thousand (10,000) dollars.

Item 3. For salary of superintendent, one thousand six hundred and fifty dollars (1,650) dollars; clerk, four hundred (400) dollars; engineer, one thousand and eighty (1,080) dollars; and wages nine thousand five hundred and seventy (9,570) dollars; total, twelve thousand seven hundred (12,700) dollars.

Item 4. For provisions, two thousand five hundred (2,500) dollars.

Item 5. For insurance, one thousand two hundred (1,200) dollars.

Item 6. For stationery, advertising, incidentals and office rent, one thousand (1,000) dollars: *Provided*, That warrants may be countersigned on Items 1, 2, 3 and 4 for bills of 1889.

Gas.

SECT. 3. Of the amount appropriated to this Department, two million six hundred twenty-six thousand seven hundred and sixty-eight (2,626,768) dollars are for the expenses of the Bureau of Gas, as follows:

Item 1. For salary of Chief of Bureau, five thousand five hundred (5,500) dollars; Assistant to the Chief and general store-keeper, three thousand (3,000) dollars; General Superintendent of distribution, and general book-keeper and controller, each two thousand five hundred (2,500) dollars. five thousand (5,000) dollars; chief clerk (main office), paymaster and chief clerk at works and superintendent of stables, coke and hauling, each two thousand (2,000) dollars, six thousand (6,000) dollars; registrar and chief meter inspector, and three superintendents of works, each one thousand eight hundred (1,800) dollars, seven thousand two hundred (7,200) dollars; general clerk (main office) Superintendent of Works and registrar, miscellaneous clerk, architect and draughtsman, and general foreman of distribution, each one thousand five

hundred (1,500) dollars, seven thousand five hundred (7,500) dollars; chief transfer clerk, one thousand three hundred and twenty (1,320) dollars; time and meter clerk, two superintendents (Spring Garden and Germantown offices), and electrician, each one thousand two hundred (1,200) dollars, four thousand eight hundred (4,800) dollars; chief weigher and coal clerk, one thousand one hundred and forty (1,140) dollars: assistant transfer clerk, suspense clerk, two inspectors of fittings, application clerk, assistant to chief meter inspector (Spring Garden office), superintendent of shops and clerk and time-keeper (Twenty-fifth Ward Works) each one thousand and eighty (1,080) dollars, eight thousand six hundred and forty (8,640) dollars: assistant to chief meter inspector (main office), foreman of meter and repair shops, and foreman coke yard (Ninth Ward Works) each one thousand (1,000) dollars, three thousand (3,000) dollars; six assistant foremen of distribution, and Superintendent (Frankford office), each nine hundred and sixty (960) dollars, six thousand seven hundred and twenty (6,720) dollars; three bill clerks, removal clerk, two foremen coke yards (Twenty-fifth and Twenty-sixth Ward Works), carpenter and messenger, two detectives, clerk of shops and clerk to general storekeeper, each nine hundred (900) dollars, nine thousand nine hundred (9,900) dollars: four inspectors of fittings and firemen, each eight hundred and forty (840) dollars, four thousand two hundred (4,200) dollars; fifty-four meter inspectors, superintendent holder station and six meter provers, each seven hundred and eighty (780) dollars, forty-seven thousand five hundred and eighty (47,580) dollars; forty-four out ordermen and superintendent of holder station, each seven hundred and twenty (720) dollars, thirty-two thousand four hundred (32,400) dollars; two chemists, each five hundred (500) dollars, one thousand (1,000) dollars; six telegraph operators, each three hundred and sixty (360) dollars, two thousand one hundred and sixty (2,160) dollars; cleaning main office, five hundred (500) dollars, and two Sunday watchmen (main office), each one

hundred and four (104) dollars, two hundred and eight (208) dollars. In all, one hundred and fifty-seven thousand seven hundred and sixty-eight (157,768) dollars.

Item 2. For wages of stokers and helpers, mechanics, laborers and other employes engaged in the manufacture of gas, laying of service pipe, maintenance of buildings, and the collection and delivery of coke, seven hundred and eighty thousand (780,000) dollars.

Item 3. For cannel and gas coal, seven hundred and eighty thousand (780,000) dollars.

Item 4. For material, supplies, repairs and improvements at works, three hundred and twenty-one thousand (321,000) dollars.

Item 5. For printing, advertising, stationery and other incidentals, thirteen thousand (13,000) dollars.

Item 6. For gas manufactured by the Philadelphia Gas Improvement Co., and delivered into the holders of the City at the Twenty-fifth Ward Gas Works, in accordance with contract dated August 3, 1888, at the rate of thirty-seven (37) cents per one thousand (1,000) cubic feet, three hundred thousand (300,000) dollars.

Item 7. For the purchase and laying (including material and labor accounts) of pipe for the distribution of gas, seventy-five thousand (75,000) dollars.

Item 8. For extensions, two hundred thousand (200,000) dollars: *Provided*, That the item for extensions known as Item 7 in the appropriation for 1889 shall not merge: *Provided*, That the City Controller shall approve such bills for work, labor or material done, made or furnished prior to 1890, as shall have been approved by the Director of the Department of Public Works, the aggregate amount thereof not exceeding sixty thousand (60,000) dollars.

Highways.

SECT. 4. Of amount appropriated to this Department, the sum of nine hundred and forty thousand nine hundred and

twenty-four (940,924) dollars is for the expenses of the Bureau of Highways, as follows:

Item 1. For salaries: Chief of Bureau, three thousand five hundred (3,500) dollars; five assistants and one superintendent of bridges, each one thousand eight hundred (1,800) dollars; chief clerk, two thousand (2,000) dollars; chief clerk's assistant and contract clerk, each, one thousand (1,000) dollars; license clerk, eleven hundred and seventy (1,170) dollars; bill clerk and assistant clerk and stenographer, each, one thousand (1,000) dollars; janitor and clerk, seven hundred and twenty (720) dollars; ten inspectors, nine hundred (900) dollars, each; inspector of repairs to sewers, twelve hundred (1,200) dollars; office boy and messenger, five hundred (500) dollars; two yard watchmen, each, six hundred (600) dollars; total, thirty-four thousand and ninety (34,090) dollars.

Item 2. For paving intersections of streets and unassessable property, one hundred thousand (100,000) dollars.

Item 3. For repairs to paved streets, to include repaving around lamp posts, fire plugs and breaks for other municipal purposes in footways, one hundred and twenty-five thousand (125,000) dollars.

Item 4. For repairing and maintaining unpaved streets, macadamized streets, roads, trunks, drains, and bridges not exceeding eight feet span, and constructing new trunks and drains, purchasing material for and resurfacing macadamized roads, and putting cinders and gravel on country roads, seventy-five thousand (75,000) dollars.

Item 5. For repairing, altering and extending sewers and inlets, and trapping and re-trapping inlets and cleaning sewers, forty thousand (40,000) dollars.

Item 6. For grading streets and roads, sixty-five thousand (65,000) dollars.

Item 7. For general repairs to bridges, thirty thousand (30,000) dollars.

Item 8. For clerk hire and incidentals, five hundred (500) dollars, and other expenses of the Board of Highway Supervisors, two thousand five hundred (2,500) dollars; total, three thousand (3,000) dollars.

Item 9. For printing, advertising and stationery, five thousand (5,000) dollars.

Item 10. For insurance on bridges, three hundred and seventy (370) dollars.

Item 11. For incidentals and office and yard expenses, three thousand seven hundred (3,700) dollars.

Item 12. For repairing meadow banks, to include repairs to the banks of Hollander's Creek, in the First and Twenty-sixth Wards, one thousand (1,000) dollars.

Item 13. For repairing, repaving and removing snow and ice from and repaving with Belgian blocks, streets in which passenger railway tracks are laid, one hundred and seventy-five thousand (175,000) dollars: *Provided*, That the moneys mentioned in this item, in so far as relates to repairing and repaving shall only be expended after notice to the railroad companies occupying the streets on which said work is to be done, and after the failure of said companies to do the work, and that the amount so expended shall be collected from said companies: *Provided*, That the streets shall be first designated by the ordinances of Councils.

Item 14. For salaries of four watchmen on Penrose Ferry bridge, six on South street bridge, two on Market street bridge, four on Callowhill street bridge and two on Girard avenue bridge, at six hundred and forty eight (648) dollars each; two on Bridesburg bridge, two on Falls bridge and two on Gray's Ferry bridge, at six hundred (600) dollars each; one on Orthodox street bridge, over Frankford Creek, at four hundred and fifty (450) dollars, and two engineers on Penrose Ferry bridge, at nine hundred (900) dollars each; total, seventeen thousand five hundred and fourteen (17,514) dollars.

Item 15. For grading, paving and repaving footways, curbing and resetting curbs, two thousand (2,000) dollars.

Item 16. For crossing, gutter and tramway stones: *Provided*, That in repairing tramway streets, where, from one intersection to the next a majority of the tramway stones are broken or worn out, the Director of the Department of Public Works may substitute from curb to curb of said streets, granite block pavement with pitch cemented joints: *And provided, further*, That in repairing gutters where the present gutter stones from one intersection to the next are unfitted for the purpose, the Director of the Department of Public Works may pave said gutters with granite blocks and pitch cemented joints, and payment for the above mentioned labor and material shall be made from this Item, thirty-five thousand (35,000) dollars.

Item 17. For carriage hire and keep of horses for the Chief of the Bureau of Highways, the assistants, superintendent of bridges, inspector of repairs to sewers, and one inspector each in the second, third, fourth and fifth districts, four hundred (400) dollars each; total, four thousand eight hundred (4,800) dollars.

Item 18. For sprinkling the macadamized portions of north and south Broad street, seven hundred and fifty (750) dollars.

Item 19. For oil, coal and engineers' stores for bridges, one thousand two hundred (1,200) dollars.

Item 20. For grade, curb and gutter stakes for paving and preliminary estimates, five hundred (500) dollars.

Item 21. For emergencies, seven thousand (7,000) dollars.

Item 22. For stone and iron cross gutters, two thousand (2,000) dollars.

Item 23. For regrading, repaving and resetting of curb on Kensington avenue, from Cambria to Clearfield street: *Provided*, That the money mentioned in this Item, in so far as relates to repairing and repaving, shall only be expended after notice to the railroad company occupying the street on which said work is to be done, and after the failure of such company to do the work, and that the amount so expended

shall be collected from said company, five thousand five hundred (5,500) dollars.

Item 24. For repaving with improved pavement, streets not occupied by passenger railways: *Provided*, That the streets shall be first designated by ordinances of Councils, two hundred thousand (200,000) dollars.

Item 25. To aid the Meadow Bank Company, in the Twenty-seventh Ward, to erect a pumping station on the banks of the Schuylkill river at or near Mingo creek, seven thousand five hundred (7,500) dollars: *Provided*, That any balances remaining to the credit of Items 2 and 6 of the appropriation for the year 1889 shall not merge; that the Director of the Department of Public Works may cause any specified work chargeable to Item 12, Repairs to Meadow Banks, and Item 21, Emergencies, to be done by day's labor; and that the City Controller shall approve bills for work, labor or material done, made or furnished prior to 1890, the aggregate amount thereof not to exceed ten thousand (10,000) dollars, the same to be taken from the several items to which they are properly chargeable.

Lighting.

SECT. 5. Of the amount appropriated to this Department the sum of five hundred and sixteen thousand eight hundred and eighty-eight (516,888) dollars is for the expenses of the Bureau of Lighting, as follows:

Item 1. For salaries, Chief of Bureau, eighteen hundred (1,800) dollars; clerk, one thousand (1,000) dollars; five district superintendents, nine (900) hundred dollars each, four thousand five hundred (4,500) dollars; total, seven thousand three hundred (7,300) dollars.

Item 2. For keep of horses and wagons for Chief of Bureau and five district superintendents, four hundred (400) dollars each; total, two thousand four hundred (2,400) dollars.

Item 3. For wages of lamplighters, foremen, messenger, driver and laborers, one hundred and twenty-nine thousand (129,000) dollars.

Item 4. For matches, lamp glass, fittings and other material, four thousand (4,000) dollars.

Item 5. For printing, advertising, and other incidentals, seven hundred and fifty (750) dollars.

Item 6. For electric lighting, one hundred and eighty-four thousand (184,000) dollars.

Item 7. For furnishing naphtha to and lighting all and every night, extinguishing, cleansing and repairing six thousand two hundred and seventy-eight (6,278) lamps of the "Maloney Company Patent," now erected, at twenty-one (21) dollars, and two hundred (200) lamps for six months (to be changed to gas-lamps), one hundred and thirty-three thousand nine hundred and thirty-eight (133,938) dollars; for furnishing naphtha to and lighting all and every night, extinguishing, cleansing and repairing one thousand (1,000) new lamps of the "Maloney Company Patent," to be erected during the year 1890, for eight (8) months, at fourteen (14) dollars each, fourteen thousand (14,000) dollars; for renewals and removals, two thousand (2,000) dollars; total, one hundred and forty-nine thousand nine hundred and thirty-eight (149,938) dollars: *Provided*, That no gasoline lamps shall be located on any street where gas mains are laid.

Item 8. For lighting Northern Liberties district, eight thousand five hundred (8,500) dollars.

Item 9. For extensions, including new gas lamps, eleven thousand (11,000) dollars; and for electric lights twenty thousand (20,000) dollars; total, thirty-one thousand (31,000) dollars.

Street Cleaning.

SECT. 6. Of the amount appropriated to this department, the sum of four hundred and forty-four thousand one hundred and thirty-seven (444,137) dollars is for the expenses of the Bureau of Street Cleaning, as follows:

Item 1. For salary of Chief of Bureau, two thousand five hundred (2,500) dollars; five inspectors, each one thousand (1,000) dollars, five thousand (5,000) dollars; one clerk, one thousand (1,000) dollars; messenger, seven hundred and twenty (720) dollars; in all, nine thousand two hundred and twenty (9,220) dollars.

Item 2. For keep of horses and wagons for Chief of Bureau and five inspectors, four hundred (400) dollars each, two thousand four hundred (2,400) dollars.

Item 3. For printing, stationery, and incidentals, three hundred (300) dollars.

Item 4. For cleaning streets, inlets, and public market houses, and for the removal of ashes, garbage, and dead animals, four hundred and thirty-two thousand two hundred and seventeen (432,217) dollars.

Surveys.

SECT. 7. Of the amount appropriated to this Department, the sum of five hundred and eighty-one thousand seven hundred and fifty (581,750) dollars, to be for the expenses of the Bureau of Surveys, as follows :

Item 1. For salaries of the chief engineer and surveyor, four thousand (4,000) dollars; principal assistant engineer, two thousand two hundred and fifty (2,250) dollars; assistant engineer, one thousand eight hundred (1,800) dollars; recording clerk, one thousand five hundred (1,500) dollars; draughtsman, one thousand five hundred (1,500) dollars; sewer registrar, one thousand five hundred (1,500) dollars; one draughtsman, at twelve hundred (1,200) dollars, and two draughtsmen at one thousand (1,000) dollars each, three thousand two hundred (3,200) dollars; sewer clerk, one thousand (1,000) dollars: typewriter and stenographer, eight hundred and fifty (850) dollars; rodman, seven hundred and twenty (720) dollars: janitor, six hundred (600) dollars: registrar, two thousand (2,000) dollars; registry clerk, eleven hundred (1,100) dollars: five draughtsmen at one thousand (1,000) dollars each, five thou-

and (5,000) dollars; and three draughtsmen at nine hundred (900) dollars each, two thousand seven hundred (2,700) dollars. In all, twenty-nine thousand seven hundred and twenty (29,720) dollars.

Item 2. For stationery, record books, draughting material, and instruments, two thousand five hundred (2,500) dollars.

Item 3 For cleaning offices, carriage hire, advertising, and incidentals, one thousand five hundred (1,500) dollars.

Item 4. For salaries of five surveyors, at five hundred (500) dollars each, two thousand five hundred (2,500) dollars, and for three surveyors, one quarter each, at one hundred and twenty-five (125) dollars each, three hundred and seventy-five (375) dollars; for salaries of five surveyors, at three thousand (3,000) dollars each, fifteen thousand (15,000) dollars; and for wages of employés, expenses, rent, furniture, tools and instruments, carriage hire and horse keep, and incidentals, in the First Survey District, three thousand six hundred (3,600) dollars; in the Fourth Survey District, two thousand five hundred and eighty (2,580) dollars; in the Eighth Survey District, three thousand six hundred (3,600) dollars; in the Eleventh Survey District, four thousand two hundred (4,200) dollars; and in the Thirteenth Survey District, nine thousand six hundred (9,600) dollars. For salaries of three surveyors, from and after April 1, 1890, at two thousand two hundred and fifty (2,250) dollars each, six thousand seven hundred and fifty (6,750) dollars; and for wages of employés, expenses, rent, furniture, tools and instruments, carriage hire and horse keep, and incidentals, from and after April 1, 1890, in the Second Survey District, three thousand three hundred (3,300) dollars; in the Third Survey District, three thousand three hundred (3,300) dollars; in the Sixth Survey District, three thousand four hundred (3,400) dollars; and for equipments and the purchase of old plans, drafts and calculations, six thousand (6,000) dollars; in all, sixty-four thousand two hundred and five (64,205) dollars: *Provided*, That the fees earned in each district shall amount to the salaries, over and above

the expenses of the office; and that work done for any department, bureau, board or commission of the city, shall be taken to be fees earned within the meaning hereof.

Item 5. For preparing liens for municipal claims, four hundred (400) dollars.

Item 6. For corner-stones and replacing landmarks, one thousand (1,000) dollars.

Item 7. For examination of bridges and sewers, one thousand (1,000) dollars.

Item 8. For surveys of properties for the Registry Bureau, four hundred (400) dollars.

Item 9. For new surveys and work ordered by Councils, not otherwise provided for, one thousand five hundred (1,500) dollars.

Item 10. For plans of streets directed to be placed on the city plan by Councils, four hundred (400) dollars.

Item 11. For renewing worn-out topographical plans in the Registry Bureau, one thousand (1,000) dollars.

Item 12. For renewing plans in the Registry Bureau, and for re-binding the registry books, one thousand five hundred (1,500) dollars.

Item 13. For establishing and permanently marking street lines in the Third Survey District, five hundred (500) dollars.

Item 14. For revising and renewing plans in the Fifth Survey District, five hundred (500) dollars.

Item 15. For revising and renewing plans in the Sixth Survey District, five hundred (500) dollars.

Item 16. For the revision of lines and grades, and a topographical survey northeastward from Chew street and westward from Broad street, in the Twenty-second Ward, three thousand three hundred (3,300) dollars.

For revision of lines and grades between School street and Mermaid avenue, and between Germantown avenue and Wisahickon avenue, in the Twenty-second Ward, one thousand three hundred (1,300) dollars.

For the revision of lines and grades east of Broad street, in the Twenty-second Ward, one thousand two hundred (1,200) dollars; and for the revision of lines and grades between Hansbury and School streets and Germantown and Wissahickon avenues, in the Twenty-second Ward, four hundred and fifty (450) dollars; in all, six thousand two hundred and fifty (6,250) dollars.

Item 17. For establishing lines and grades and a topographical survey on outline plan No. 193, south of Eleven Mile lane, east of the Frankford and Bristol turnpike, in the Twenty-third Ward, one thousand nine hundred (1,900) dollars.

For establishing lines and grades and making topographical survey on outline plan No. 193, north of Convent avenue and east of the Frankford and Bristol turnpike, in the Twenty-third Ward, one thousand eight hundred (1,800) dollars.

For establishing lines and grades and a topographical survey north of Longshore and east of G street, in the Twenty-third Ward, three thousand seven hundred and fifty (3,750) dollars.

For revising the lines and grades and making a topographical survey on plan No. 263, between Nestor and Lott street and between Meeting House road and Starkey street, in the Twenty-third Ward, one thousand seven hundred (1,700) dollars; and for a topographical survey between Dark Run road and Strahle street, northwestward from the Frankford and Bristol turnpike, two thousand three hundred and twenty-five (2,325) dollars; in all, eleven thousand four hundred and seventy-five (11,475) dollars.

Item 18. For establishing lines and grades and topographical survey between Sixty-third and Seventy-first streets, and between Elmwood avenue and the Chester Branch of the Philadelphia and Reading Railroad, eight hundred and fifty (850) dollars.

Item 19. For carriage hire and keep of horse for the chief and the assistants, eight hundred (800) dollars.

Item 20. For expenses attending the preparation of plans of the port, and for the increase of its landing accommodations, two thousand (2,000) dollars.

Item 21. For establishing standard levels and measures in various parts of the city, testing work on plans and inspecting surveys and plans, two hundred and fifty (250) dollars.

Item 22. For salaries of two inspectors of drain connections, at twelve hundred (1,200) dollars each, two thousand four hundred (2,400) dollars: *Provided*, They do not engage in any other business during the business hours of the day.

Item 23. For salary of one supervisor of the intercepting sewer, nine hundred (900) dollars.

Item 24. For engraving and printing maps of the city, two hundred (200) dollars.

Item 25. For the examination and reconstruction of old sewers with man-holes, ventilators and ventilation connections, twenty thousand (20,000) dollars.

Item 26. For the construction of Clearfield street sewer from the west side of Thirteenth street to the south side of the Connecting or Pennsylvania Railroad, twenty thousand (20,000) dollars; Wingohocking sewer from Penn to Wister streets, seventy thousand (70,000) dollars; and the completion of the Cohocksink sewer, one hundred and fifteen thousand (115,000) dollars; in all two hundred and five thousand (205,000) dollars.

Item 27. For the Aramingo canal system, seventy-five thousand (75,000) dollars.

Item 28. For the construction of a bridge, with stone piers, iron deck and oak plank footway, forty feet wide, on or near the line of McCallum street, over Cresheim creek, in the Twenty-second Ward, according to plans and specifications to be prepared by the Department of Public Works: *Provided*, That Mr. Henry H. Houston shall dedicate the ground for the approaches, and pay one-half of the cost of said bridge, not exceeding twenty-five thousand (25,000) dollars, and shall deed to the city a bridge already built over Wissahickon avenue

on the line of Thirty-fifth street, twenty-five thousand (25,000) dollars.

Item 29. For the construction of branch sewers, inlets, and man-holes, one hundred thousand (100,000) dollars: *Provided*, That the amount assessable for the construction of sewers in front of city properties shall be paid out of this item.

Item 30. For connections with the intercepting sewer, twenty-five thousand (25,000) dollars: *Provided*, That no part of said appropriation for surveys shall be expended except for work prosecuted in accordance with an ordinance of Councils, and that all new surveys, and the revision of sectional plans shall be paid for at a rate not exceeding three (3) dollars per acre for lines and grades, and one (1) dollar and fifty (50) cents per acre for topography, unless otherwise directed by the ordinance authorizing the work; and that all bills for surveys shall state the number of days employed on such surveys, and the charge per diem for the corps engaged: *Provided, also*, That the City Controller shall approve bills for labor and material done or furnished prior to 1889, the aggregate amount thereof not to exceed two thousand (2,000) dollars, the same to be taken from the appropriate item: *Provided*, That balances remaining to the credit of Items 29, 30, 31, 32, 33 and 34 of the appropriation for the year 1889, shall not merge.

Water.

SECT. 8. That of the amount appropriated to this Department, the sum of eight hundred and ninety-six thousand and fifty-three (896,053) dollars is for the expenses of the Bureau of Water, as follows:

Item 1. For salary of chief of bureau, six thousand (6,000) dollars; chief clerk, two thousand (2,000) dollars; assistant clerk, one thousand and eighty (1,080) dollars; correspondence clerk, nine hundred (900) dollars; time clerk, nine hundred (900) dollars; messenger, six hundred and fifty (650) dollars; draughtsman, one thousand eight hundred (1,800) dollars; draughtsman, one thousand (1,000) dollars; draughts-

man, nine hundred (900) dollars; general superintendent, three thousand five hundred (3,500) dollars; clerk, nine hundred (900) dollars; assistant clerk, eight hundred and fifty (850) dollars; assistant to chief, two thousand (2,000) dollars; clerk, one thousand (1,000) dollars; assistant clerk, nine hundred (900) dollars; pipe inspector, one thousand two hundred (1,200) dollars; pipe clerk, eight hundred and fifty (850) dollars; assistant to chief, one thousand two hundred (1,200) dollars; search clerk, one thousand one hundred (1,100) dollars; assistant search clerk, nine hundred (900) dollars; assistant clerk, eight hundred and fifty (850) dollars; chief inspector, one thousand one hundred (1,100) dollars; nineteen (19) inspectors, each nine hundred (900) dollars; permit clerk, one thousand and eighty (1,080) dollars; assistant permit clerk, one thousand (1,000) dollars; purveyor, one thousand six hundred (1,600) dollars; five (5) purveyors, each one thousand four hundred and eighty (1,480) dollars; six (6) purveyors' clerks, each seven hundred and twenty (720) dollars; seven (7) general foremen, each nine hundred and thirty-nine (939) dollars; five (5) foremen of repairs, each seven hundred and eighty (780) dollars; superintendent of shop, one thousand five hundred (1,500) dollars; clerk to superintendent of shop, nine hundred (900) dollars; six (6) engineers, each one thousand (1,000) dollars; four (4) engineers, each nine hundred and fifty (950) dollars; two (2) engineers (with houses), each eight hundred and ten (810) dollars; two (2) engineers, each eight hundred and ten (810) dollars; engineer, seven hundred and fifty (750) dollars; two (2) oilers, acting as engineers, each eight hundred and ten (810) dollars; twenty (20) oilers, each seven hundred and fifty (750) dollars; thirty (30) firemen, each seven hundred and fifty (750) dollars; sixteen (16) coal passers, each six hundred and seventy-five (675) dollars; helper, seven hundred and fifty (750) dollars; two (2) storekeepers, each seven hundred (700) dollars; foreman of bricklayers, one thousand (1,000) dollars; foreman of carpenters, one thousand (1,000)

dollars; foremen of stonemasons, painters, riggers, each nine hundred (900) dollars; foreman of laborers, eight hundred and forty (840) dollars; twenty-five (25) watchmen, each six hundred and seventy-five (675) dollars; four (4) policemen, each six hundred and seventy-five (675) dollars with an additional sum of forty (40) dollars each for the purchase of uniforms; janitor at main office, six hundred and seventy-five (675) dollars; six (6) janitors, each six hundred (600) dollars; river watchman, eight hundred and fifty (850) dollars; lineman, seven hundred and twenty (720) dollars; telephone operator (night), six hundred (600) dollars; two (2) telephone operators (day), each three hundred and sixty (360) dollars; electrician, nine hundred (900) dollars; general storekeeper, nine hundred (900) dollars; total, one hundred and seventy-seven thousand and fifty-three (177,053) dollars.

Item 2. For general supplies, including fuel, oil, and small stores, one hundred and forty-five thousand (145,000) dollars.

Item 3. For repairs to machinery, including the conveyance of workmen incident thereto, fifty thousand (50,000) dollars.

Item 4. For maintenance and repairs to buildings, grounds, and reservoirs, fifty thousand (50,000) dollars.

Item 5. For repairs and improvements of the distribution, including the purchase of material and cost of labor in connection therewith and expenses incident thereto, eighty-five thousand (85,000) dollars.

Item 6. For supplies, including fuel and labor at the city construction and repair shop, seventy-five thousand (75,000) dollars.

Item 7. For general, incidental, and contingent expenses, including keep of horses for Chief of Bureau, general superintendent and assistant to Chief, each four hundred (400) dollars, fourteen thousand (14,000) dollars.

Item 8. For the purchase of material and cost of labor in connection with the laying of service pipes, and expenses incident thereto, one hundred thousand (100,000) dollars.

Item 9. For extensions, two hundred thousand (200,000) dollars: *Provided*, That nothing in this ordinance shall prevent the Director of the Department of Public Works from laying water-pipe, making repairs by day's work, or the employment of any additional service, when the exigencies of the Water Bureau so require: *Provided, also*, That the City Controller shall approve bills for work, labor or material, done, made or furnished prior to 1890 to Water Bureau, the aggregate amount thereof not to exceed twenty-five thousand (25,000) dollars, the same to be taken from the several items to which they are properly chargeable.

SECT. 9. When the Director of the Department of Public Works is obliged to employ labor to do work under neglected or annulled contracts, then payment shall be made from the Item against which such contracts are charged, and the amount so paid charged against the contractor on the amount set aside for such neglected or annulled contracts.

SECT. 10. Warrants shall be drawn as follows:

For the employes of the City Ice Boats, one warrant, payable monthly.

For the Bureau of Gas.—For the employés of the main office, meter and pipe inspector's departments, service gang, and Spring Garden office, one warrant; for the employés in the distribution department and holder stations at Ninth and Diamond, Ninth and Mifflin and Twenty-fifth and Callowhill streets, one warrant; for the employés at the Ninth Ward works, one warrant; for the employés at the Twenty-fifth Ward works, one warrant; for the employés at the Twenty-sixth Ward, one warrant; for the employés on the Germantown, Frankford and Manayunk rolls, one warrant; employés of the Bureau of Gas are to be paid semi-monthly.

For the employés in the *Bureau of Lighting* one warrant, payment semi-monthly.

For the Bureau of Water.—For the employés on the hydrographic corps roll, one warrant, payment once every two

months ; for the employés at the pumping stations, one warrant for each station, payment monthly.

The following employés in the Bureau of Water to be paid semi-monthly: For the employés in the Purveyor's districts, one warrant for each district; for the employés of the city construction and repair shop, one warrant; for the employés upon the improvement to distribution and contingent roll, one warrant; for the employés upon the buildings, grounds and reservoir roll, one warrant.

Warrants for the Director's office and the city ice boats shall be drawn by the Director of the Department of Public Works; all others by the chiefs of the respective Bureaus and approved by the Director of the Department of Public Works.

SECT. 11. All ordinances or part of ordinances inconsistent herewith be, and the same are, hereby repealed.

Approved this twenty-eighth day of December, A. D. 1889.

EDWIN H. FITLER,
Mayor of Philadelphia.

ANNUAL REPORT

OF THE

BUREAU OF WATER,

FOR THE YEAR 1889.

OFFICERS

OF THE

BUREAU OF WATER.

Chief,

JOHN L. OGDEN.

Assistants.

ALLEN J. FULLER,

WILLIAM WHITBY.

Draughtsmen :

John E. Codman,

James G. Davis,

James J. Jefferson.

Chief Clerk—JOB T. HICKMAN.

Assistant Clerks—J. G. Dixon, Kennedy McNeal.

Correspondence Clerk—P. de Haven.

Search Clerk—Thomas Spence.

Assistant Search Clerk—H. J. Johnson.

Assistant Clerk—William J. Duffy.

Time Clerk—William J. Innes.

Pipe Inspector—Theodore S. S. Baker.

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*, Lewis Culp, William Fletcher.

CHESTNUT HILL—*Engineer*, Henry W. Everly.

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

KENSINGTON—*Oilers*, Peter J. Tuttle, Moses Holden.

Works-General.

Foreman Carpenter—Henry Guest.

Foreman Bricklayer—Frank A. Mooney.

Foreman Stonemason.—Crawford Lukens.

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—W. F. Courtney.

Clerk to Superintendent of Shop—W. H. Winter.

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 Foreman, 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, Jonathan Bon-sall. *General Foreman*, Samuel Loeb.
Office, Town Hall, Germantown.

ANNUAL REPORT
OF THE
BUREAU OF WATER,
DEPARTMENT OF PUBLIC WORKS,
FOR THE YEAR 1889.

Philadelphia, January 21, 1890.

GENERAL LOUIS WAGNER,

Director of the Department of Public Works.

SIR:—The report of the operations of the Bureau of Water for the year 1889 is herewith respectfully submitted.

Receipts.

The following detailed statement of the receipts from water rents, etc., at the office of the Receiver of Taxes has been furnished by Mr. E. S. Higbee, the Chief Clerk, in charge:

Total Receipts, Bureau of Water, for the Year 1889.

MONTHS.	Searches.	Delinquent Rents.	Delinquent Penalties.	Rents, 1889.	Penalties, 1889.	Fractional Rents.	Water Pipe.	Bureau of Water, Department of Public Works.	Totals.
January.....	\$396 25	\$4,645 75	\$552 83	.....	.....	\$10,475 50	\$7,407 75	\$721 75	\$24,199 92
February.....	379 75	1,730 00	244 51	\$249,406 19	.....	8,011 25	7,522 05	201 44	267,495 19
March.....	499 50	1,725 50	254 34	379,213 10	.....	9,153 21	8,695 43	177 41	399,718 49
April.....	478 00	2,257 00	336 34	979,063 77	.....	13,300 12	19,251 06	166 16	1,014,852 45
May.....	457 75	1,132 16	164 04	52,453 20	2,603 84	16,635 07	7,571 94	1,683 92	82,701 92
June.....	411 25	1,369 00	263 47	63,030 80	3,130 36	12,469 57	10,245 56	2,255 00	93,115 01
July.....	374 50	612 50	91 43	13,423 31	1,918 35	9,097 50	16,142 84	4,326 10	45,986 53
August.....	312 75	2,062 00	308 13	19,936 85	2,985 33	18,476 49	17,036 69	727 33	61,845 57
September.....	383 75	836 50	124 72	14,409 00	2,120 64	8,844 02	13,605 68	224 71	40,549 02
October.....	472 25	4,346 82	652 06	62,853 77	9,298 44	17,004 98	14,320 71	237 04	109,186 07
November.....	432 75	1,694 50	252 82	7,252 50	1,074 19	15,291 82	17,987 06	353 91	44,339 55
December.....	457 75	995 50	148 09	7,500 00	1,116 80	4,635 11	9,824 86	288 93	24,967 04
Totals.....	\$5,056 25	\$23,407 23	\$3,332 78	\$1,848,542 49	\$24,247 95	\$143,394 73	\$149,611 63	\$11,363 70	\$2,208,956 76
Receipts through the office of the City Solicitor 1889.....									33,043 09
Total receipts of the Bureau of Water for the year 1889.....									\$2,241,999 85
Receipts as previously estimated.....									2,000,000 00

Items of Receipts under Head of "Fractional Rents."

YEAR.	Rents.	Meter rents.	Ferrules.	Repairs.	Totals.
1889.....	\$67,309 01	\$39,689 47	\$32,593 25	\$3,803 00	\$143,394 73
1888.....	00,055 25	33,340 16	18,676 00	1,478 75	113,550 16
Increase.....	\$7,253 76	\$6,349 31	\$13,917 25	\$2,324 25	\$29,844 57

Revenues for Ten Years, 1880 to 1889, inclusive.

116	YEAR.	Delinquent Water Rents.	Delinquent Penalties.	Water Rents.	Penalties.	Fractional Rents.	Water-Pipe.	Searches.	Chief's Office.	City Solicitor's Office.	Totals.
	1880.....	\$112,728 37	\$16,783 11	\$1,218,925 66	\$19,002 35	\$48,038 07	\$26,077 90	.....	\$4,786 07	\$38,015 53	\$1,484,357 06
	1881.....	84,591 40	12,627 66	1,256,662 00	19,234 38	53,451 56	47,489 11	.....	5,549 01	29,936 22	1,509,541 34
	1882.....	78,543 01	11,479 18	1,295,419 87	18,016 23	49,529 90	34,979 52	.....	7,515 88	21,421 05	1,516,904 64
	1883.....	69,995 84	10,310 00	1,380,882 17	23,280 44	67,088 10	45,853 09	.....	8,515 11	21,144 41	1,627,069 16
	1884.....	19,837 72	2,492 97	1,566,027 57	22,797 76	77,557 40	71,542 00	\$461 50	10,670 89	21,098 20	1,792,486 01
	1885.....	11,267 25	1,561 03	1,567,031 94	22,298 78	101,643 88	92,182 18	1,988 75	9,197 00	18,993 23	1,826,164 04
	1886.....	15,049 50	1,964 42	1,637,296 69	21,377 80	97,219 62	122,743 91	2,960 00	10,121 36	24,594 05	1,933,328 34
	1887.....	19,040 37	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	2,030,434 61
	1888.....	13,995 04	1,948 54	1,793,432 38	23,584 86	113,550 16	123,667 85	4,158 25	7,742 45	22,846 97	2,114,926 50
	1889.....	23,407 23	3,332 78	1,848,542 49	24,247 95	143,394 73	149,611 63	5,056 25	11,363 70	33,043 09	2,241,999 85
	Total.....	\$448,456 23	\$65,205 48	\$15,285,709 60	\$218,293 67	\$867,412 63	\$830,749 67	\$18,037 50	\$82,749 08	\$260,597 69	\$18,077,211 55

Comparative Statement.

1889.....	\$23,407 23	\$3,332 78	\$1,848,542 49	\$24,247 95	\$143,394 73	\$149,611 63	\$5,056 25	\$11,363 70	\$33,043 09	\$2,241,999 85
1888.....	13,995 04	1,948 54	1,793,432 38	23,584 86	113,550 16	133,667 85	4,158 25	7,742 45	22,846 97	2,114,926 50
Increase.....	\$9,412 19	\$1,384 24	\$55,110 11	\$663 09	\$29,844 57	\$15,943 78	\$898 00	\$3,621 25	\$10,196 12	\$127,073 35
Decrease.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

The revenue has exceeded the estimate furnished to the City Controller by \$241,998.85; the total increase over the previous year amounts to \$127,073.35.

There has been a gain in every item, the largest being in water rents.

The fractional rents exceed the previous year by 26 per cent., showing that building operations are still on the increase.

For list of receipts from the office of Chief of the Bureau of Water, see Appendix A.

Expenditures.

The total net appropriation to the Bureau was \$1,366,519.42, of which \$713,571.82 were for maintenance and improvements, and \$652,947.60 for extensions.

The sum available from the year 1888 due on uncompleted contracts, was \$14,915.01, and \$3,647.60, which not being required for this purpose, was credited to the annual appropriation for 1890. The total available appropriation was therefore \$1,381,434.43.

The expenditures were:

For current expenses.....	\$708,847 53
For extensions.....	590,743 56
For extension, appropriation 1888.....	14,915 01
	\$1,314,506 10
The amount not merging.....	57,979 20
The amount merging.....	8,949 13

The amount due on bills unpaid is approximately \$3,000 00.

The large amount merging was due to the failure of the contractors for coal and iron castings to execute supplementary contracts in time, and to the delay of others in presenting their bills. With the exceptions of Items 2 and 5 the appropriations were adequate.

Item 2, for coal, was originally short about \$8,000. Item 5, for the laying of water supply pipes, was exhausted about September 1, when all work except repairs virtually stopped until near the end of the year, when an additional sum was

received. Builders having houses ready for the introduction of water were obliged to purchase and lay pipes at their own expense, or lose the rent and sale of their houses. The city lost in water rents, and the builders by the delay in the disposal of their properties.

The items for extensions were used for the completion of the last section of the East Park Reservoir, for laying a thirty-inch main from the Roxborough basin to Mount Airy, and for a portion of a forty-eight inch pipe from the East Park Reservoir to Kensington. For a detailed statement of the expenditures see report of the Chief Clerk, Appendix B.

Appropriations and Expenditures.

Appropriation December 24, 1888.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging.
Item 1. Salaries—				
Office Chief of Bureau.....	\$93,234 67	\$92,675 45		
Fairmount Pump'g Stat'n.....	9,110 00	8,965 47		
Sp. Garden Pump'g Stat'n.....	35,485 00	30,961 43		
Belmont Pumping Stat'n.....	11,050 00	10,934 86		
Roxborough Pump'g Stat'n.....	10,770 00	10,555 86		
Mt. Airy Pumping Stat'n.....	2,970 00	2,970 00		
Chestn't Hill Pump'g Stat'n.....	1,500 00	1,500 00		
Frankford Pump'g Stat'n.....	10,475 00	9,609 58		
Kensington Pump'g Stat'n.....	4,470 00	4,402 50		
	\$179,064 67			
Transferred—				
To Bureau of High-ways.....	\$2,500			
To Item 7, Bureau of Water.....	2,500			
To Item 2, Bureau of Water.....	1,100			
	6,100 00			
	\$172,964 67	172,575 15	\$389 52	
Item 2. Regular supplies, including fuel, oil, and small stores.....	\$145,000 00			
Transferred—				
To Item 5, Bureau of Water.....	3,000 00			
	\$142,000 00			
Transferred—				
From Item 1.....	\$1,100			
From Item 6.....	800			
From Item 8.....	1,500			
From Item 10.....	4,300			
	8,200 00			
	150,200 00	148,543 34	1,656 66	
Item 3. Repairs to machinery, including the conveyance of workmen incident thereto.....	50,000 00	49,932 02	67 98	
Item 4. Maintenance and repairs to buildings, grounds and reservoirs...	50,000 00	49,910 15	89 85	
Item 5. Maintenance and improvement to the distribution, including purchase of material and cost of labor connected therewith, and expenses incident thereto	\$175,000 00			
Transferred—				
From Item 2.....	\$3,000			
From Item 10.....	1,400			
From other Bureaus.....	19,900			
	24,300 00			
	109,300 00	197,373 71	1,926 29	
Item 6. Supplies and labor at City Shop.....	\$75,000 00			
Transferred—				
To Item 2.....	800 00			
	74,200 00	73,875 39	324 61	

Appropriations and Expenditures—(Continued.)

Appropriation December 24, 1888.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merg'g
Item 7. General and incidental and contingent expenses, including \$1,200 for keep of horse for Chief of Bureau, General Superintendent and Assistant..... \$14,000 00				
Appropriation Oct. 24, 1889..... 244 65				
Transferred—				
From Item 1.....2,500 00				
<u>2,744 65</u>	\$16,744 65	\$16,475 27	\$269 38	
Item 8. Extensions.....\$600,000 00				
Balance from books of 1888 3,647 60				
\$603,647 60				
Transferred—				
To Item 2.....\$1,500 00				
To Item 10.....25,000 00				
<u>26,500 00</u>	577,147 60	566,334 63	1,953 30	\$3,859 67
Item 9. To refund to Trustees of West Philadelphia Friends Meeting, paid for water-pipe in front of their place of worship, north side of Powelton avenue, west of Forty-second, appropriation 1888.....	162 50	162 50		
Item 9. For the laying of a 48-inch main from the East Park Reservoir to the Kensington Basin. Ordinance September 30, 1889.....				
Transferred—				
From the Bureau of Gas... \$35,000 00				
From the Bureau of Street Cleaning..... 2,000 00				
From the Bureau of Surveys..... 20,000 00				
From Item 8, Bureau of Water..... 25,000 00				
\$82,000 00				
To Item 2..... 6,200 00				
<u>75,800 00</u>	75,800 00	24,408 93	2,271 54	49,119 53

PUMPAGE.

The total number of gallons pumped was as follows :

Fairmount Station.....	11,413,836,469	
Spring Garden Station.	20,423,759,237	
Belmont Station.....	4,157,551,297	
Roxborough Station.....	2,648,073,522	
Chestnut Hill Station.....	119,709,520	
Frankford Station.....	2,390,088,868	
Kensington Station.....	1,025,362,191	
Total.....		42,178,381,104
Supplementary } Roxborough.....	18,790,515	
Lift. } Mount Airy.....	321,748,162	
Total.....		340,538,677
A grand total of.....		42,518,919,781

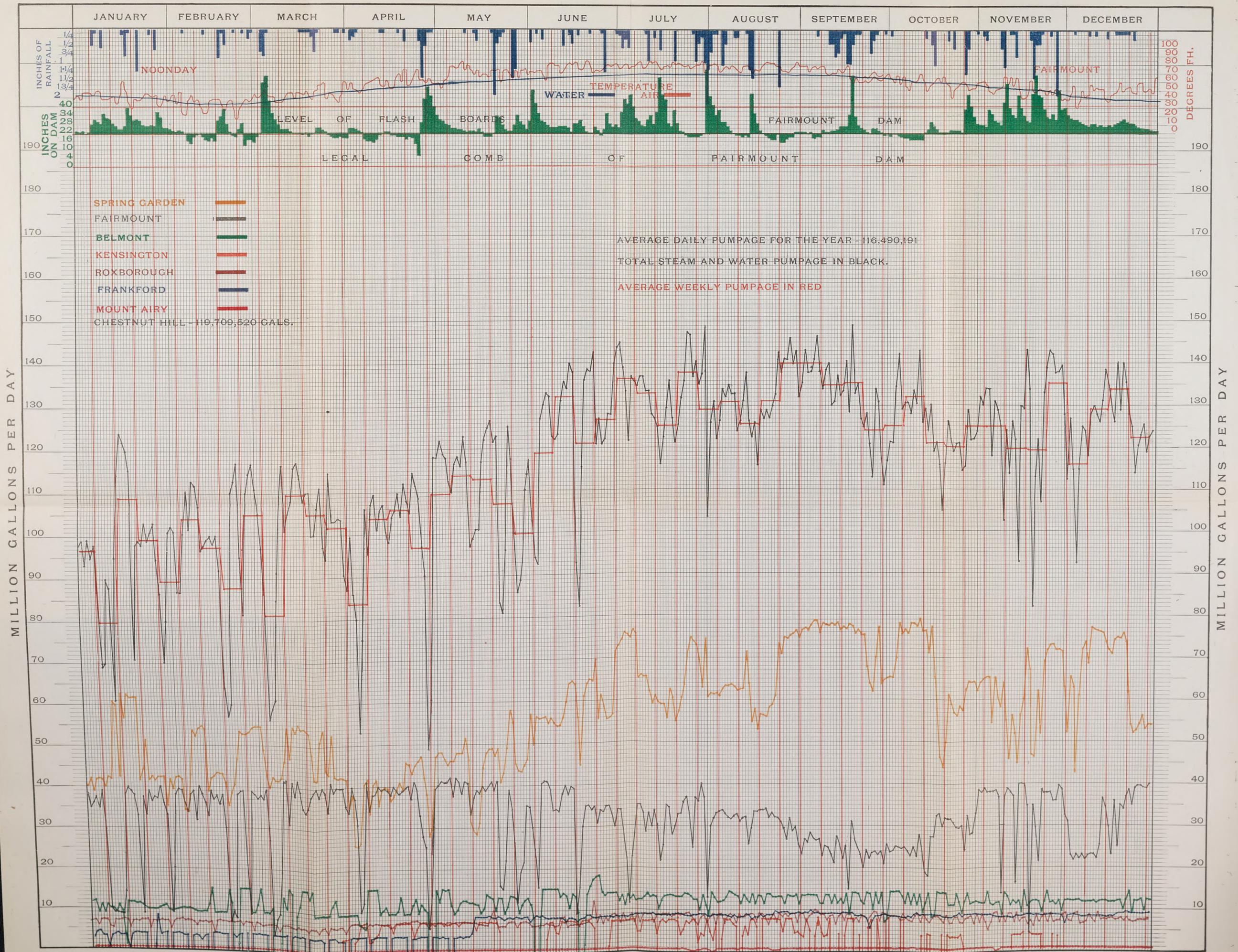
Total Gallons Pumped during 1889.

Month.	Water Power.	Steam Power.	Totals.	Average gallons per day.
January.....	903,848,385	2,089,399,720	2,943,248,105	94,948,487
February.....	906,853,335	1,839,756,723	2,746,610,058	98,093,216
March.....	1,061,698,450	2,040,975,689	3,102,674,139	100,086,282
April.....	1,007,522,370	1,901,055,870	2,908,578,240	96,952,608
May.....	1,073,900,957	2,332,131,910	3,406,032,867	109,872,027
June.....	986,941,265	2,723,045,320	3,709,986,585	123,666,219
July.....	961,431,847	3,190,907,681	4,152,339,528	133,946,436
August.....	963,225,337	3,089,238,877	4,052,464,214	130,724,652
September.....	731,520,508	3,253,649,276	3,985,169,784	132,888,992
October.....	836,601,819	3,024,109,920	3,860,711,739	124,589,088
November.....	1,025,547,334	2,747,738,165	3,773,285,499	125,776,183
December.....	954,744,862	2,923,074,161	3,877,819,023	125,090,936
Total.....	11,413,836,469	31,105,083,312	42,518,919,781	116,490,191

AMOUNT OF WATER PUMPED BY ALL THE WORKS FROM 1854 TO 1889, INCLUSIVE, IN U. S. GALLONS.

YEAR.	FAIRMOUNT.		DELAWARE.		SCHUYLKILL.		TWENTY-FOURTH WARD AND BELMONT.		ROXBOROUGH AND GERMAN-TOWN.		CHESTNUT HILL.		FRANKFORD.		MOUNT AIRY.		ROXBOROUGH AUXILIARY.		TOTALS.		
	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total Water Pumped.	Daily Average.	Total for all the Works.	Total Daily Average.	
1854.....	2,286,402,222	6,264,116	618,173,121	1,693,625	1,366,011,559	3,742,497													4,279,586,902	11,700,233	
1855.....	2,787,736,850	7,637,635	567,804,060	1,555,628	1,525,987,725	4,180,788	9,538,170	26,132											4,891,066,805	13,400,183	
1856.....	2,867,188,965	7,833,850	769,566,040	2,102,639	1,980,637,500	5,411,578	52,577,642	143,655											5,669,970,147	15,491,722	
1857.....	3,059,797,730	8,383,007	811,462,085	2,223,184	2,315,832,461	6,344,746	121,948,840	334,106											6,309,040,116	17,285,044	
1858.....	3,058,418,667	8,379,229	757,187,690	2,074,487	2,819,641,992	7,725,047	204,177,624	559,391											6,839,425,973	18,738,163	
1859.....	3,390,271,757	9,288,416	868,567,100	2,379,636	2,643,736,620	7,243,114	265,456,170	727,277											7,168,031,647	19,638,443	
1860.....	3,612,989,017	9,871,555	872,144,980	2,382,910	2,696,960,210	7,368,744	283,646,070	774,989											7,465,740,277	20,398,197	
1861.....	3,731,785,628	10,224,070	983,805,740	2,695,358	2,527,182,710	6,923,788	353,313,900	967,983											7,596,087,978	20,811,200	
1862.....	3,564,724,753	9,766,369	909,126,440	2,490,757	3,068,527,420	8,324,733	420,507,810	1,152,076											7,932,886,423	21,733,933	
1863.....	5,586,712,091	15,306,060	1,182,539,680	3,239,835	2,203,769,280	6,037,724	525,754,090	1,440,422											9,498,775,141	26,024,041	
1864.....	5,970,801,329	16,313,665	1,090,884,060	2,980,558	1,725,444,660	4,714,330	519,877,800	1,420,431											9,307,007,849	25,428,983	
1865.....	7,082,015,640	19,402,783	1,429,591,700	3,916,690	2,005,038,484	5,493,256	535,923,360	1,468,283											11,052,569,184	30,281,011	
1866.....	7,721,817,582	21,155,665	1,271,841,020	3,484,496	947,652,428	2,596,308	606,665,380	1,652,097	106,369,060	291,422									10,654,345,470	29,189,987	
1867.....	7,990,416,594	21,891,552	427,935,060	1,172,425	1,590,248,454	4,356,845	677,717,190	1,856,759	177,104,200	485,217									10,863,421,498	29,762,798	
1868.....	8,024,530,911	21,924,948	705,442,350	1,927,438	2,337,365,642	6,386,245	727,824,780	1,988,592	190,015,200	519,167									11,985,178,883	32,746,390	
1869.....	7,489,611,069	20,519,482	1,042,780,453	2,856,934	2,735,569,020	7,494,709	928,561,494	2,544,004	218,229,800	597,890									12,414,752,336	34,013,020	
1870.....	8,134,985,170	22,287,631	1,186,131,144	3,249,674	3,003,737,166	8,229,417	850,011,192	2,328,798	227,946,600	624,511									13,402,811,272	36,720,030	
1871.....	8,821,728,593	24,169,065	1,007,378,521	2,759,941	2,201,294,172	6,030,943	1,054,210,990	2,888,249	413,787,205	1,133,664									13,498,389,481	36,981,916	
1872.....	7,366,632,573	20,127,411	1,474,531,040	4,028,773	2,223,287,070	6,074,555	1,456,756,728	3,980,210	518,811,050	1,417,517									13,040,018,461	35,623,465	
1873.....	8,717,538,594	23,883,667	1,364,109,884	3,737,287	1,508,295,800	4,132,317	1,959,966,670	5,369,772	373,287,495	1,844,623									14,223,198,443	38,967,667	
1874.....	7,749,007,798	21,230,158	1,558,518,765	4,269,914	1,536,505,220	4,209,603	2,969,227,504	8,134,870	720,165,810	1,973,057									14,553,425,097	39,817,603	
1875.....	7,994,234,254	21,902,012	1,839,190,470	5,038,878	1,356,295,950	3,715,879	3,055,507,870	8,371,254	818,339,525	2,242,026	33,592,000	92,033							15,097,160,069	41,363,029	
1876.....	8,547,163,024	23,352,906	2,011,301,489	5,495,359	2,179,733,340	5,955,556	3,748,651,929	10,242,218	935,702,907	2,556,565	50,754,850	138,674							17,473,308,039	47,741,272	
1877.....	9,492,419,433	26,015,985	2,149,106,828	5,865,390	1,729,810,384	6,297,697	3,486,803,917	9,594,170	960,670,580	2,648,008	58,427,850	158,912							17,817,144,732	48,983,958	
1878.....	8,322,288,784	22,800,791	2,133,094,379	5,844,000	2,902,600,680	7,955,070	4,076,537,188	11,170,000	1,056,085,543	2,893,386	78,267,900	214,433	532,789,858	2,090,000					19,101,664,332	52,333,326	
1879.....	7,278,357,488	19,950,213	2,194,470,977	6,012,222	4,468,480,020	12,258,850	3,954,962,917	10,835,515	1,144,745,970	3,136,564	87,532,350	239,815	765,551,793	2,097,402					19,894,101,515	54,507,518	
1880.....	7,887,896,254	21,551,630	1,995,974,076	5,453,481	5,483,661,280	14,982,681	3,543,457,439	9,681,577	1,169,598,279	3,195,624	89,555,850	244,688	950,649,208	2,597,402					21,120,792,386	57,707,082	
1881.....	7,575,326,689	20,754,319	1,815,588,861	4,974,202	6,902,944,760	18,910,533	4,245,905,582	11,632,618	1,214,029,524	3,326,000	87,841,200	240,660	880,083,222	2,411,187					22,721,014,838	62,249,355	
1882.....	9,377,468,535	25,691,694	1,549,240,460	4,244,494	6,993,626,450	19,160,620	4,445,387,322	12,179,144	1,304,640,631	3,574,369	87,330,000	239,260	933,747,002	2,558,211					24,691,440,430	67,647,782	
1883.....	9,757,996,729	26,704,374	2,344,352,195	6,422,883	7,311,998,170	20,032,872	3,108,660,439	8,516,878	1,374,629,731	3,766,109	67,833,650	185,845	1,211,953,357	3,320,420	102,181,610	477,484	6,251,370	17,127	25,284,957,251	69,273,856	
1884.....	8,575,107,594	23,429,255	2,622,508,140	7,165,323	6,892,574,290	18,832,990	2,361,190,136	6,455,000	1,353,033,263	3,696,729	71,664,068	195,804	838,327,533	2,290,512	319,179,725	872,076	9,060,018	24,754	25,495,179,353	69,658,969	
1885.....	6,847,346,991	18,759,850	1,749,734,826	4,793,794	11,367,263,025	31,143,200	6,922,412	1,438,288,524	3,940,517	77,114,315	211,272	824,831,901	2,259,813	325,312,350	891,267	8,431,759	23,101			25,165,020,072	68,945,260
1886.....	7,282,553,795	19,972,856	1,474,067,403	4,038,540	14,018,439,547	38,406,765	2,881,953,078	7,895,761	1,720,294,578	4,713,135	81,556,446	223,442	883,140,241	2,419,562	303,009,988	830,164	13,921,493	38,141	28,658,966,569	78,433,289	
1887.....	10,105,736,633	27,716,643	1,919,173,169	5,258,008	13,761,359,184	38,688,645	3,264,247,601	8,943,144	2,017,987,581	5,528,733	106,744,560	292,450	926,490,846	2,538,331	311,700,750	853,974	13,339,441	36,546	32,426,779,765	88,840,492	
1888.....	11,241,113,108	30,713,423	1,267,154,007	3,462,169	15,701,108,746	42,899,203	3,668,958,241	10,024,476	2,350,415,393	6,421,899	94,910,340	259,317	2,409,718,606	6,586,662	319,462,875	872,646	15,922,112	43,503	37,068,763,428	101,280,774	
1889.....	11,413,836,469	31,279,705	1,025,362,191	3,728,589	20,423,753,237	55,955,504	4,157,551,297	11,390,551	2,648,073,522	7,254,955	119,709,520	327,971	2,390,088,868	6,548,188	321,748,162	881,501	18,790,515	51,480	42,518,919,781	116,490,191	

PUMPAGE DIAGRAM FOR THE YEAR 1889.



The pumpage for the year 1889 exceeded that for 1888 by 5,450,156,353 gallons, over 14 per cent., the same increase as the preceding year.

The steam pumpage increased 5,277,423,992 gallons, or 20 per cent., and water power 172,723,361 gallons, or $1\frac{1}{2}$ per cent.

The daily average was 116,490,191, an increase over 1888 of 15,209,417, or 15 per cent.

Estimating the population at 1,050,000, this was 110 gallons daily per capita, which is unnecessarily large, and represents considerable waste.

The maximum quantity pumped in one day was 148,966,334 gallons on September 19, and the minimum 47,642,722 on April 28.

Nearly 27 per cent. of the pumpage was by water power, and 73 per cent. by steam.

No water was pumped at Kensington Station in January, February and December, and very little in March, October and November. During the warm weather it was impossible to keep up the supply without occasionally running the engine.

There was no trouble in regard to deficiency in any part of the city, and except in the northern section there was no complaint about the quality.

The cost of pumpage per million gallons raised one hundred feet high was lower than ever before. The decrease was due principally to the price of coal, which was fifty-two cents lower per ton than during 1888.

Pumpage Table for the Years 1880 to 1889 inclusive.

Year.	No. of gallons pumped to Reservoirs, etc.	No. of gallons pumped 100 feet high.	Cost per million gallons pumped 100 ft. high.	Gallons per capita per day.	Estimated Population.
1880	21,120,792,386	31,686,275,272	\$5 51	68	847,000
1881	22,721,014,838	34,238,528,111	6 88	71	869,000
1882	24,691,440,430	37,873,302,258	6 66	76	890,000
1883	25,284,957,251	37,949,320,701	6 51	76	911,000
1884	25,495,179,353	39,001,865,294	5 54	74	932,000
1885	25,165,020,072	39,308,901,886	4 70	72	953,000
1886	28,658,966,569	46,255,361,203	4 13	80	975,000
1887	32,426,779,765	51,289,948,331	3 99	89	995,000
1888	37,068,763,428	59,483,831,199	4 49	100	1,020,000
1889	42,518,919,781	69,034,118,434	3 87	110	1,050,000

The pumpage by water-power was greater than during any previous year, and the turbines were stopped oftener and longer on account of high water than for an inadequate flow from the river.

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

Fairmount Pumping Station, 1889.

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	831,666,944	8,025	161½	11½	.....	301½	260½
3	2,258,361,546	8,098	173½	8½	.....	219	264
4	2,010,985,015	7,418½	148	29½	372	729	63
5	1,900,368,314	7,222½	135	32	658	558½	154
7	1,660,411,025	6,731½	112	33	612	1,100½	171
8	1,362,434,125	5,466½	97½	18	618	868	1,692
9	1,394,659,500	5,479½	65½	34	652	757	1,772
	11,413,836,469	48,441½	893	166½	2,912	4,533½	4,376½

The following table shows the gallons of water pumped at Fairmount during ten years, from 1880 to 1889, inclusive, and the cost, including repairs, per million gallons raised 100 feet.

Year.	Gallons per 100 feet.	Repairs.	Cost per million gallons.
1880.....	7,887,896,254	\$1,431 00	\$1 98
1881.....	7,575,326,689	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

RAIN-FALL.

Rain-fall observations are made at ten stations by employés of the Bureau, and reports are received from eleven other stations by volunteer observers. The Bureau has self-registering gauges in use at three locations. The total rain-fall observed at our own station in this city was 50.62 inches or 6.66 inches greater than during the previous year. At the Pennsylvania Hospital the amount is stated to be 60.55 inches, which is exceeded by one year only since 1825. The greatest rain-fall was at Ottsville, 71.09 inches. In the Schuylkill Valley the precipitation was 33 per cent. above the average.

On July 31 three inches of rain fell, which was the largest amount in any one day.

The storm which caused the Johnstown flood did not reach any of our stations.

There were 159 days when 0.01 or more inches of rain were observed.

FLOW OF THE SCHUYLKILL.

Taking the average rain-fall on the water shed at 62.77 inches, the total amounted to 1,963,105,486,848 gallons. About 45 per cent. of this is accounted for at Fairmount as follows :

Waste over Flash-Boards on Dam.

January.....	34,823,259,437 gallons.
February.....	9,149,063,983 "
March.....	39,358,101,215 "
April.....	36,268,603,294 "
May.....	19,892,034,224 "
June.....	37,172,599,111 "
July.....	80,248,932,913 "
August.....	35,004,870,581 "
September	23,388,008,600 "
October.....	23,505,763,803 "
November.....	126,294,566,769 "
December.....	27,621,086,317 "
Total.....	<u>492,726,890,247</u>
Gallons pumped.....	42,518,919,781
Used for power.....	342,415,094,070
Lockage.....	<u>2,555,000,000</u>
Total.....	880,215,904,098

An average per day of 2,411,550,000 gallons.

There were 97 days when no water flowed over the dam, and 268 days during which the waste amounted to a total height of 195 feet 10 inches.

The highest flow in any one day was on July 31, when there were 66 inches on the dam and 44 inches going over. The difference, 22 inches, being the height of the flash boards.

The lowest monthly flow was in February, when the daily average amounted to 326,000,000. The highest flow was during the month of November, when 42 feet 1 inch went over the flash boards, a daily average of 42,098,188,923 gallons.

The average of three observations is taken as the daily flow.

QUALITY OF THE WATER.

Owing to the excessive rain-fall the water was occasionally muddy, but frequent analyses showed that (except possibly in the water pumped at the Kensington Station) with regard to matters in solution, it was quite satisfactory.

The prevalence of typhoid fever during the year was as usual attributed to the drinking water. The Public Ledger, however, demonstrated that the number of cases in proportion to the population was not on the increase, and in the following letter from "the world's greatest hygienist," the author is of the opinion that the water supply is not altogether responsible for this disease. The letter was addressed to and furnished to the Press for publication by Professor Dr. Samuel G. Dixon, of the University of Pennsylvania.

TO PROF. DR. SAMUEL G. DIXON,
Hygienist.

MOST HONORED COLLEAGUE:—I believe that the water supplies of our large cities are not responsible for the epidemics of typhoid fever as has been so generally supposed. That we are neglecting entirely too much the purification of the ground where the typhoid germs live; as for instance, in Philadelphia, with its defective sewers, which there produce the same results as were produced by the defective cess-pools and sewers in Munich.

The purification and the keeping the ground clean will have the same results in Philadelphia as in Munich, which was a hot bed for typhoid fever, but is now one of the healthiest cities in the world in this regard. Philadelphia would, likewise, not at once, but gradually lose its tendency to typhoid epidemics, as Munich and Berlin, and not by another supply of water, but by ground purification. The sooner this is appreciated the sooner you will get rid of typhoid.

The increase in the last few years of typhoid cases in Hamburg is of interest, because that city had for the last

twenty years a supply of unfiltered water from the river Elbe, and had very little typhoid, until, in consequence of its connecting itself with the toll-alliance of Germany, followed the great harbor labors and digging up of the ground; when these earth works are finished, then also will disappear the typhoid from Hamburg.

With great respect,

Your most humble

D. M. V. PETTENKOFER.

It might be interesting to review what has been done to improve the water and preserve its purity.

Not many years ago there was a sewer in Coates street emptying almost into Fairmount forebay. In 1867 complaint was made to Councils about the disgusting nature of its drainage, consisting of the offal from a slaughter-house in addition to house drainage from a large number of dwellings.

In the triangular piece of ground north of Fairmount and west of the Reading Railroad were some omnibus and car stables, hotels, rolling mill, and manure piles, the refuse from which ran into the river. A short distance above the dam was a small stream through which the drainage from the House of Refuge, Girard College, breweries, and slaughter-houses, found its way into the stream.

North of Girard avenue bridge, within a few feet of the Forebay of the Spring Garden pumping station was, for many years, a large sewer, which drained a number of breweries and slaughter-houses. The filth emptied into Fairmount pool from this source was of the most objectionable character. On the western side of the river, just above the old West Philadelphia pumping station, was a stream which carried the drainage of a portion of the Twenty-fourth Ward.

At the Falls and at Manayunk, Gas Works, slaughter-houses, numerous water-closets, dye-houses, paper mills, etc., poured large quantities of deleterious matter into the river.

At the Columbia bridge was a large oil refinery. By the establishment of the Park and the construction of sewers, all of this filth has been removed or turned into the river below the dam.

For these improvements the city has expended the following amounts :

For Fairmount Park.....	\$6,500,000 00
Pennsylvania Avenue Sewer.....	65,701 00
Thirtieth Street Branch.....	38,569 00
Twenty-eighth Street Branch.....	12,994 92
Mantua Creek Sewer.....	138,661 33
Intercepting Sewer, main line.	479,040 96
Branches, and storm water conduits.....	86,393 12
Wissahickon Valley Branch.....	290,519 73
Monoshone Branch.....	7,999 93
Total.....	<u>\$7,619,879 99</u>

This does not include the amount paid by property owners for sewers.

At present there is no reason whatever why the water in Fairmount pool should not be as wholesome as that in Flat Rock dam.

PUMPING STATIONS.

The stations are generally in first class condition, and with one exception the engines are in good order.

FAIRMOUNT.

The only important change was the removal of the heavy double beat valves from No. 8 pumps, and the substitution of others of rubber.

One hundred and forty young trees were planted on the reservoir bank.

The crib in front of the dam requires redecking; the timber is on hand, but the water was never low enough to begin the work. This crib is not essential to the safety of the dam, and if entirely washed away would not weaken the main structure.

Its use is to protect the dam from trees and heavy timbers during a freshet. The old structure, of a different form, and when but half as strong as at present, stood many years without a crib or apron below.

The roof over the mound dam wheel-house leaks badly; it should be covered with sheet asphaltum.

During the past year these works almost reached their maximum capacity. Some alterations can probably be made to the turbines and pumps which will enable them to increase their pumpage without using any more water for power than at present.

This will require an expenditure of about \$30,000, but as the cost of pumping by water is only about one-third the cost for steam, this money would soon be refunded by the reduced cost of pumpage.

SPRING GARDEN.

Forty-eight per cent. of the entire water supply was pumped at this station.

The increase over the preceding year was 4,722,650,491 gallons, or 30 per cent.

The total daily capacity is 90,000,000 gallons. The average pumpage, including stoppage for muddy water, alterations and repairs, was 56,000,000.

Except for the high river, due to the continuous rain-fall which allowed the water power works to be in constant operation, the pumps at this station would have been taxed to their utmost capacity. Should a low flow of the river occur the following season and the pumps at Fairmount be stopped, it could be scarcely possible for this station to pump sufficient water to meet the demand. Preparations are being made to move the Worthington engine from Kensington to this station, which will increase the capacity about 7,000,000 gallons.

During the year No. 11 engine was arranged to pump subsided water from the East Park Reservoir into the direct supply district. It was first tried without an air chamber on

Front End of Pump.
 Revolutions, - - - - $14\frac{3}{4}$
 Spring, - - - - 80 lbs.



Back End of Pump.
 Revolutions, - - - - $14\frac{3}{4}$
 Spring, - - - - 80 lbs.



Indicator Cards

FROM

No. 11 Pump, Spring Garden Station,
 BUREAU OF WATER.

Cards taken November 21, 1889.

Pump Working Without Air Chamber,
 Suction on East Park Reservoir.

JOHN L. OGDEN,
 Chief of Bureau.

Front End of Pump.

Revolutions, - - - - 14
Spring, - - - - 80 lbs.



Back End of Pump.

Revolutions, - - - - 14
Spring, - - - - 80 lbs.



Diagram.

From Suction Main,
Spring, - - - - 80 lbs.



Indicator Cards

FROM

No. 11 Pump, Spring Garden Station,
BUREAU OF WATER.

Cards taken December 4, 1889.

Pump Working With Air Chamber,
Suction on East Park Reservoir.

JOHN L. OGDEN,
Chief of Bureau.

the suction pipe, but the ram, due to taking the water from an elevation of 100 feet, caused a break in the pipe. After attaching an air chamber 30 inches in diameter and 36 feet in height, the engine worked very satisfactorily, and preparations were made to use No. 8 engine for the same service.

In December No. 11 engine broke down. A defective strap on one of the cross heads gave way, breaking the cross head and bending the guides.

The accompanying diagrams show the cards taken from this pump before and after putting on the air chamber.

The other engines and the boilers are in good order.

Owing to leaks in the pumping mains, which it seemed impossible to stop, the grounds in front of the station have been in an unsightly condition, but are now being filled in and terraced.

The stack of the south boiler house should be rebuilt and raised to the same height as the north stack. A new tin roof is required on both the engine and boiler houses.

At the new station everything is in excellent shape.

At Corinthian avenue basin an iron fence, taken from Norris Square, was placed at the foot of the embankment on the south side.

BELMONT.

The total pumpage at this station was 4,157,551,297 gallons, a daily average of 11,390,000.

The old cylinder boilers were removed, and five new furnace flue tubular boilers similar to those in use at other stations, were put in.

The engines and boilers were repaired as required during the year.

The reservoir at George's Hill holds but little more than an average supply for three days. During July and August a three days' supply would empty the basin so that the time available for settlement of the mud in the water is not sufficient, and unless filtration is resorted to, a larger basin will soon be necessary. Sites for two large reservoirs can be found within the bounds of the West Park.

ROXBOROUGH.

The total pumpage was 2,648,073,522 gallons, a daily average of over 7,000,000.

By the laying of a thirty-inch pipe from this station to Mt. Airy the forcing of water to Germantown has been rendered easier for the pumps.

During the warm weather both Worthington engines were in service, and the danger of a break-down makes it advisable to put in another pump in place of the Cornish engine, which has not been used for many years.

The marine boilers 4 to 7 were moved and connected with the new stack erected during the previous year.

ROXBOROUGH AUXILIARY.

Nothing was done at this station or at Manatawna except ordinary repairs.

MOUNT AIRY.

A Korting patent condenser was put in, so arranged as to be used for either engine. The usual repairs to machinery, buildings, grounds and reservoirs were made.

The capacity of the basin is 4,546,000 gallons. On November 5 a break occurred in the pumping main, caused by blasting a trench for a parallel pipe; before it could be repaired, which required about twelve hours, the water fell in the basin from 10 feet 9 inches to 2 feet 6 inches. A few hours more and Germantown would have been without water.

The laying of the new thirty-inch pipe from Roxborough basin to Mount Airy, which was finished on December 7, will not only increase the supply, but add to the security, as it is not probable that a break will occur in both mains at the same time.

This main enables us to pump entirely into Roxborough basin, and supply Germantown by gravity, thus giving some additional time for subsidence.

CHESTNUT HILL.

No new work was done at this station.

FRANKFORD.

The grounds were graded and pavements put down.

One engine is necessarily kept in reserve, for the want of an additional pumping main.

KENSINGTON.

The building of a sewer through the station, the contract for which has been awarded, will necessitate the abandonment of these works for pumping. The supply for this district will be drawn from the East Park reservoir, through a forty-eight inch main now being laid.

EAST PARK RESERVOIR.

With the exception of erecting the inlet fountain and trimming up the outside slopes, this reservoir is now completed.

The third and last section was lined on the inside, and made ready for the introduction of water, which was let in on October 8.

This basin furnished subsided water to the old city only. When the 48-inch main, now being laid, is completed, the Kensington District will be supplied.

Two engines at the Spring Garden Station will pump water from it into the direct pumpage district when the water in the river is muddy. A forty-eight inch pipe from the basin to Twenty-fifth and Spring Garden streets, not yet laid, will enable us to give subsided water to that part of the city below South street. For work in detail, see Appendix C.

DISTRIBUTION.

A thirty-six inch main was laid from the East Park Reservoir to the Spring Garden Station, and connected with No. 8 and No. 11 engines, by which thirty millions of subsided water

can be delivered to the northwestern part of the city when necessary.

An additional pumping or gravity main 30 inches in diameter was laid from the Roxborough basin to Allen's lane and McCallum streets, and connected there with the German-town supply pipe. The laying was begun on July 1 and completed on December 4. It is 13,258 feet in length. A forty-eight inch main for the supply of Kensington and Richmond was begun on November 21, and will be completed, it is hoped, before warm weather of 1890, or before its services will be needed.

Water Pipes Laid.

Pumping mains.....	14,178 feet.
Supply mains.....	5,176 "
Service pipes.....	177,532 "
Fire and other connections.....	10,285 "
Total.....	<u>147,171</u> "
Or 27 miles and 4,611 feet.	

The total feet of pipe now in use is about 929 miles.

The relays amounted to 21,577 feet.

The total number of fire hydrants is 7,433, of which 2,848 are of the new style, with a six-inch connection.

The new attachments made amounted to 9,544; an increase of 756 over the previous year.

Except for the insufficient appropriation all of this work could have been greatly increased. It was impossible to lay pipes to supply hundreds of new buildings with water, and the result was a great loss to the owners.

Meters.

There are 304 meters in use.

During the year it was thought advisable to place meters on certain fire connections, and the result was a large increase in the water rents of these establishments. They pay by meter rates, and draw water through the fire pipe, notwithstanding the agreement not to use water in this way.

For report in detail, see Appendix D.

Construction and Repair Shop.

The following table shows the principal work performed, and the increase since 1879.

The profit is estimated at \$15,160.44, but if there were no profit, the convenience of having work done quickly and satisfactorily in our own shop is a great advantage.

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	3,506
1883	729	328	423	4,799
1884	198	367	588	4,966
1885	451	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

For work in detail, see report of Mr. W. F. Courtney, Appendix E.

Hydrographic Work.

At a very slight expense the hydrographic work has been continued and some valuable information obtained. The year 1889 was a maximum in rain-fall and stream-flow. The total rain-fall was about 25 per cent. above the average, and 17 per cent. greater than during 1888. The greatest rain-fall was 73 inches at West Chester. In this city our automatic gauge at Thirty-second and Spruce streets showed a total of 50.62 inches.

At the U. S. Signal Service Station, Ninth and Chestnut streets, the precipitation was 50.60 inches, while at the Pennsylvania Hospital it was 60.55 inches.

For results of rain-fall and stream-flow observations, see Appendix F.

SUBSIDENCE AND FILTRATION.

The completion of the East Park reservoir, with a capacity of nearly seven hundred million gallons, will enable the Bureau to furnish subsidized water to the greater part of the city when the necessary supply mains shall have been laid. No provision has as yet been made to supply the Twenty-first, Twenty-second, Twenty-third, Twenty-fourth, Twenty-seventh and Thirty-fourth Wards with clean water.

The engines at Belmont can be stopped only for a short time, and when the river continues to be muddy for more than three or four days, the pumping must be resumed notwithstanding its condition. At such times West Philadelphia gets cloudy water.

The Roxborough and Mt. Airy basins, combined, do not hold two days' supply, and during the extreme warm weather scarcely more than sufficient for one day.

In order to supply these districts with clean water it will be necessary to build subsiding basins, or to filter it. Available sites for reservoirs have been examined, and estimates of cost of construction made.

Several propositions to filter a portion of, or the entire, water supply, are under consideration.

For statement of work done in the draughting room, see report of Chief Draughtsman, Appendix G.

Permits.

The Permit Clerks and Inspectors were, on January 1, transferred from the office of the Receiver of Taxes to this Bureau, since which time all permits have been issued and inspections made by the Department of Public Works.

The Permit Clerks issue permits for attachments to new buildings, for additional appliances in old buildings, and for repairs.

During the year 9,127 permits for connections to new buildings were issued, an increase of 339 over the previous year.

Inspections.

The duties of the inspectors are :

First.—To examine all premises where water has been introduced, and return an account of all connections and openings, and the rate of charge as fixed by Councils or their committee.

Second.—To examine and report cases of fraudulent use of water and abuse of permits, and such other duties as may be assigned.

An examination of all buildings where water has been introduced is made whenever it is thought advisable. The last inspection of this character was made in 1884, when about \$200,000 were added to the revenue, mainly for appliances put in without permits and without the knowledge of the Bureau.

All new attachments for the introduction of water are carefully examined to see that no appliances are put in except those specified in the permit, and for which payment has been made.

When errors in the assessments are claimed by property owners the Inspectors adjust the charge; and when persons decline the use of water or make a reduction in the number of openings, they see that the changes are carried out.

Another duty is to patrol their districts in order to detect the establishment of new businesses, such as bakeries, barber shops, laundries, photographic establishments, printing offices, bottling establishments, etc., that have been started without a permit. The following table, giving an account of the work performed by the Inspectors, shows that over \$33,000 have been added to the revenue by such discoveries.

The fraudulent use of water is not uncommon, and its detection adds to the revenue. In some instances persons having meters were found using their fire attachments to obtain water without payment.

One great difficulty experienced by the Inspectors is to properly estimate the quantity of water used by appliances for

which no regular charge has been fixed; the use of water therefrom not being continuous the amount can only be guessed, the verification of which can be made only by a meter. In some instances, probably, the consumer is overcharged, but generally the estimate is against the city.

The rates for the use of water for manufacturing purposes were undoubtedly based on the consumption during ten working hours. Engines running ten hours daily are charged as much as those in use twenty-four. The same applies to dye-houses, manufacturing and other establishments, which may be in operation ten or twenty-four hours.

The division of some of the wards of the city necessitated the writing of new registers.

The duplicates for the office of the Receiver of Taxes and the City Controller, from which water rent bills are made out and audited, were prepared by this branch of the Bureau, the work being partly done by the Inspectors.

The following table will give a general idea of the work performed by the Inspectors.

Respectfully,

JOHN L. OGDEN,

Chief of Bureau.

*Summary of the Work done by Inspectors' Department
During the Year 1889.*

Wards.	Permits.	Inspections.	Declines.	DISCOVERIES.	
				Number.	Amount.
First.....	588	134	34	41	\$656 00
Second.....	72	34	13	9	102 00
Third.....	46	23	10	11	131 50
Fourth.....	44	37	25	23	112 50
Fifth.....	84	60	31	21	496 00
Sixth.....	106	91	40	19	604 00
Seventh.....	100	32	20	15	274 00
Eighth.....	111	63	15	24	585 00
Ninth.....	88	56	19	16	676 00
Tenth.....	97	45	21	8	546 00
Eleventh.....	113	107	26	90	648 00
Twelfth.....	79	88	52	75	450 00
Thirteenth.....	89	62	25	59	222 00
Fourteenth.....	223	362	27	75	1,137 00
Fifteenth.....	603	164	51	81	1,550 50
Sixteenth.....	128	133	18	120	564 00
Seventeenth.....	97	96	19	116	2,825 00
Eighteenth.....	192	92	35	104	420 00
Nineteenth.....	611	226	71	187	1,868 00
Twentieth.....	411	238	60	380	840 00
Twenty-first.....	672	84	39	404	2,273 25
Twenty-second.....	727	111	35	120	472 00
Twenty-third.....	236	119	8	225	860 00
Twenty-fourth.....	1,465	412	65	813	1,495 50
Twenty-fifth.....	1,945	272	83	584	3,296 00
Twenty-sixth.....	1,756	167	38	319	2,889 50
Twenty-seventh.....	557	67	13	125	1,497 50
Twenty-eighth.....	4,439	211	65	641	3,149 00
Twenty-ninth.....	955	95	60	195	764 00
Thirtieth.....	223	99	29	87	1,196 00
Thirty-first.....	221	90	37	110	520 00
Total.....	17,078	3,870	1,084	5,100	\$33,120 25

STATEMENT OF PERMITS ISSUED DURING THE YEAR 1889, BY WARDS.

APPLIANCES.	WARDS.																															Total.				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
Aquaria.....	1														1																	1				3
Bakeries.....				3	2		1	2												1			1		2	1	3		6	3						25
Barber shops.....		1			2				1	1	2			1	2	3	3	2	5	5	2	3		1	4	1	2	5	9	1	3					59
Bars.....	1	2	1	2	2	4	2	3	6	5	5	5	4	3	2	2	1	2	2	5		3	1		1	2	3	5	1							75
Basins and sinks in dwellings.....	17	2	7	6		2	35	82	14	22	2	7	15	3	180	1	10		30	123	22	181	18	191	38	90	207	1026	190	6	1				2,528	
Basins and sinks in offices and stores.....		2	7	3	117	72		110	175	14	9	5	9	21	6	1	6	2	20	8	9	23	9	6	39	7	39	9	18				22		768	
Baths in dwellings.....	396	8	11	4	2	6	33	44	9	16	2	2	19	20	250	14	10	51	243	61	189	384	130	740	1143	1061	408	2571	347	66	60				8,300	
Baths in public buildings.....				4		5			5																			11	2						27	
Bidets.....								2	1													3		3					1							10
Bottling establishments.....				1							2	2	2	1			2	1	2	1						2		3	2		1					22
Building purposes (number).....	37	3	1	1		1	7	12	1	2	1		1	4	15		3	9	20	10	113	141	45	137	154	98	55	181	34	3	10					1,099
Carriages and wagons.....									8	30											1		17		16	1		6								79
Cut-offs.....	16	25	16	19	15	10	31	12	6	18	11	14	17	55	34	5	17	23	38	44	3	9	4	27	19	31	6	25			42	24				616
Half dwellings.....												10									2											3				15
Drug stores.....								1			1				2		1		3			1		2	3	2	2	2	3		1					24
Ferrules (number).....	526	42	29	34	32	32	60	41	22	37	24	22	28	77	234	23	43	93	233	91	221	568	234	724	1305	994	429	2180	477	163	109					9,127
Fountains (counter).....		2		1			1	1	2		1	3	1	2	1		1		4	1		3	1	2	4	3		6	4		1					45
Fountains (garden).....															1							1						1	2							5
Forges.....												3							5				6		2	2	3									21
Greenhouses.....	2						1													1		7	4	4	6	6	2		1							34
Hydrants (in new buildings).....	403	3	6	17	7	12	23	17	23	9	14	5	6	11	235	12	19	80	247	61	258	541	236	737	1362	1009	419	2523	342	56	85					8,778
Ice cream saloons.....												1								2								1								4
Lawn sprinklers.....																					1							1								2
Laundries.....							2		1				1	3	1	1				2	2		1		2		1		2	2		1				22
Machines for scouring washing, and bleaching.....											10	20	1		2					26	1					13			2			1	1			77
Milk-houses.....	1			1			1						1					1					1	2		2										10

STATEMENT OF PERMITS ISSUED DURING THE YEAR 1889, BY WARDS—Continued.

APPLIANCES.	WARDS.																															Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Motors (beer).....	1	4	2	2	3	6	2	2	1	3	5	4	4	2	1	2	2	6	7	4	3	4	1	2	6	4	1	3	8	2	3	100	
Motors (organ).....							3			2		1			1					1		4						3	1	1	17		
Photograph galleries.....									1				1										1								3		
Plug permits.....	10	36			1	1	5	1	1	1	2	1	1					1	2		5	4	1	5	5	1	6	20			160		
Pools in churches.....				1																				1			1		1		4		
Restaurants, eating and oyster saloons.....								1	4			1	2							4				1		1		1			15		
Screw nozzles.....	1			1			1	2	1		1		1	1	1			1	7	2	1	18	1	5	10	1	11	2	3		72		
Slaughter-houses.....																						1		1	1		1		1		5		
Stalls in stables.....	59	12		5						128	115		12		75	12	5	20	20	19	63	34	125	8	262	90	92	36	416	147	10	60	1,825
Steam boilers (number).....	1	2			12	13		7	16	3	13	7		5	5	5		6	18	6	5	7	6		27	3	6	3	6	1	7	188	
Steam boilers (horse-power).....	120	34			362	301		248	702	122	232	97		151	71	100		54	414	125	181	75	102		1005	143	113	149	149	15	195	5,200	
Steam engines (number).....	1	1			3	1		6	3		4				1	1			3	4		3		4	2	1	2	1	3	1	3	48	
Steam engines (horse-power).....	4	2			9	7		30	23		47				2	62			35	20		36		20	3	1	3	6	25	3	10	348	
Street sprinklers.....																																	105
Shower baths (public).....								3	2																				2	3		10	
Tubs, vats, and tanks.....					2						29	34				15		2	11				6		71			14				184	
Urinals in dwellings.....															1	1					1		1					1				5	
Urinals in stores, offices, factories, and hotels.....			1		51	18		19	78	3		4	4	1		1	5		6	19	3	8	3	2	11	9			20		2	268	
Urinal troughs.....					1																					2	1		1				5
Wash-paves.....	94	3	4	4	3	3	15	16	13	4	1	2	8	5	199	13	12	24	276	55	27	127	24	411	350	249	113	2026	193	21	26	4,321	
Wash-paves for watering horses.....	2	1		1	1		2				4	1	1		1		1	3	1		4	4		5	2	2	2	1			4	43	
Wash-tubs (stationary).....			3		4	3	29	63	21	12		2	3	5	35	2		5	2	17	3	122		46	3	32	150	100	47	3		712	
Water-closets in dwellings.....	226	40	17	24	38	20	66	83	25	88	33	26	58	134	498	81	64	48	470	315	83	526	31	1289	779	586	391	3642	659	39	8	10,392	
Water-closets in stores, offices, and factories.....	6	4	6	2	93	71	2	78	133	86	9	8	14	22	4	5	5	3	9	15	7	14	4	5	75	9	38	129	80		76	957	
Watering vessels.....	8	71										14																					93
Washing cars.....																									32								32

STATEMENT BY WARDS OF THE NUMBER AND KIND OF PREMISES AND APPLIANCES ON THE GENERAL BOOKS OF THE BUREAU OF WATER, JANUARY, 1890.

APPLIANCES.	WARDS.																															Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Machinery for washing, scouring, etc.....		2	1	1	3			6	1	4	18	20	4		4	8	12	10	114	7	6	10	22		88	13	2	2		1	54	413	
Malt houses.....				1		1					2	1			2	3	1	1	3	2		1	1	1		1			6	1	28		
Milk houses.....	22	3	3	2	22	8	10	4	5	2	1	2	2	2	3	2	1	4	8	4			4	7	12	3	4	4	2	4	150		
Motors, beer.....	7	7	7	10	21	28	19	16	15	10	16	22	21	9	19	9	11	15	34	18	3	18	8	20	13	15	4	20	40	33	14	502	
Motors, organ.....				1			4	7	3	4		2		1	3	2			2	4	3	18		8		1	11	5	5	3	87		
Photograph galleries.....	2	3		3	5	4	2	15	16	6	6	1	6	2	6	1	4	3	7	6	1	3	2	2	3	1	3	3	3		5	105	
Pools in churches.....		2	1	2	3	2	2	1	1	3			1	2	3	1				4	3	2	2	6	2	1	4	4	7		3	62	
Premises with water.....	10426	4466	2652	2417	2311	2676	4628	2321	2244	3221	1182	1630	2973	3288	8441	1847	1727	4807	10401	8051	8246	4014	2788	10810	11250	11776	4118	13748	10541	5427	6481	170,911	
Premises without water.....	72	758	251	399	495	279	504	307	142	401	830	513	347	758	642	1015	1273	936	501	349	689	183	925	542	845	128	213	364	139	220	306	15,336	
Rectifying establishments.....				1		1														1					1							4	
Restaurant, eating and oyster.....	14	7	6	9	27	72	12	33	65	16	23	11	26	18	14	10	15	21	24	33	9	6	3	15	12	12	7	13	7	8	13	561	
Screw nozzles.....	128	51	49	48	173	211	119	204	138	149	119	101	129	84	306	122	126	209	221	267	203	254	106	393	114	64	218	245	279	88	154	5,072	
Shot towers.....		1																															1
Slaughter houses.....	21										3	1	5	5	4	2	8	6	14	12	8	6	5	22	19	4	2	4	5	1	2	159	
Soap boiling establishments.....	2		1								5		1		1	1		2	2	1												1	17
Stand-pipes for watering engines.....									1		2		1		1									2	2		1			2		12	
Stalls in stables.....	1656	769	168	425	132	320	823	896	989	1121	667	468	628	998	2418	590	585	1668	1848	1881	839	1615	747	2190	1327	1306	1059	1935	2129	759	1758	33,818	
Stalls in markets.....			144		80	327	213		1076		324	440	34	206	388		104		268	175	71		293	76	223	60		1071	169	85	5,818		
Stalls, country.....			35	114	117	27	10	32	89	32	213	127		146	119	45		131	347	188	45	140	219	69	97		86	206		18	2,652		
Stalls, fish.....			1		17	3	1		6		3	2		3	1	1	1	2	5				3	1	1	1		13	2		67		
Steam boilers, number.....	75	50	13	13	28	290	221	100	162	77	42	41	33	49	175	110	63	71	225	70	90	81	72	49	188	67	51	47	77	29	131	2,790	
Steam boilers, horse-power.....	2099	1321	257	472	2471	4655	930	1962	4238	1525	1435	891	970	1311	5240	2527	2147	1876	6409	1549	3518	1563	2586	924	5887	1958	779	834	2581	821	3548	69,284	
Steam boilers, heating, number.....	1			5	38	39	8	22	38	8			4		17	3			7	4	5	14	9	11	4	5	8	5	7	3		265	
Steam boilers, heating, horse-power.....	8			18	372	342	264	255	245	231				12					158													1,905	
Steam engines, number.....	57	21	10	6	64	164	5	86	105	33	32	22	6	32	47	37	30	28	95	79	6	63	34	43	38	29	25	4	34	26	54	1,315	
Steam engines, horse-power.....	808	387	185	55	415	1484	140	1057	2501	534	277	385	38	500	736	728	394	375	1823	715	262	620	323	370	461	419	195	244	640	218	422	17,711	
Steam saws, number.....								4		2										2							9		2			19	
Swimming-baths.....								2	1																	1	1		2			7	
Tubs, tanks and vats.....	20	18	4	14	90	72	15	13	55	26	143	452	6	114	182	382	22	76	45	78	74	83	37	183	29	6	72	12	32	188	2,543		
Turbine wheels.....									1											2					2							5	
Urinals in dwellings.....	35	12	7	6	8	2	11	78	14	31	2	2	34	8	26	4	6	24	16	18	2	30	10	9	9	9	17	24	28	1	1	484	
Urinals in offices, stores, factories.....	10	9	7	13	673	702	20	397	621	107	23	40	63	81	101	21	25	84	62	75	27	75	18	87	59	33	51	34	119	28	27	3,692	
Urinal troughs.....	6	2	3	1	5	4	3	4	3	4	3	2		3				7	8	2	2		9	5	4	4	4	8	7	3	1	107	
Vats, lime.....											198														10			9				419	
Vats, tan.....											17	11					58	48		88					10							232	
Vinegar establishments.....											1							1		1												3	
Wash pave.....	1717	644	477	259	580	385	1415	1662	887	1453	216	635	1331	1506	4518	492	450	936	4128	4712	478	1698	593	3851	2519	2313	1957	5544	6460	1683	1430	56,931	
Wash paves for watering horses.....	23	9	10	6	10	2	6	7		4	6	3	3	3	9	9	11	15	17	17	8	12	6	42	44	8	10	11	11	10	343		
Wash-tubs.....	35	13	27	9	54	19	735	1704	471	545		14	260	150	1186	401	84	23	63	612	62	1179	19	851	26	104	1258	1218	1143	100	16	12,391	
Water-closets in dwellings.....	860	280	257	232	458	414	2296	3618	1146	2346	206	820	1390	2006	7759	416	355	336	3577	4836	348	3986	204	3362	2883	2032	4192	14290	7824	766	651	74,148	
Water-closets in offices, stores, factories, etc.....	32	86	62	50	2293	8537	114	1705	2489	874	276	195	127	373	712	193	196	209	545	249	95	340	63	390	238	99	329	269	652	153	197	17,092	
Wool washers.....				4			1												3	6		3		2	5	9	1		1		5	40	

APPENDIX A.

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1889.*

January 3.....	Henry Snyder.....	Rent at Fairmount.....	\$600 00
10.....	William H. Achuff.....	Repairing pipe.....	27 15
14.....	Jos. Ladley.....	Stone.....	67 60
15.....	Quaker City Croquet Club....	Rent at 22d and Brown streets	10 00
18.....	Delaware Avenue Market.....	Repairing pipe.....	17 00
February 5.....	Thomas Carter.....	Fire connection.....	72 04
9.....	D. McMahon.....	Repairing pipe.....	28 99
18.....	Methodist Episcopal Hospital	Supply connection.....	54 95
23.....	C. Eneu Johnson Co.....	Fire connection.....	45 46
March 18.....	Pennsylvania Railroad Co....	Fire connection.....	84 32
18.....	Warrant No. 58.....	Overdrawn.....	1 10
21.....	Comm'r's of Fairmount Park	Repairing pipe.....	14 75
22.....	St. Luke's P. E. Church.....	Motor connection.....	70 83
22.....	Warrant No. 589.....	Overdrawn.....	45
28.....	Blind Asylum.....	Repairing pipe.....	5 96
April 4.....	Gilbert & Bacon.....	Motor connection.....	41 77
6.....	Holy Trinity Church.....	Renewing stop.....	7 67
11.....	William Burns.....	Stone.....	20 00
15.....	U. S. Appraisers Stores.....	Removing stop-box.....	7 52
20.....	Citizens Passenger R.W. Co..	Fire connection.....	84 73
29.....	W. C. Allison.....	Repairing pipe.....	4 47
May 13.....	Martin Burke.....	Old material.....	997 50
14.....	Thomas A. Allison.....	Stone.....	20 00
15.....	Purvis & Son.....	Old material.....	206 25
17.....	University of Pennsylvania..	Fire connection.....	106 59
24.....	People's Passenger R.W. Co..	Moving stops.....	76 27
28.....	Bussenious & Cunliff.....	Old material.....	225 80
31.....	Ehret & Co.....	Fire connection.....	49 07
31.....	South Broad Street Theatre..	Repairing leak.....	2 44

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1889—(Continued).*

June 5.....	Charles A. Porter.....	Repairing pipe.....	41 48
6.....	John T. Harris.....	Rent at Cambria basin.....	100 00
10.....	J. W. Harris.....	Rent at Cambria basin.....	100 00
17.....	Croft & Allen.....	Fire connection.....	72 04
18.....	Martin Burke.....	Oid material.....	1,100 00
June 18.....	Blessing & Co.....	Fire connection.....	\$64 52
22.....	P. & R. R.R. Co.....	Relaying pipe.....	591 33
22.....	Wm. Johnson.....	Motor connection.....	66 63
24.....	Barbara Goodwin.....	Rent at Cambria basin.....	100 00
26.....	S. C. Buchanan.....	Old material.....	19 00
July 2.....	William Root.....	Rent at Cambria basin.....	50 00
5.....	Charles A. Porter.....	Lowering pipe.....	32 28
11.....	Henry Snyder.....	Rent at Fairmount.....	600 00
12.....	George V. Cresson.....	Fire connection.....	54 59
24.....	Philadelphia Traction Co.....	Altering stops.....	25 86
24.....	U. S. Express Co.....	Supplying connection.....	63 37
25.....	Martin Burke.....	Old material.....	3,500 00
August 3.....	Baugh, Son & Co.....	Fire connection.....	39 05
6.....	Charles A. Porter.....	Lowering pipe.....	15 56
6.....	Charles A. Porter.....	Altering pipe.....	33 08
13.....	U. S. Electric Light Co.....	Supply connection.....	65 70
16.....	Bussenious & Cunliff.....	Old material.....	563 94
19.....	J. Williams.....	Stone.....	10 00
September 4.....	Delaware Ave. Sugar House..	Supply connection.....	53 14
11.....	Penna. Hospital for Insane..	Supply connection.....	109 50
18.....	John & James Dobson.....	Fire connectioz.....	58 07
30.....	C. W. Wright.....	Stone.....	4 00
October 3.....	John T. Harris.....	Rent at Cambria basin.....	100 00
4.....	Charles J. Field.....	Setting fire hydrant.....	31 00
18.....	William Carter.....	Stone.....	3 00
18.....	John Swazer.....	Stone.....	4 00
18.....	Samuel Wood.....	Fire connection.....	61 08
29.....	H. C. Eyre.....	Repairing pipe.....	15 67
29.....	H. C. Eyre.....	Repairing pipe.....	22 29

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1889—(Continued.)*

November 4.....	Am. Long Distance T.&T.Co.	Shifting pipe.....	30 68
6.....	W. P. Ogelsby.....	Repairing pipe.....	7 65
9.....	Pennsylvania Railroad Co....	Fire connection.....	94 79
9.....	Pennsylvania Railroad Co....	Fire connection.....	64 66
12.....	Claus Spreckles.....	Supply connection.....	72 20
18.....	H. L. Hagner.....	Repairing pipe.....	89 29
21.....	John F. Betz & Son.....	Supply connection.....	7 00
30.....	Pennsylvania Railroad Co....	Fire connection.....	67 69
December 7.....	Charles A. Porter.....	Relaying pipe.....	49 89
7.....	Charles A. Porter.....	Altering pipe.....	29 04
19.....	John W. Harris.....	Rent at Cambria basin.....	100 00
21.....	William Root.....	Rent at Cambria basin.....	50 00
23.....	Jos. Ladley.....	Stone.....	60 00
		Total.....	\$11,363 70

APPENDIX B.

REPORT OF CHIEF CLERK.

BUREAU OF WATER.

Philadelphia, February 8, 1890.

MR. JOHN L. OGDEN,

Chief of Bureau of Water.

SIR:—I have the honor to submit herewith a detailed statement of the expenditures of the Bureau for the year 1889.

Respectfully,

J. T. HICKMAN,

Chief Clerk.

Detailed Expenditures of the Bureau for 1889.

General Appropriation.	Amount appropria'd.	Amount expended.	Amount merging.	Amount not merging
An Ordinance to make an appropriation to the Bureau of Water, for the year 1889, approved December 24, 1888.....	\$1,238,064 67			
Balance from books of 1888.....	18,562 61			
Increased by transfer.....	77,307 15			
	\$1,383,934 43			
Diminished by transfer to Bureau of Highways.....	2,500 00			
Net appropriation.....	\$1,381,434 43			
Item 1. Salaries.....	\$179,064 67			
Diminished by transfer to Bureau of Highways.....	\$2,500			
Bureau of Water, Item 7.....	2,500			
Bureau of Water.....	1,100			
	6,100 00			
Net appropriation to Item 1.....	172,964 67			
Salary of Chief of Bureau.....	6,166 67	6,166 67		
General superintendent.....	3,500 00	3,500 00		
Assistant engineers.....	3,200 00	3,200 00		
Draftsmen.....	4,000 00	3,759 68		
Chief clerk.....	2,000 00	2,000 00		
Assistant clerks.....	1,980 00	1,980 00		
Janitor at main office.....	675 00	675 00		
Watchman, main office.....	675 00	675 00		
Lineman.....	720 00	720 00		
Telephone operators.....	960 00	960 00		
Foreman laborers.....	840 00	840 00		
Watchmen, reservoirs and district yards.....	15,525 00	14,585 86		
Policemen (\$40 each for uniforms).....	2,860 00	2,860 00		
River watchman.....	750 00	750 00		
General storekeeper.....	900 00	900 00		
Correspondence clerk.....	900 00	900 00		
Clerks to general superind't.....	1,750 00	1,750 00		
Search clerk.....	1,100 00	1,100 00		
Assistant clerks.....	1,750 00	1,728 23		
Time clerk.....	900 00	900 00		
Messenger.....	650 00	650 00		
Pipe inspector.....	1,200 00	1,200 00		
Purveyors.....	9,000 00	9,000 00		
Clerk to purveyors.....	4,320 00	4,320 00		
General foreman.....	6,573 00	6,573 00		
Foreman repairs.....	3,120 00	3,120 00		
Superintendent of shop.....	1,500 00	1,500 00		
Clerk to superint'd of shop.....	900 00	900 00		
Permit clerk.....	1,080 00	1,080 00		
Assistant permit clerk.....	1,000 00	1,000 00		
Chief inspector.....	1,100 00	1,100 00		
Inspectors.....	17,100 00	17,056 63		
Foreman bricklayers.....	1,000 00	1,000 00		
Foreman carpenters.....	900 00	900 00		
Foreman painters.....	900 00	900 00		
Foreman riggers.....	900 00	900 00		
Foreman stonemasons.....	900 00	900 00		
Electrician.....	900 00	900 00		
Janitors.....	3,600 00	3,523 61		

Detailed Expenditures of the Bureau for 1889.

Item No. 1, continued.	General Appropriation						Amount expended.	Amount merging.	Amount not merging.
	Engineers.	Oilers.	Firemen.	Storekeeper.	Telephone operators.	Coal passers.			
SALARIES OF EMPLOYEES AT PUMPING STATIONS.									
Fairmount.....	2	4	.....	1	.....	.....	\$5,433 15		
Spring Garden.....	4	10	20	1	1	6	32,910 00	27,235 21	
Belmont.....	2	2	4	1	.....	4	10,800 00	9,963 36	
Roxborough.....	2	2	4	.....	.....	4	9,120 00	8,710 17	
Mt. Airy.....	2	.....	.....	.....	.....	2	2,970 00	2,970 00	
Chestnut Hill.....	1	1	.....	.....	.....	.....	1,500 00	1,500 00	
Frankford.....	2	2	4	.....	.....	2	8,000 00	7,697 08	
Kensington.....	.....	2	2	.....	.....	.....	3,120 00	3,052 50	
Total.....							\$172,775 15	\$880 52	

Detailed Expenditures of the Bureau for 1889.

General appropriation	Amount appropria'd.	Amount expended.	Amount merging.	Amount not merging
Item 2. Regular supplies, including fuel, oil, and small stores.....	\$145,000 00			
Increased by transfer from				
Item 1, Bureau of Water.....	\$1,100 00			
Item 6, Bureau of Water.....	800 00			
Item 8, Bureau of Water.....	1,500 00			
Item 9, Bureau of Water.....	4,800 00			
	8,200 00			
	\$153,200 00			
Diminished by transfer to Item 5, Bureau of Water.....	3,000 00			
Net appropriation to Item 2		\$150,200 00		
Deficiencies of 1888:				
Gasoline.....	\$31 20			
Coal at stations.....	3,707 76			
			\$3,738 96	
COAL AT OFFICES AND DISTRICTS.				
7 tons stove, at \$5.18.....	\$36 26			
5 tons stove, at \$5.23.....	36 15			
7 tons stove, at \$5.20.....	36 40			
16 tons stove, at \$5.75.....	92 00			
8 tons stove, at \$5.95.....	47 60			
9 tons stove, at \$6.40.....	57 60			
51.15 tons nut, at \$4.92.....	254 72			
			550 73	
COAL AT PUMPING STATIONS.				
Roxborough:				
1,243.10 tons pea, at \$2.85.....	\$3,552 53			
Spring Garden:				
3,190.11 tons pea, at \$2.85.....	9,093 07			
			12,645 60	
Fairmount:				
178 tons egg, at \$4.26.....	758 28			
Chestnut Hill.				
958.03 tons pea, at \$2.70.....	2,587 06			
Kensington:				
1,688.02 tons pea, at \$2.27.....	3,831 99			
Frankford:				
2,627.01 tons pea, at \$2.32.....	6,094 76			
Belmont:				
9,499.11 tons pea, at \$2.33.....	22,133 96			
Roxborough:				
10,070.12 tons pea, at \$2.35.....	23,665 92			
Spring Garden:				
27,984.01 tons pea, at \$2.35.....	67,407 63			
			126,479 60	
Coke.....			390 10	
Hauling coal, Roxborough to				
Auxiliary, 15 tons 1,120 lbs., at 50 cts per ton.....	\$7 75			
64 tons, at 48 cts per ton.....	30 72			
			38 47	
Hauling coal, Chestnut Hill				
to Mt. Airy, 64 tons 740 lbs., at 50 cts. per ton.....	\$32 16			
520.12 tons, at 43 cts per ton.....	223 77			
			255 93	

Detailed Expenditures of the Bureau for 1889.

General appropriation.	Amount appropria'd	Amount expended.	Amount merging.	Amount not merging
OIL.				
444 gals. black, at 8¼ cts.....	\$36 66			
153 gals. castor, at \$1.05.....	160 65			
4,248½ gals. cylinder, at 45 cts. 1,911 83				
1,594 gals. engine, at 35 cts.....	557 90			
2,659½ gals. gasoline, at 14 cts. 372 33				
299½ lbs. grease, at 11 cts.....	32 95			
2,042½ gals. headlight, at 10 c. 204 25				
1,448½ gals. lard, at 68 cts.....	984 98			
		4,261 55		
1,032 lbs tallow, at 7½ cts.....		77 40		
Wood.				
2 cords, at \$8.50.....	\$17 00			
11 cords, at \$8.00.....	88 00			
		105 00		
Total.....		\$148,543 34	\$1,656 66	
Item 3. Repairs to machinery, including the conveyance of workmen incident thereto.....	\$50,000 00			
Deficiencies of 1888:				
Machine work.....	\$11 87			
Steel and wire.....	98 54			
		\$110 41		
Anti-incrustation solution.....		1,000 00		
Brass fittings.....		858 51		
Chandlery.....		94 00		
Corporation cocks, 1504 (¾"), at 57 c.....		857 28		
Freight.....		9 35		
Firebrick.....		14 28		
Grate bars.....		215 83		
Gum goods.....		2,193 24		
Hardware.....		500 00		
Hauling.....		300 00		
Iron castings, 44,444 lbs., at 2¼ cts.....		1,000 00		
Iron fittings.....		1,500 00		
Lumber.....		468 15		
Machine work.....		455 00		
Packing.....		318 29		
Repairs to boilers:				
Chestnut Hill.....	\$181 39			
Fairmount.....	219 54			
Roxborough.....	1,017 85			
Spring Garden.....	1,061 55			
Belmont.....	1,500 80			
		3,981 04		
Repairs to Engines:				
Roxborough.....	\$294 00			
Belmont.....	309 98			
Mt. Airy.....	785 00			
		1,388 98		
Repairs to hoist.....		2 90		
Repairs to pipe covering:				
Spring Garden.....	\$44 10			
Belmont.....	344 53			
Roxborough.....	416 77			
		805 40		
Transportation.....		635 00		
Tube cleaner.....		38 00		
Water meters.....		906 00		

Detailed Expenditures of the Bureau for 1889.

General Appropriation.	Amount appropri'd.	Amount expended.	Amount merging.	Amount not merging
Item 3, continued.				
Wages:				
Blacksmith.....	78 00			
Stone masons.....	978 25			
Painters.....	1,599 00			
Carpenters.....	3,510 00			
Laborers.....	3,995 96			
Bricklayers.....	8,179 12			
Machinists.....	13,940 03			
		\$32,280 36		
Totals.....		\$49,932 02	\$67 98	
Item 4. Maintenance and repairs to buildings, grounds, and reservoirs..	\$50,000 00			
Deficiencies of 1888:				
Electric supplies.....	\$11 80			
Hardware.....	5 50			
Horse shoeing.....	22 60			
		\$39 90		
Brass fittings.....		247 10		
Bricks, lime, and cement.....		2,683 25		
Chandlery.....		2,544 11		
Cleaning cess-pools.....		45 50		
Coping stone.....		347 53		
Electric supplies.....		222 19		
Forage.....		789 45		
Gas fixtures.....		20 90		
Grease.....		3 00		
Gum goods.....		1,193 77		
Hardware.....		1,564 89		
Hauling.....		3 65		
Hauling ashes, Frankford.....	\$45 00			
" Kensington.....	204 00			
" Roxborough.....	419 88			
		668 88		
Hauling coal, Chestnut Hill to Mt. Airy, 91 tons at 43 cents.....		39 15		
Horse shoeing.....		88 70		
Leather belting.....		24 70		
Lumber.....		3,500 00		
Oil filters.....		150 00		
Paints.....		1,440 05		
Professional services, V. S.....		14 50		
Repairs to electric plant.....	\$111 00			
" gas machine.....	5 08			
" harness.....	61 35			
" roofs.....	1,037 70			
" wagons.....	66 53			
		1,281 66		
Scale.....		105 75		
Settees.....		178 88		
Wages, blacksmith.....	\$39 00			
" horses, carts, and " drivers.....	193 50			
" bricklayers.....	219 60			
" extra coal passers.....	381 72			
" machinists.....	508 38			
" stone masons.....	1,038 50			
" helpers.....	4,580 16			
" carpenters.....	5,387 50			
" painters.....	6,100 00			
" laborers.....	14,263 78			
		32,712 64		
Totals.....		\$49,910 15	\$89 85	

Detailed Expenditures of the Bureau for 1889.

General Appropriation.	Amount appropriated.	Amount expended.	Amount merging.	Amount not merging.
Item 5.—Maintenance and improvement to the distribution, including purchase of material and cost of labor connected therewith, and expenses incident thereto... \$175,000 00				
Increase'd by transfers from Bureau of Highways, \$3,500 00				
Increase'd by transfers from Bureau of Water, Item 2, 3,000 00				
Increase'd by transfers from Bureau of Water, Item 10 1,400 00				
Increase'd by transfers from other bureaus 16,400 00				
<u>24,300 00</u>				
Net appropriation to Item 5.....	\$199,300 00			
Deficiencies of 1888:				
Coke..... \$25 80				
Hauling..... 24 99				
Measuring over pipe..... 379 92				
Repairs to tools 44 62				
.....		\$475 33		
Brass fittings.....		425 13		
Chandlery.....		1,100 00		
Coke.....		21 40		
Corporation cocks:				
8,946— $\frac{1}{2}$ -inch, at 57c..... \$5,099 22				
500— $\frac{1}{2}$ -inch, at 62c..... 310 00				
400— $\frac{3}{4}$ -inch, at 80c..... 320 00				
200—1-inch, at \$1.15..... 230 00				
100—1 $\frac{1}{2}$ -inch, at \$2.75..... 275 00				
50—2-inch, at \$4.25..... 212 50				
.....		6,446 72		
Dynamite.....		84 50		
Drain pipe.....		9 00		
Gum goods.....		999 17		
Hardware.....		812 06		
Hauling pipe.....		5,053 80		
Iron fittings.....		1,054 16		
Iron pipe:				
8,721 lengths 6-in., 3,183,910 lbs., at 1.17 $\frac{1}{2}$ \$36,264 75				
50 lengths 8-in., 24,297 lbs., at 1.17 $\frac{1}{2}$ 276 49				
72 lengths 10-in., 47,085 lbs., at 1.17 $\frac{1}{2}$ 529 24				
917 lengths 12-in., 839,827 lbs., at 1.17 $\frac{1}{2}$ 9,431 26				
75 lengths 36-in., 381,511 lbs., at 1.17 $\frac{1}{2}$ 4,177 52				
44 lengths 48-in., 323,004 lbs., at 1.17 $\frac{1}{2}$ 3,520 74				
.....		54,200 00		
Iron specials:				
16,754 lbs., at 17 $\frac{1}{2}$ \$314 14				
80,001 lbs., at 1 $\frac{1}{2}$ 1,520 02				
319,975 lbs., at 2 $\frac{1}{2}$ 7,089 44				
74,905 lbs., breeches pipe, at 3.48..... 2,696 59				
Drilling and facing..... 429 81				
.....		12,000 00		

Detailed Expenditures of the Bureau for the year 1889.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 6. Continued.				
Coal.....		\$108 00		
96½ tons bit., at \$3.30.....	\$230 34			
26½ tons nut, at \$4.92.....	1,800 00			
Gum goods.....		1,530 34		
Hardware.....		641 80		
Iron castings:		3,784 72		
151,794 lbs. at 1⅞c.....	\$2,504 59			
2,735 lbs. at 1⅞c.....	51 28			
170,144 lbs. at 1⅞c.....	3,232 77			
555,711 lbs. at 2¼c.....	12,503 50			
Extra work.....	48 64			
		18,340 78		
Iron and steel.....		2,496 85		
Lead coating, 3,334 lbs. at 4c.....		333 36		
Leather belting.....		99 07		
Lumber.....		2,000 00		
Machine work.....		5 00		
Non-shrinking metal, 1,948 lbs. at 28c.....		545 44		
Packing.....		5 69		
Paints.....		14 13		
Plug valves:				
200 at \$2.25.....	\$450 00			
700 at \$5.....	3,500 00			
		3,950 00		
Repairs to roof.....		36 00		
Roof (new tin at shop) 15,920½ s. y. at 7¼c.....		1,233 85		
Special pipe castings:				
106,453 lbs. at 2⅞c.....	\$2,341 97			
29,415 lbs. B. P. at 3⅞c.....	1,058 94			
Extra work.....	266 40			
		3,667 31		
Tallow, 100 lbs at 7¼c.....		7 50		
Tube cleaner.....		38 00		
Wages.....		28,558 98		
Total.....		\$73,875 39	\$324 61	
Item 7.—General and incidental and contingent expenses, including \$1,200 for keep of horse for Chief of Bureau, General Superintendent and assistants..... \$14,000 00				
Increased by appro- priation.....	\$244 65			
Transferred from Item 2.....	2,500 00			
	2,744 65			
Net appropriation to Item 7.....	\$10,744 65			
Stationery.....		* \$16 24		
Advertising.....		277 50		
Carriage hire.....		132 50		
Carpet.....		99 00		
Desks and chairs.....		305 50		
Dinners. Water Committee.....		347 75		
Electric supplies.....		332 23		
Ground rent, 918 Cherry street.....		26 66		
Ice.....		285 21		

*Deficiencies of 1888.

Detailed Expenditures of the Bureau for 1888.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Incidentals, hydrographic.....	\$220 47			
" office.....	223 13			
		\$443 60		
Iron safe.....		631 00		
Keep of horse.....		1,200 00		
Maps.....		384 00		
Papers (daily).....		29 66		
Plants.....		55 00		
Pressure gauge.....		75 00		
Repairs to instruments.....		103 75		
Rent of shop, Fifth District.....		50 00		
Stationery, etc.....		4,946 72		
Subscriptions.....		34 00		
Telephone rental, etc.....		1,265 75		
Transportation.....		179 70		
Type writer, etc.....		100 50		
Washing towels.....		84 00		
Wages, contingent.....	\$3,506 00			
Wages, hydrographic.....	1,564 00			
		5,070 00		
Total.....		\$16,475 27	\$269 38	
Item 8—Extensions.....	\$600,000 00			
Balance from books, 1888.....	3,647 60			
	\$603,647 60			
Diminished by trans- fer to Item 2, Bu- reau of Water.....	\$1,500			
To Item 10, Bureau of Water.....	25,000			
	26,500 00			
Net appropriation to Item 8.....	\$577,147 60			
Deficiencies of 1888:				
Iron pipe.....	\$531 14			
Supporting tracks.....	310 44			
		841 58		
Asphalt paving, 12,755 s. y. at \$2.....		25,510 00		
Bricks, lime and cement.....		1,973 57		
Donkey pump.....		1,016 00		
Dynamite.....		170 90		
Electric supplies.....		192 47		
Excavating pipe trench.....		281 58		
Granolithic pavement.....		870 95		
Hauling pipe.....		2,200 00		
Hardware.....		24 95		
Horses, carts and drivers.....		2,646 95		
Incidentals, hydrographic.....		46 89		
Iron pipe:				
609, 6-in., 243,993				
lbs., at .01 ³³ / ₁₀₀	\$2,779 09			
Less penalty.....	71 31			
	\$2,707 78			
900, 6-in., 328,399 lbs., at				
\$26 per ton.....	3,811 75			
100, 10-in., 176,349 lbs., at				
.01 ⁷⁵ / ₁₀₀ per lb.....	2,169 10			
600, 30-in., 1,967,371 lbs., at				
.01 ³³ / ₁₀₀ per lb.....	23,411 74			
600, 30-in., 2,130,540 lbs., at				
.01 ³³ / ₁₀₀ per lb.....	26,525 21			
16, 48-in., 116,481 lbs., at				
.01 ³³ / ₁₀₀ per lb.....	1,269 64			
		59,895 22		

Detailed Expenditures of the Bureau for the Year 1889.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Iron railing.....		290 00		
Iron specials:				
53,913 lbs., at .02½.....	\$1,213 05			
67,650 " at .02½.....	1,488 30			
		2,701 35		
Lead (pig), 197,624 lbs., at .037000.....		7,736 98		
Lining basin, western section East Park Reservoir, 29,528 s. y. brick, at \$1.73½.....	\$51,404 58			
180,554 s. y. concrete, at \$1.73½.....	313,261 19			
		364,665 77		
Lumber.....		2,000 00		
New boilers.....		10,125 33		
Powder (blasting).....		42 50		
Repairs to tools.....		5 31		
Siding (use of).....		9 00		
Supporting tracks.....		548 66		
Stone building.....	\$337 50			
Stone coping.....	69 19			
Stone flag.....	208 00			
		614 69		
Testing steel.....		106 00		
Tools for shops.....		4,418 00		
Towing.....		15 00		
Traveling expenses.....		181 91		
Wharfage.....		44 23		
Wages:				
Buildings, grounds, and reservoirs \$208 74				
Excavating pipe trench... 3,966 90				
Fourth District..... 32,363 09				
Fifth District..... 5,259 62				
Sixth District..... 9,144 27				
East Park Reservoir..... 26,216 22				
		77,158 84		
		\$566,334 63	1,953 30	\$8,859 67
Item 9—To refund to Trustees of West Philadelphia Friends' Meeting, paid for water-pipe in front of their place of worship, north side of Powelton avenue, west of Forty-second street, appropriation March 27, 1889.....	\$162 50	162 50		
Item 9—To a new item to be called Item 9, Bureau of Water, for the laying of a 48-inch main, from East Park Reservoir to the Kensington Basin.				
Transferred from Item 7, Bureau of Gas.....	\$35,000 00			
Transferred from Item 4, Bureau of Street Cleaning	2,000 00			
Transferred from Item 34, Bureau of Surveys.....	20,000 00			
Transferred from Item 8, Bureau of Water.....	25,000 00			
	\$82,000 00			
Diminished by transfer to Item 2, Bureau of Water.	6,200 00			
Net appropriation to Item 9.....	75,800 00			
Hauling.....		3,740 82		

Detailed Expenditures of the Bureau for 1889.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Lead (pig) 225,000 lbs. at 4.4%.....		10,395 25		
Iron pipe, 149 36-in., 693,009 lbs. at 1.2%.....		8,524 01		
Iron specials, 84,872 lbs., at 2%.....		1,680 47		
Testing iron.....		5 00		
Traveling expenses.....		63 38		
		\$24,408 93	2,271 54	49,119 53
For the extension of Works, appropriated from Gas Loan No. 9, May 18, 1886.				
Balance January 1, 1889.....	\$13,800 00			
Transferred to Item 8, appropriation for 1889.....	2,500 00			
Net balance.....		11,300 00		
Pumping engine.....	\$13,800 00			
Less penalty.....	2,500 00			
		11,300 00		
For the extension of Works, appropriated Dec. 31, 1887, to Item 8, appropriation for 1888.				
Balance January 1, 1889.....	\$4,762 61			
Transferred to Item 8, appropriation for 1889.....	1,147 60			
Net balance.....		3,615 01		
Coping stone.....			994 01	
Stack, Roxborough Station.....			2,621 00	
		\$3,615 01		

RECAPITULATION.				
Balance from books of 1888.....		\$18,562 61		
Transferred from other bureaus.....	\$77,307 15			
Transferred to other bureaus.....	2,500 00			
		74,807 15		
Annual appropriation.....		\$1,288,064 67	\$1,381,434 43	
Expended from annual appropriation:				
Refunds.....	162 50			
Deficiencies.....	5,312 42			
Extensions.....	590,743 56			
Maintenance.....	703,372 61			
		1,399,591 09		
Expended from balance for extensions.....		14,915 01		
Total expenditure.....		1,314,506 10		
Amount merging.....	8,949 13			
Amount not merging.....	57,979 20			
		66,928 33		
			1,381,434 43	

APPENDIX C.

REPORT

OF THE

GENERAL SUPERINTENDENT

OF

WORK DONE DURING 1889 TO BUILDINGS, GROUNDS AND
RESERVOIRS, AND BOILERS AND MACHINERY OF
THE SEVERAL PUMPING STATIONS.

OFFICE OF THE GENERAL SUPERINTENDENT,

BUREAU OF WATER.

January, 20, 1890.

JOHN L. OGDEN,
Chief.

SIR:—The following report of work performed under my
direction for the year 1889 is herewith submitted.

Respectfully,

F. L. HAND,

General Superintendent.

FAIRMOUNT.

BUILDINGS, GROUNDS, AND RESERVOIRS.

The mansion house was cleaned, the old paint burned off,
and painted inside and out with two coats of paint; the re-
tiring rooms and refreshment saloon painted and grained; the
columns of the colonnade were all burned off, repainted and

sanded and the entire rail painted and sanded. The flag pavements in Nos. 7, 8 and 9 wheel house were reset; new cement pavement laid around No. 1 pump; the old wood platforms over the flumes Nos. 3, 4 and 5 turbines torn up and cement floor laid.

The flash boards on the dam had to be replaced a number of times, owing to the heavy rains during the year. The summer houses, watch boxes and stop houses were kept in repair; a new iron fence was placed on the coping of the retaining wall of the basin, extending from the Green street entrance at Twenty-fifth street to the bridge entrance on Spring Garden street; the walks and drives on and around the basin were graded with gravel and rolled; 140 young trees were planted on the middle terrace around the bank; the banks were kept mowed and the inside slopes cleaned; the walks in the garden and the bottom of the basin of the fountain relaid with brick pavement; 36 new benches placed around the garden and the wheel houses whitewashed.

REPAIRS TO MACHINERY.

Turbine No. 1.—One-half of wheel gate renewed with one-half inch boiler iron, and the other half repaired; head gate repaired; new keys in spur and fly wheels; valves in pump repaired; flume and screens in pump repaired.

Turbine No. 3.—All lost motion taken up; step reset; cogs in bevel and spur wheel rekeyed; brass pipes run to steps and the old iron ones removed; step taken out and dressed.

Turbine No. 4.—Main bearings dressed up; cogs rekeyed; pump examined and all lost motion taken up.

Turbine No. 5.—Valves taken out and repaired; pumps packed and all lost motion taken up.

Turbine No. 7.—Steps taken out, regrooved; new water pipe run; new valves in pumps; cogs renewed in bevel and spur wheels and lost motion taken up.

Jonval Turbines—Double Acting Horizontal Plunger
Pumps.—Total Capacity, 33,200,000 Gallons per
day.

FAIRMOUNT PUMPING STATION.

Capacity No. 1.—2,000,000 Gallons per day.
" Nos. 3, 4, and 5.—5,300,000 Gallons per day.
" Nos. 7, 8, and 9.—5,100,000 " " "

1889.	Running Time of each Turbine in Hours.							Gallons Pumped by each Turbine.							Total Gallons Pumped each Month.	Average Pumpage per day.	OIL.	
	No. 1.	No. 3.	No. 4.	No. 5.	No. 7.	No. 8.	No. 9.	No. 1.	No. 3.	No. 4.	No. 5.	No. 7.	No. 8.	No. 9.			Castor.	Engine.
January.....	636	681	521	506	494	468	493	68,207,104	194,146,923	139,012,245	131,711,388	127,097,425	117,691,925	125,981,375	903,848,385	29,156,399	18	223
February.....	557½	567½	548	524	526½	527½	530½	60,557,056	163,523,154	146,240,725	133,966,600	134,611,750	133,734,575	134,219,475	906,853,335	32,387,619	23	188
March.....	689	693	635	584	635	641	634	75,184,256	195,479,213	166,307,984	148,489,022	157,839,825	160,841,850	157,561,300	1,061,698,450	34,248,337	19	247
April.....	686½	683½	622½	587½	573½	581½	582½	74,128,896	192,859,350	162,239,234	148,690,940	140,955,825	144,851,525	144,666,600	1,007,522,370	33,584,079	23	203
May.....	733	737	675½	593½	592½	604½	536½	79,444,992	210,365,434	182,052,588	158,186,618	152,230,650	155,052,300	136,628,375	1,073,900,957	34,641,966	41	227
June.....	715½	611½	672	606½	577½	392	591	74,898,560	163,977,615	173,837,113	159,497,702	149,498,700	100,627,800	153,603,775	986,941,265	32,898,042	33	189
July.....	720½	720½	672½	598½	600	254	321	76,688,256	199,857,330	183,716,986	161,499,825	149,774,300	59,098,325	127,796,825	961,431,847	31,013,930	36	216
August.....	714	696	718	716	700½	656½	16½	75,595,648	181,118,602	195,438,645	186,876,492	165,323,600	154,794,900	4,077,450	963,225,337	31,071,785	46	216
September.....	703	699	374	630	357	241	70	73,606,272	196,065,144	106,012,943	174,792,299	89,474,125	75,325,250	16,244,475	731,520,508	24,384,016	32	276
October.....	724	590	604	669	573½	.....	588	69,917,568	158,017,431	163,531,913	175,197,057	134,006,275	.....	135,931,575	836,601,819	26,987,155	34	197
November.....	657	675	664	610	612	600	604	60,888,960	185,446,931	186,239,851	161,740,467	145,471,300	142,074,400	143,685,425	1,025,547,334	34,184,911	29	224
December.....	489	744	712	597½	489½	500½	512½	42,549,376	206,564,419	198,279,788	159,719,904	115,027,250	118,341,275	114,262,850	954,744,862	30,798,221	17	171
Total.....	8,025	8,098	7,418½	7,222½	6,731½	5,466½	5,479½	831,666,944	2,253,361,546	2,010,935,015	1,900,368,314	1,660,411,025	1,362,434,125	1,394,659,500	11,413,836,469	31,279,795	341	2,577

Turbine No. 8.—Old Cornish valves taken out, and both sides fitted with brass valve seats with four inch rubber valves (180 in all); new gibs in cross head, with set-screws for setting them out; pump plungers refastened; new keys in shaft and spur wheel entirely recogged.

Turbine No. 9.—Bevel wheel taken off of upright shaft, wheel and shaft trued up and two extra keys put in; main shaft trued up; pumps and valves examined; spur and bevel wheels entirely recogged.

The boiler for heating station was repaired; heater pipes renewed; steam syphons put in all the wheel shoes for blowing water out of them after a high tide; new tail gates hung at all the wheels.

SPRING GARDEN—(Old Station).

BUILDINGS AND GROUNDS.

The engine house was painted on the outside; roof repaired over engine and boiler house; the old wood platforms around No. 8 pump-well torn out, and iron beams set in the masonry and grating fitted on them; a wall built between Nos. 7 and 8 engine to keep the water from flowing into No. 7 crank pits; an iron rail was run along the pit in front of No. 8 engine house; new drains made and others altered for draining the hill behind the coal shed; a cement walk was laid the entire length of the coal shed, along railroad track and ash pits; a trench was dug along the forebay wall, and 8-inch pipe laid connecting the intersecting sewer and both engine houses; new closet of stone was built, pointed, plastered and painted, for the use of the man in the upper house; the forebay walls were cleaned, the old mortar cut out of the joints and repointed the entire length; the stand pipe on the hill near the railroad repaired, new section put in the inside pipe, and the outside cleaned of rust and painted with two coats of paint; weather vane adjusted on rollers and gilded; the old closets behind machine shop were torn down and the wells filled up; engine and boiler rooms whitewashed; general

storehouse plastered and laid out in blocks, and closets and shelves put in for stores; racks placed on the end of storehouse for pipe to be kept in stock; new shed built in the rear of wagon shed for the storage of large pumps, suction and discharge pipes, hoisting engine and all extra pumping machinery; the shed was covered with a tin roof and painted; retaining wall built along the foot of the hill behind storage shed, and a manure pit made; coal shed whitewashed on the outside, and under it racks fitted up for the storage of the rail removed by this Department from Girard avenue bridge; all screens, inlets and drains kept clean and the grounds in general in good order.

MACHINERY.

Engine No. 6.—Packed plungers, stuffing boxes and cylinders, valve stems, and made joints on steam chest.

Engine No. 7.—Packing in cylinders all set out; air pumps repaired; new pump valves put in; fly wheel re-fastened; beam centres adjusted; crank shaft raised and boxes lined up; link journals, cross head, crank pins examined; all joints and stuffing boxes kept packed.

Engine No. 8.—Cylinder heads taken off, packing set out; air pumps taken out and all new studs put in; plungers in pumps examined and new pump valves put in. The pump end was taken down in order to connect the pump to the 36 inch main to East Park, but owing to the break in No. 11 engine it was replaced with the old pipes.

Engine No. 11.—This engine was connected in the summer to a 36-inch main direct from East Park reservoir, to pump subsided water into the district supplied by direct pumpage, but owing to the heavy ram in the pipe the stop in the suction pipe broke, and was replaced by a stronger one. A supplemental trial, however, was not attempted again until the heavy pumpage of summer was over, when, after a run of forty-eight hours, it was deemed advisable, on account of the heavy ram the whole length of the pipe, to place an air chamber in the

Total Capacity, 58,000,000 gallons per day.

OLD SPRING GARDEN STATION.

No. 6.—Simpson Rotary Compound.—Capacity, 8,000,000 gallons per day.
 No. 7.—Marine Rotary Compound.—Capacity, 20,000,000 gallons per day.
 No. 8.—Worthington Duplex.—Capacity, 10,000,000 gallons per day.
 No. 11.—Gaskill Compound.—Capacity, 20,000,000 gallons per day.

1889.	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 lbs., per sq. n.				Gallons raised 100 ft. per pound of Coal.	
	No. 6.	No. 7.	No. 8.	No. 11.	No. 6.	No. 7.	No. 8.	No. 11.	Gallons.	Gallons.	Tons.	Lbs.		Qts.	Qts.	No. 6.	No. 7.	No. 8.	No. 11.		
																					Cylinder.	Engine.
January.....		697	716 $\frac{3}{4}$	219 $\frac{1}{2}$		449,826,800	341,273,680	185,325,600	976,426,080	31,497,615	1,554	2,061	.20	485	208 $\frac{1}{2}$	.....	77	74	50	447.1
February.....		614 $\frac{1}{2}$	455			401,414,560	218,584,800		619,999,360	22,142,834	1,086	706	.20	327 $\frac{1}{2}$	123	.....	74	60	.....	406.3
March.....		687 $\frac{3}{4}$	404 $\frac{3}{4}$			445,321,560	197,428,560		642,750,120	20,733,874	1,091	1,246	.20	340 $\frac{1}{2}$	139 $\frac{1}{2}$	.....	73	51	.....	419.2
April.....		283 $\frac{1}{2}$	267 $\frac{1}{4}$	93		184,458,370	126,100,800	71,462,400	382,021,570	12,734,052	555	828	.20	200	114 $\frac{1}{2}$	.....	63	61	50	459.8
May.....		392 $\frac{1}{4}$	67 $\frac{1}{4}$	271 $\frac{1}{4}$		263,368,960	32,611,600	202,906,400	498,886,960	16,093,127	585	1,228	.19	247	158	.....	66	57	54	609.7
June.....		663 $\frac{1}{4}$	469 $\frac{3}{4}$	293 $\frac{1}{2}$		492,322,930	218,891,680	225,206,500	876,421,110	29,214,237	1,179	675	.20	430 $\frac{1}{2}$	217 $\frac{1}{2}$	.....	65	60	57	529.1
July.....		666 $\frac{1}{2}$	381 $\frac{1}{2}$	713 $\frac{3}{4}$		447,361,700	186,398,800	494,337,300	1,128,098,300	36,390,267	1,356	755	.20	494	357	.....	60	56	68	592.2
August.....		742	435 $\frac{1}{4}$	505 $\frac{1}{4}$		531,424,100	218,640,400	322,161,600	1,072,226,100	34,587,938	1,398	280	.19	488	315	.....	58	53	78	546.0
September.....		720	597 $\frac{1}{2}$	709 $\frac{3}{4}$		568,500,200	300,592,320	461,980,300	1,331,073,320	44,369,110	1,792	573	.20	567	350 $\frac{1}{2}$	.....	52	54	80	528.8
October.....		641 $\frac{1}{2}$	420	637 $\frac{1}{4}$		502,667,920	212,264,640	440,212,000	1,155,144,560	37,262,727	1,699	1,260	.19	482	306	.....	55	54	80	483.9
November.....		702 $\frac{3}{4}$	415 $\frac{3}{4}$	457 $\frac{1}{4}$		504,867,420	213,890,400	321,976,000	1,040,733,820	34,691,127	1,508	275	.19	373 $\frac{1}{2}$	268	.....	70	54	63	491.3
December.....		125 $\frac{1}{2}$	695 $\frac{3}{4}$	607	477 $\frac{1}{2}$	46,237,500	534,324,950	289,896,560	318,511,200	1,188,970,210	1,980	201	.20	559	309 $\frac{1}{2}$	47	59	63	80	427.5
Totals and averages..	125 $\frac{1}{2}$	7,506 $\frac{3}{4}$	5,240 $\frac{3}{4}$	4,378	46,237,500	5,265,859,470	2,556,574,240	3,044,080,300	10,912,751,510	29,897,949	15,787	1,128	.19	4,994	2,867	47	66	58	55	492.1

supply pipe. Engine was again stopped, and three lengths of 30-inch flange pipe were connected, with an attachment for pumping air into it, and the engine again started.

By this means the ram was entirely overcome in the supply pipe, and the engine can be successfully used for that purpose.

The engine has had many new pump valves and new air pump valves; broke gib in the cross-head connection of low pressure cylinder; all four of the cylinder heads taken off, and cylinders and packing examined; the strap connecting the cross-head of low pressure cylinder on the left side broke, also breaking cross-head, brasses and guide brasses. It is now being repaired.

BOILERS.

Boilers Nos. 12 to 16, inclusive.—The tubes of these boilers were taken out and the boilers thoroughly cleaned; the tubes safe ended or new ones put in; all boilers cleaned, new joints made on them; all gauge cocks, water gauges, steam blow-off and safety valves examined and adjusted; heater pipes repaired; bridge walls and arches repaired and furnaces relined.

Boilers Nos. 17 to 21, inclusive.—A new heater for heating feed water was placed on the top of these boilers; the exhaust of the donkey pumps and drips turned into it; new joints were made on the drums of the new boilers, and one section of 10-inch cast-iron pipe replaced; the boilers cleaned, fronts painted and tops whitewashed.

SPRING GARDEN—(New Station).

BUILDINGS AND GROUNDS.

A new floor of ash and walnut was laid in the engine room; new closet for the men built of brick in the rear of the bath house, and a door cut through from the fire room; pipes run under the floors and connected with the 8-inch pipe to the sewer; the room fitted up and plastered, painted and grained.

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.

1889.	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 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.
January	201¼	548	111,869,820	311,274,284	423,144,104	13,649,809	740	1,368	.19	348½	48½	77	77	258.3	
February	666	547¼	355,791,778	275,689,902	631,481,680	22,552,917	1,153	462	.19	368½	56	79	79	389.9	
March	742	7:39½	390,487,914	389,872,304	780,360,218	25,172,910	1,423	81	.20	408½	62	79	79	393.6	
April	639½	698½	350,069,614	385,196,502	735,266,116	24,508,870	1,347	1,764	.20	425	59½	77	77	388.4	
May	740¼	726	436,533,665	426,913,557	863,447,222	27,853,136	1,450	1,406	.19	373	65	77	77	420.4	
June	714	711¼	427,579,538	423,812,699	851,392,237	28,379,741	1,435	1,185	.20	436	61	76	76	422.1	
July.....	743¾	738½	456,888,669	455,742,361	912,581,030	29,438,097	1,518	1,895	.20	454	66	77	77	427.8	
August.....	736	735	444,871,339	442,302,084	887,173,423	28,618,497	1,479	1,705	.19	407	62	75	75	426.9	
September.....	717	711	450,725,540	446,899,831	897,625,371	29,920,845	1,469	1,963	.20	430	75½	77	77	434.8	
October.....	742¼	743	446,600,435	441,286,997	887,887,432	28,641,530	1,693	660	.20	473	68	76	76	347.0	
November.....	675¾	715½	391,137,326	409,233,123	800,370,449	26,679,014	1,483	2,156	.20	454½	65	79	79	384.0	
December.....	738½	726¼	414,681,911	425,596,534	840,278,445	27,105,756	1,581	1,138	.20	503½	64	76	78	378.3	
Totals and averages..	7,056¾	8,339¾	4,077,187,549	4,833,820,178	9,511,007,727	26,057,555	16,778	103	.19	5,081½	747½	77	76	403.6	

The telephone room was also fitted up with retiring room and painted.

The floors in engine room were oiled; pumps varnished; fire room whitewashed; flower beds laid out on the river front, and the flower beds and lawns kept in good condition; urns in front of engine house painted, and filled with flowers, and the walks and grounds kept clean.

The roofs over boiler and engine houses were painted; new rain conductors run to forebay; the ash pit taken up and replaced with a grade and drained; a cement walk made from end of coal shed to boiler house and around ash pit, and the river wall repaired under Girard avenue bridge.

MACHINERY.

Engine No. 9.—All new joints put on steam chest, steam and exhaust pipes; air pump studs renewed; valves reset; new pump valve seats put in and caulked with copper wire, and valves put in as required.

Engine No. 10.—New joints made on high-pressure cylinder heads; air pump valves renewed; pump valves refastened and new ones put in.

A new feed-water heater was placed in the cellar of the engine house, and the exhaust of the donkey pumps turned into it and the feed water passed through.

Boilers Nos. 22 to 27 and 30 to 33, inclusive.—All cleaned and scaled; all bridge walls rebuilt; all safety, stop, blow-off and check valves kept in good working order; all gauge cocks and glass gauges attended to, and all joints made as required.

REPORT OF OPERATIONS DURING 1889 AT EAST PARK RESERVOIR.

The following is a report of operations at East Park reservoir for the past year.

During the year the third or western section of the reservoir was completed.

In January and February the Engineer Corps made sections of the bottom and banks of this section, from which were calculated the finished grade of the bottom, the amount of gravel to be moved and the quantity of clay required, as well as the approximate quantities of concrete and brick-work.

It was also deemed advisable to stake out before the contractors began operations the main grade lines in the bottom; all curves at both top and bottom of the banks, and many intermediate intersections of the bottom and foot of slope. One set of engineers was thus enabled without difficulty to keep ahead of the contractors.

The first load of clay for the lining was received on February 27, the contractors beginning to grade the bottom, and grub out trees and bushes about the same time.

During March the entire bottom was dressed to sub-grade; the stone-crusher erected and put in operation; and a single line of track laid from the Pennsylvania Railroad through the Park grounds to the centre of the basin. To accommodate this track the embankment at the south end was cut down 14 feet, the cut being 18 feet wide at the top and 10 feet at the bottom. From the inside face of this cut a heavy trestle was built 600 feet into the basin, the height at the cut end being 14 feet. At the south end a gangway was built into the basin, 300 feet long and 18 feet wide. At the north end two parallel gangways were built into the basin, each 300 feet long and 18 feet wide. From the outside berm of the north bank to the Parade grounds, a long gangway was built, having a truss-bridge across the Park drive. This gangway was 750 feet long, 18 feet wide, and was used almost exclusively for the transportation of clay from the Parade grounds to the basin. About 170,000 loads of clay were received at this point during the work.

A large cement shed was built in the centre of the basin at the end of the railway track. Water was furnished the contractors from 2-inch and 3-inch pipes, laid entirely around the basin on the banks, connected with the mains in the Park, and from each of the pass pipes on the east side of the basin.

The inside slopes were dressed to a slope of one vertical to one and a half horizontal, and received a lining of 2 feet of good clay. At some places clay of the required thickness had been placed on the banks when the basins were originally constructed. On top of this clay lining a layer of two inches of cement mortar was spread, mixed in the proportion of one part cement to two of sand. Bricks on edge were bedded on this mortar, and the top edge finished with a border of bricks set on end, laid and pointed with mortar, consisting of one part cement to one of sand.

The bottom of the basin was graded to drain into the drain-box on the west side, and received a clay lining 18 inches thick. The clay was put on in three layers, each layer being rolled thoroughly with a steam roller weighing 18 tons.

On this clay a concrete lining $4\frac{1}{2}$ inches thick was placed, the concrete being composed of one part cement, two parts sand, and four parts $1\frac{1}{2}$ inch broken stone or slag. The concrete was mixed and used according to the method adopted in lining the other sections.

The contractors, Messrs. Filbert and Porter, laid the first brick on April 10, and the first concrete on April 12; the following shows the progress of the work during the season :

Month	Concrete laid.	Brickwork laid.
	Sq. yds.	Sq. yds.
April	18,000	4,500
May	64,100	10,500
June	60,900	8,700
July.....	24,500	4,300
August	11,326	1,628
	178,826	29,628

The last concrete was laid August 21, and the last brick August 27. Water was let into the basin on October 8.

The top of the bank was graded to have a rise of 6 inches toward the outside berm, and covered with a pavement composed of $1\frac{1}{2}$ inches of asphalt laid over 4 inches of concrete

of the same character as that used in the bottom of the basin. During the season 12,597 square yards of this pavement were laid.

The four brick piers at the ends of the pass pipes were reconstructed, the man-holes over these pipes raised to grade and finished with iron covers.

The drain box on the west side of the basin was overhauled, and a new 12-inch stop placed at the end of the drain pipe.

A pine fence was placed on top of the embankment and painted.

The drive at the south end was widened and raised 4 feet at upper end to conform to the finished grade of the banks.

The outside slope of the bank was dressed up at points requiring it, and trees and underbrush were cut out.

In October a 48-inch pumping main was laid on the south division bank to the intersection of the three division banks, and entered by a quarter-turn into the foundation of the new overflow basin constructed at this point. This overflow basin will be 45 feet in diameter, with an outlet 22 feet wide to each of the three basins. The foundation is of concrete over 12 inches of clay, and contains 216 cubic yards of concrete. A pumping main 48 inches in diameter was let into the brick lining at the south end of the basin, and a sheet-iron apron placed under it to receive the discharge.

A brick apron was built under the outlet from the overflow basin.

The following are the dimensions and elevations of the section completed :

Area of bottom.....	178,826 square yards.
Area of inside slopes.....	29,628 square yards.
Area of water surface.....	199,976 square yards.
Elevation of bottom.....	109.5 C. D.
Elevation of water line.....	133.4 C. D.
Elevation of top embankment.....	137.4 C. D.
Distance around top of inside slope.....	5,479 feet.
Distance around foot of inside slope.....	5,218 feet.
Capacity	304,736,360 gallons.

No. 1 Section.—The apron at southwest corner was washed out, and a new one 18 feet wide built and sheathed with iron. At the overflow in centre of division banks, an apron was built 20 feet wide, lined with bricks on edge and grouted.

No. 2 Section.—This section was emptied to examine the condition of the bottom and slopes. Only slight repairs were required to the bottom. The slopes were repaired to some extent, made necessary by settling of the banks. The basin was cleaned of the mud remaining in it; an apron was built in the southwest corner at the overflow to conform to those in the other sections, and the stop-house and the screens cleaned.

The coping stones on the stop houses were completed; the brackets and columns for the gate hoists put up; an iron fence put on both the houses and all iron work painted; the entrance to them on the outside was pointed, cement floors laid, coping of cement made on the walls, iron gates fitted on the top of them. The asphalt pavement was repaired around Norris street stop-house and on division bank; the banks kept mowed and the grounds at foot of bank cleaned and graded.

CORINTHIAN AVENUE BASIN.

A new iron fence was put up at the foot of the slope on Parrish street, extending from Corinthian avenue to Twenty-second street; a gate was placed at both streets and all painted.

The inside slope of the south bank from the top, extending to the 15 feet line was taken up, the banks rammed with fresh clay and the bricks relaid. The overflow at southwest corner repaired; inclines and top of walk graded and rolled; trees trimmed; slopes weeded; banks mowed and pavement repaired.

SPRING GARDEN BASIN.

All the old sod was cut off of the outside slope, the banks graded and rammed, fresh soil put on and sown with seed; the top of bank and inclines were graded, graveled and rolled;

the ground around foot of banks leveled off and cleaned of all rubbish ; fence put up on property line and sheds torn down that extended over line of property. The stand-pipe on north-west corner of basin was taken down and the old rotten wood removed ; fence repaired and the basin kept clean of grass and weeds. The stop-houses were rebuilt and pointed.

BELMONT.

BUILDINGS AND GROUNDS.

The old cylindrical boilers were taken out and broken up, the walls torn down, bricks hauled to the back of coal shed and cleaned ; the ground for the foundation for the new boilers prepared. foundation laid, flue excavation made by cutting out considerable rock, the flue and connection to each boiler built and connection made to stack. The pavement was laid over flue ; the old brick fire room floor all taken up, and cement floor laid all around boilers and between car tracks ; railroad track taken up and altered, and new drains laid for blow-off of new boilers, and for draining the roof fire and bath room.

The old brick piers under Nos. 1, 2 and 3 engine, cylinders were taken out and iron columns substituted therefor ; a wall was built entirely around the air pumps, making them all in one pit ; cement floors laid on the bottom and drained in fore-bay ; paving and grading done around ash pit and coal shed ; brick foundations built under the engine room floor, and donkey pumps moved from the fire room and placed thereon ; hole cut through the walls and steps built to make passage-way from fire room to pumps.

The floor of engine room was found to be rotten and was torn up ; new joist and yellow pine flooring laid throughout ; new closets for tools made, and place under the office fitted up for a machine shop.

The wall along tow-path was rebuilt ; new steps built on banks ; all the new work in engine room painted and var-

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. 1.—Worthington Duplex.—Capacity,
8,000,000 gallons per day.

1889.	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 100 feet per pound of coal.
	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.		Cylinder.	Engine.	No. 1.	No. 2.	No. 3.	
January	6:8	7:13	1	147,680,700	160,803,240	296,335	308,780,275	9,960,654	806	1,516	.20	87	31¾	88	88	88	369.4
February	1:11	3:09½	5:14¾	22,757,400	72,397,416	195,856,580	291,011,396	10,393,264	683	846	.19	71¼	22¾	88	88	88	411.0
March		2:35½	6:41¾		57,188,976	243,916,200	301,105,176	9,713,070	664	1,180	.20	67¾	27¾		88	88	437.3
April	5:71½	2:46½	6:54½	17,930,700	60,669,960	208,108,650	285,709,310	9,556,977	624	2,170	.19	78	21½	88	88	88	442.7
May	2:23	5:40	5:23½	53,499,600	126,958,104	189,285,800	369,742,904	11,927,190	735	199	.20	105¾	31½	88	88	88	485.4
June.....	4:23½	2:42	6:13	93,630,300	54,941,952	219,050,250	367,622,502	12,234,083	744	605	.20	103¾	29	88	88	88	476.7
July.....	1:50	6:13	6:33½	35,372,400	141,584,040	212,481,410	389,437,850	12,562,511	768	2,013	.20	114	33¾	88	88	88	483.8
August.....	1:07½	6:73	6:28½	25,894,200	150,777,744	214,422,020	391,093,964	12,615,934	774	840	.20	125	30½	88	88	88	487.4
September.....		5:68	6:59½		125,129,774	245,246,070	370,375,844	12,345,861	733	116	.20	109	29¾		88	88	487.6
October.....		5:23½	7:12½		119,486,952	257,582,045	377,068,997	12,163,516	794	123	.20	102¼	28½		88	88	458.3
November.....	1:07½	4:35	6:02½	25,715,100	100,929,768	221,368,065	348,003,933	11,600,131	851	785	.20	102¾	26½	88	88	88	394.6
December.....	1:18	3:22	7:42	3,925,500	74,019,806	278,653,840	356,599,146	11,503,198	809	176	.20	90½	24½	88	88	88	425.8
Totals and average's	2,400	5,453	6,967	426,405,300	1,244,878,732	2,486,267,265	4,157,551,297	11,390,551	8,989	1,614	.19	1,155¾	336¾	88	88	88	446.3

nished; pumps and pipes all painted; roof of engine and fire room repaired; south side of fire room torn out in order to remove old boilers and reset new ones, and the same built up again and sliding doors hung.

A new green-house was built with a brick base, using the old brick from the boilers; steam pipes were run in and around the house; shelves and boxes made for plants; roof and ends glazed, and a glass partition put in one end with extra steam and water pipes, and all painted with three coats of paint, and a hot-bed made on the west side of the green-house. The grounds around the station were graded, gravel put on and rolled; walks and flower beds laid out and the grounds kept in good condition.

MACHINERY.

Engine No. 1.—This engine broke the head of plunger, and at the same time the cylinder and cross-head. The cylinder head and cross-head were banded with wrought iron, pump plunger turned and trued up, the diaphragms taken out and bushed to fit plunger; low pressure cylinders both bored out and new piston rings fitted; new packing rings for the intermediate heads put on; glands renewed; pump and piston rods trued up; cushion-valves all taken off; valve faces scraped, and stems renewed; pump valves all taken out and replaced; air pumps examined, all joints renewed.

Engine No. 2.—Cylinder heads were taken off and packing set out; pump valves taken out and new ones put back as required; all air pumps examined and new valves put in; lagging removed from the cylinders and partly renewed, and new joints put on steam chest and steam pipes.

Engine No. 3.—Packing in cylinders was examined; pump valves renewed; air pumps repaired and new joints made.

BOILERS.

Five new steel furnace-flue tubular boilers, built by the I. P. Morris Co., in accordance with designs and specifications fur-

nished by this Bureau, were put in during the year on brick foundations and connected to the old boilers. They are eight feet six inches in diameter and twenty feet long; are built throughout of steel and designed to carry one hundred pounds of steam pressure, and are fitted with Fox's patent corrugated furnaces. The boilers have been fired and found to be tight under pressure. They have been covered with Macan's Magnesia plaster throughout.

Boilers Nos. 9 to 15, inclusive.—Tubes were all taken out and safe ended or new ones replaced; boilers all thoroughly cleaned; walls repaired; bridge walls rebuilt; water columns taken down and cleaned; all safety, blow-off and feed valves examined, gauge-cocks and water glasses cleaned and new joints made on all steam pipe connections.

Donkey Pump.—One new 8 in. x 8 in. x 12 in. duplex Barr pump was put in on new foundation built therefor, and connected to all the boilers and hot well.

BASIN.

The entire fence was repaired around the basin with new posts and pickets; steps and hand rail on south side of slope repaired; watch-house repaired and painted; wall of division bank and aprons at overflow repaired; west section cleaned of all rubbish and the entire slopes and banks kept weeded and mowed.

ROXBOROUGH.

BUILDINGS AND GROUNDS.

The floor in the old Cornish engine room was all torn out, and new joist and yellow pine floor laid; new dressing and bath rooms made; machine shop rebuilt; new cement floor laid in fire room; new railroad tracks put in; old coal scales taken out, new foundation built and new scales put in; new bumper built on the side track at coal scales; three coats of paint put on entire boiler and engine house; windows glazed;

Total Capacity, 14,750,000 gallons per day.

ROXBOROUGH PUMPING STATION.

No. 1.—Cornish Overhead Beam.—Capacity, 2,250,000 galls per day.
 No. 2.—Worthington Duplex.—Capacity, 5,000,000 galls. per day.
 No. 3.—Worthington Duplex.—Capacity, 7,500,000 galls. per day.

1889.	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. Cylinder.	Engine.	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.	Lbs.				Qts.	Qts.		No. 2.	No. 3.
January	706½		208,029,705		208,029,705	6,710,632	757	1,651	25	179½	46½	160	160	452.9		
February	25½	625	6,476,135	180,987,138	187,463,273	6,695,116	693	10	24	166	42½	160	160	443.4		
March	722		183,498,850		183,498,850	5,919,317	736	1,181	25	177	53	160		411.1		
April	19½	689½	4,930,630	196,972,983	201,903,613	6,730,120	769	297	24	208½	65	160	159	433.1		
May	192½	570½	48,806,545	165,525,720	214,422,274	6,916,847	794	1,896	24	200½	67½	159	160	445.1		
June	474½	332	119,779,440	90,156,138	209,935,578	6,997,852	807	320	24	219	72	158	161	428.0		
July	163	742½	38,683,645	207,873,114	246,556,759	7,953,443	959	650	25	273	76½	155	163	424.0		
August	237½	697	56,327,505	194,116,533	250,444,128	8,078,842	1,011	406	25	265	91	150	164	408.6		
September	229	687	51,958,380	192,439,067	244,397,447	8,146,581	1,016	589	25	261	73	150	164	396.8		
October	191½	705	42,682,370	199,595,163	242,277,533	7,815,401	1,004	30	24	289	82	150	163	398.1		
November	183½	643½	44,009,015	180,866,117	224,975,132	7,499,171	968	2,195	24	253	67	153	162	383.0		
December	119	671½	20,265,180	204,904,050	224,169,230	7,553,846	938	983	25	204	65½	149	146	411.7		
Totals and averages..	2,557½	7,070	627,107,785	2,020,965,737	2,648,073,522	7,254,995	10,466	1,248	25	2,696½	801½	155	160	417.8		

Total Capacity.—785,000
Gallons per day.

ROXBOROUGH AUXILIARY STATION.

No. 1.—Knowles.—Capacity,
500,000 Gallons per day..

No. 2.—Knowles.—Capacity,
285,000 Gallons per day.

1889.	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. Cylinder.	Mean Water Pressure.		
	No. 1.	No. 2.	No. 1.	No. 2.	Gallons.	Gallons.	Tons. Pounds.				Quarts.	No. 1.	No. 2.
January.....	42	39	923,400	391,061	1,314,461	42,401	8	2,184	.20	7½	36	36	
February.....	32	46	690,200	511,291	1,201,491	42,910	9	53	.19	8	36	36	
March.....	33	51	721,550	600,435	1,321,985	42,644	7	1,371	.20	8	36	36	
April.....	45½	43	859,073	488,851	1,347,924	44,930	5	1,695	.20	7½	36	36	
May.....	60	43	1,570,800	501,413	2,072,213	66,845	5	363	.20	4	36	36	
June.....	31	66	731,700	772,145	1,503,845	50,128	4	1,981	.20	4	36	36	
July.....	43	73	1,025,400	862,763	1,888,163	60,908	4	2,228	.20	4	36	36	
August.....	29	83	561,550	980,243	1,541,793	49,735	5	76	.20	4	36	36	
September.....	47	56	1,138,650	664,543	1,803,193	60,106	4	2,213	.20	3¾	36	36	
October.....	42	64	1,051,200	558,285	1,609,485	51,918	5	935	.20	4	36	36	
November.....	31	59	790,700	699,545	1,490,245	49,674	5	461	.20	4	36	36	
December.....	38	62	972,500	723,217	1,695,717	51,700	6	921	.20	4	36	36	
Totals and averages.....	473½	685	11,036,723	7,753,792	18,790,515	51,480	73	1,041	.20	62¾	36	36	

roofs repaired; new rain conductors put in place; walls of engine room whitewashed and blocked off; fire room whitewashed; grounds around station graded and good soil put on and sodded, and coal shed repaired and whitewashed on the outside.

MACHINERY.

Engine No. 2.—The breaking of the low-pressure piston in this engine necessitated its renewal. The old piston was therefore taken out and shipped to the builders of the engine, H. R. Worthington & Co. of New York, who replaced and returned it complete. The air pumps were all examined, valves in pump renewed when necessary and all joints and stuffing boxes kept packed.

Engine No. 3.—Cylinder heads were removed and packing examined; new pump rod put in north pump; all bolts in diaphragms renewed; new studs put in air pumps; new joints placed on steam pipe and all other joints kept tight; lagging around cylinders repaired and felt lining put on steam chest covers.

The pumps of both engines have been scraped and cleaned, and painted with two coats of paint, striped and varnished.

BOILERS.

Foundations for the marine boilers Nos. 4 to 7 inclusive, were built, the boilers moved back and connected to the new brick stack with sheet iron. The boilers were thoroughly cleaned inside and out and painted with two coats of paint on the outside, and were covered with the H. W. Johns' patent covering. All the steam and feed pipes were either altered, or, as in most cases, renewed; new blow-off pipes were run, the stop valves altered and safety valves ground in.

All other boilers were cleaned and scaled; new joints made on all steam and water connections; bridge walls rebuilt; furnaces relined; feed-water heater placed under the floor of Cornish engine room and donkey exhaust turned through it.

A new donkey pump of the same size and make as the one mentioned at Belmont was put in at this station.

ROXBOROUGH AUXILIARY WORKS.

The entire property from the works to and along Shawmont avenue, through the woodland to the lane on south side of basin, was fenced in with oak posts and wire fence, the posts being cut from wood on land belonging to this Bureau. The fence around basin was repaired; banks and grounds around works kept in good condition; engine room and boiler house whitewashed; pumps examined and boiler cleaned, and tanks on Ridge avenue examined and cleaned.

MOUNT AIRY.

BUILDINGS AND GROUNDS.

An iron fence was put up from the engine house on Allen's lane to the wall of basin; the grounds inside of fence graded and leveled off; ash pile at fire room removed and the bank graded, terraced and sodded; walks laid out and flower beds made on the grounds in the rear of the engine house; the basin banks and slopes cleaned; fence repaired; well over stops relaid; two coats of paint put on inside and outside of fire room; a wrought iron rail run along the wall in front of the works, and the pavement on Allen's lane raised with ashes and a curb put in.

MACHINERY.

The engines were connected to Korting's patent condenser, placed in the upper part of engine room in such manner, that either engine could be run from it, forming 28 inches of vacuum on the engine, formerly worked high pressure, and thus dispensing with the exhaust steam and preventing the waste of water from running on the railroad. New brass valve-seats, with rubber valves, were put in both pumps; steam valves faced up; new joints made; boilers all cleaned, and new bridge walls built.

Total Capacity.—1,000,000
gallons per day.

MOUNT AIRY PUMPING STATION.

No. 1.—Davidson's Rotary.—Capacity,
1,000,000 gallons per day.
No. 2.—Davidson's Rotary.—Capacity,
1,000,000 gallons per day.

1889.	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 lbs. per sq. inch.		Gallons raised 100 feet 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.....		744		26,087,500	26,087,500	841,532	52	11	.20	31	31	.....	57	298.7
February.....	144	528	5,200,000	18,743,750	23,943,750	855,133	49	1,960	.20	36½	31	57	57	285.9
March.....	192	543	6,773,750	19,254,412	26,028,162	839,618	51	1,460	.20	34	31	57	57	300.0
April.....	648	72	22,962,500	2,560,000	25,522,500	850,750	51	1,146	.20	34	31	57	57	295.0
May.....	720		28,100,000		28,100,000	906,451	59	802	.20	34	34	57	.....	281.9
June.....	720	55	27,821,000	1,561,250	29,382,250	979,408	63	780	.20	41	40½	57	60	276.2
July.....	681	11	26,645,000	411,250	27,056,250	872,782	55	1,940	.20	34	35	57	57	288.4
August.....	676	3	26,835,125	94,750	26,929,875	868,705	57	155	.20	32¾	32¾	57	57	281.0
September.....	720		27,618,625		27,618,625	920,620	58	1,390	.19	30	31½	57	.....	280.6
October.....	744	18½	28,195,000	597,500	28,792,500	928,790	61	400	.20	39	41	57	57	280.2
November.....	680		25,216,250		25,216,250	840,541	53	775	.20	32	31½	57	.....	281.5
December.....	744		27,070,500		27,070,500	873,241	58	205	.19	31½	31½	57	.....	277.5
Totals and Averages..	6,669	1,974¼	252,437,750	69,310,412	821,748,162	881,501	671	2,064	.20	409¾	401¼	57	57	285.1

CHESTNUT HILL.

BUILDINGS AND GROUNDS.

The wall around the dam on the south side was rebuilt; dam and well cleaned of weeds; tank in tower examined, cleaned and the bottom pitched; engine and fire room white-washed; tower cleaned down and windows in it repaired and glazed.

The basin on the county line was drawn off and cleaned; fence repaired and coping stone reset; new flag-stone cemented over railroad spring; grounds kept mowed; foundation made and frame put in, and a new five ton scale placed for weighing coal for Chestnut Hill and Mount Airy Stations.

MACHINERY.

Engine Nos. 1 and 2.—These engines were examined and packed; new joints made and kept in good condition; a heater for feed-water put in and the pumps exhaust turned into it.

The boilers and mud drums were repaired, cleaned and new joints made thereon, and all valves, feeds and blows examined.

FRANKFORD.

BUILDINGS AND GROUNDS.

The grounds around this station were graded, fresh soil put on and sown with grass; trees and shrubbery planted; flower beds made; walks made of gravel and rolled; a granolithic pavement, extending to the wharf, laid in front of engine house and a fountain placed in the centre; new fence put up along Glen's lane; fence on south side of works repaired; all the rotten wood taken out of coal shed, the bottom raised up with ashes and new floor laid; wharf repaired with new string pieces; roof on engine and boiler house repaired and new rain conductors put on; the fire room, cellar, store room and machine shop white-washed; new benches placed in the garden, and all kept in good condition.

Total capacity, 750,000 gallons per day.

CHESTNUT HILL PUMPING STATION.

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

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

Month	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.	Oril.		Mean Water Pressure and Mean Suction Lift in Pounds per Square Inch.		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.		
															Qts.	Qts.	No. 2.	No. 3.
January							5	1,610	.33						
February							5	650	.30						
March	9	4	442,800	124,800	567,600	18,309	6	802	.32			53	53	493.7	
April		8		179,400	179,400	5,980	5	855	.35	1¼			53	184.3	
May		334		6,561,360	6,561,360	211,656	20	1,285	.18	17¼			53	176.4	
June		437		9,824,100	9,824,100	327,470	30	2,130	.13	23			53	175.5	
July	118	464	6,504,240	11,612,160	18,116,400	584,400	40	2,062	.15	29½			53	244.8	
August	212	352	9,011,920	9,586,680	18,598,600	599,954	44	1,169	.19	31			53	281.0	
September	486	6	17,190,480	187,200	17,377,680	579,256	44	851	.22	23			53	216.5	
October	293	238	10,519,820	6,429,720	16,949,540	546,759	44	303	.19	25			53	212.4	
November	64	491	3,099,600	13,423,800	16,523,400	550,780	40	1,868	.19	23½			53	115.6	
December		558		15,011,440	15,011,440	484,240	38	2,144	.19	23			53	113.2	
Totals and averages..	1,189	2,887	46,768,860	72,940,660	119,709,520	327,971	327	1,779	.23	196½			53	53	201.9

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.

1889.	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 lbs. per sq. inch.		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.	
January	271½			95,617,595	95,617,595	3,084,438	162	120	.18	46	73	78	77	467.0
February.....	192½	39½	70,212,182	14,443,641	84,655,773	3,023,420	123	80	.20	46	69	77	77	559.6
March.....	261		95,002,002		95,002,002	3,064,580	138	280	.25	51	74	77	77	559.4
April.....	60¼	207½	22,017,237	72,454,824	94,472,061	3,149,068	116	160	.25	52	78	77	78	662.0
May.....	514	61	177,820,368	21,188,946	199,009,314	6,419,655	207	1,720	.25	98	147	77	75	779.1
June.....	66½	640½	21,791,234	223,547,278	245,338,512	8,177,950	237	2,120	.25	117	174	74	77	838.6
July.....	536	206¼	196,085,123	74,384,376	270,469,499	8,724,822	313	880	.25	124	177	77	77	701.9
August.....	595	148	217,707,444	52,328,484	270,035,928	8,710,836	341	560	.25	125	161	78	80	643.6
September.....	475	236½	179,741,763	82,181,274	261,923,037	8,730,767	318	80	.24	120	133	79	79	669.8
October.....	405	338	145,721,991	118,670,742	264,392,733	8,528,797	315	1,600	.25	124	148	77	70	681.1
November.....	381½	337½	133,021,638	116,871,303	249,892,941	8,329,764	293	1,480	.25	120	162	76	79	692.1
December.....	314¼	423	115,175,940	144,103,533	259,279,473	8,363,853	293	1,480	.25	124	172	79	79	718.1
Totals and averages..	3,801¼	2,909½	1,374,296,872	1,015,791,996	2,390,088,868	6,548,188	2,860	1,600	.24	1,147	1,568	77	77	679.5

MACHINERY.

Engine No. 1.—Both cylinder heads were taken off and packing rings set out; throttle valve altered; new valves put in air pumps; air pump taken out and new studs and valves put in; leads taken from all journals and lost motion taken up; joints made on steam pipe and covering repaired.

Engine No. 2.—Pumps were examined, new seats put in, and valves when required; cut off and valve-gear repaired; air pumps examined and all joints kept in repair; donkey pump repaired with new piston rod and packing rings.

BOILERS.

All boilers cleaned; new bridge walls put in; all safety valves ground in, and all joints and blow-off and feed pipes examined; gauge cocks and water columns inspected from time to time.

WENTZ FARM RESERVOIR.

The banks at the overflow were dug up to repair leak in the pumping main over northeast corner of reservoir; apron grouted; banks kept mowed and inside slopes weeded; the sheds over pumping main at trestles repaired and stop-houses cleaned and whitewashed.

KENSINGTON.

BUILDINGS AND GROUNDS.

New pavement was laid in front of the works; fenders on end of wharf repaired; coal shed shored up and new railroad track laid; boiler roomed whitewashed; roof repaired over engine and fire rooms; pumps painted, striped and varnished; cellar cleaned and whitewashed.

MACHINERY.

Engine cylinder heads were removed; packing rings set out; pump-valves examined and renewed as required; air

KENSINGTON PUMPING STATION.

No. 3.—Worthington Duplex.—
Capacity, 6,000,000 gals. per day.

1881

1889.	Running Time in Hours.	Gallons Pumped.	Average Pumpage per day.	Coal.		Percentage of Ashes.	Oil.		Mean Water Pressure and Mean Suction Lift in pounds per square inch.	Gallons raised 100 ft. per pound of coal.
	No. 3.	No. 3.	Gallons.	Tons.	Pounds.		Cylinder.	Engine.		
							Quarts.	Quarts.		
January.....				20	400	.25				
February.....				21	2,080	.20	2	1½		
March.....	85	10,341,576	333,599	38	536	.26	3	4	48	155.5
April.....	598	173,633,376	5,787,779	210	142	.25	126½	29½	49	475.2
May.....	509	149,889,663	4,835,150	190	385	.25	74½	22	49	453.2
June.....	438½	131,625,186	4,387,506	164	924	.25	57½	20	48	460.3
July.....	654½	196,703,430	6,345,271	230	373	.24	81½	29½	48	491.0
August.....	550½	171,195,066	5,522,421	203	8	.24	65	26¾	49	484.9
September.....	325	101,454,759	3,381,825	138	449	.21	30½	11	49	419.2
October.....	162½	49,987,140	1,612,488	93	70	.21	14	7	48	308.9
November.....	134	40,531,995	1,351,066	88	489	.24	13	13½	48	269.2
December.....				50	2,231	.25	5			
Totals and averages.....	3,407	1,025,362,191	3,728,589	1,448	1,367	.24	472¾	164¾	48	406.

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pumps taken out and new pins put in trunks; one new rock shaft arm put on; donkey pumps connected to the suction main to keep the exhaust from the wharf; all charge pipes renewed and new relief valve put on.

BOILERS.

New bridge walls were built in all the boilers; furnaces relined; boilers cleaned; all safety blow-off and feed-valves, also, all gauge cocks and water columns examined.

LEHIGH BASIN.

The banks on Lehigh avenue had several slides, caused by the heavy rains; they were all repaired by putting in fresh clay, thorough ramming and sodding. The bank of Eighth street was graded; the incline on the northwest corner rebuilt; the entire top of bank was graded, gravel put on and rolled; the standing pipe on south side of southeast section taken down, the old wood platform torn out and the apron repaired: steps at Lehigh avenue and Sixth and Eighth streets were torn out and new ones built; pavement on Lehigh avenue repaired from Sixth to Eighth streets; all the stop houses repaired and pointed; inside slopes repaired and weeded and the division and outside banks kept mowed.

MACHINE SHOP.

TWELFTH AND REED STREETS.

Foundations were built for new tools placed in shop; walls around boilers rebuilt; furnaces relined and bridge walls built in boilers; concrete and cement floor laid in boiler house; roofs of machine shop and out-houses repaired and painted, and windows glazed and doors repaired.

TOTAL GALLONS PUMPED DURING 1889.

1889	Fairmount.	Spring Garden.	Belmont.	Roxborough.	Roxborough Auxiliary.	Mount Airy.	Chestnut Hill.	Frankford.	Kensington.	Totals.	Average per day.	Percentage of pumpage.	Maximum Gallons for one day.	Minimum Gallons for one day.	Total Steam Pumping.
January.....	903,848,385	1,399,570,184	308,780,275	208,029,705	1,314,461	26,087,500	.....	95,617,595	.....	2,943,248,105	94,943,487	6.92	124,090,233	61,946,408	2,039,399,720
February.....	906,853,335	1,251,481,040	291,011,396	187,463,273	1,201,491	23,943,750	.....	84,655,773	.....	2,746,610,058	98,093,216	6.46	117,276,159	57,039,206	1,839,756,723
March.....	1,061,698,450	1,423,110,338	301,105,176	183,498,850	1,321,985	26,028,162	567,600	95,002,002	10,341,576	3,102,674,139	100,086,262	7.30	117,346,842	56,305,988	2,040,975,689
April.....	1,007,522,370	1,117,287,686	286,709,310	201,903,613	1,347,924	25,522,500	179,400	94,472,061	173,633,376	2,908,578,240	96,952,608	6.84	118,005,459	47,642,722	1,901,055,870
May.....	1,073,900,957	1,362,334,182	369,742,904	214,422,274	2,072,213	28,100,000	6,561,360	199,009,314	149,889,663	3,406,032,867	109,872,027	8.01	126,453,797	81,305,994	2,332,131,910
June.....	986,941,265	1,727,813,347	367,622,502	209,935,578	1,503,845	29,382,250	9,824,100	245,338,512	131,625,186	3,709,986,585	123,666,219	8.72	142,429,347	82,533,431	2,723,045,320
July.....	961,431,847	2,040,679,330	389,437,850	246,556,759	1,888,163	27,056,250	18,116,400	270,469,499	196,703,430	4,152,339,528	133,946,436	9.81	148,678,621	116,104,970	3,190,907,681
August.....	963,225,337	1,959,399,523	391,093,964	250,444,128	1,541,793	26,929,875	18,598,600	270,035,928	171,195,066	4,052,464,214	130,724,652	9.50	145,981,388	103,346,077	3,089,238,877
September.....	731,520,508	2,228,698,691	370,375,844	244,397,447	1,803,193	27,618,625	17,377,680	261,923,037	101,454,759	3,985,169,784	132,838,992	9.37	148,966,344	111,275,844	3,253,649,276
October.....	836,601,819	2,043,031,992	377,068,997	242,277,533	1,609,485	28,792,500	16,949,540	264,892,733	49,987,140	3,860,711,739	124,539,088	9.08	142,551,644	104,682,426	3,024,109,920
November.....	1,025,547,334	1,841,104,269	348,003,933	224,975,132	1,490,245	25,216,250	16,523,400	249,892,941	40,531,995	3,773,285,499	125,776,183	8.87	143,280,129	82,176,269	2,747,738,165
December.....	954,744,862	2,029,248,655	356,599,146	234,169,230	1,695,717	27,070,500	15,011,440	259,279,473	.....	3,877,819,023	125,090,936	9.1	140,129,354	92,671,209	2,923,074,161
Total and averages.....	11,413,836,469	20,423,759,237	4,157,551,297	2,648,073,522	18,790,515	321,748,162	119,709,520	2,390,088,868	1,025,362,191	42,518,919,781	116,490,191	100.00	.....	.....	31,105,083,312
Increase over 1888.....	172,723,361	4,722,650,491	488,593,056	297,658,129	2,868,403	2,285,287	24,799,180	.....	.....	5,450,156,353	15,209,417	.....	10,291,557	.....	5,277,432,992
Decrease from 1888.....	.....	.....	.....	.....	.....	.....	.....	19,629,733	241,791,816	.....	.....	.....	.....	732,899	.....

CURRENT EXPENSES AND WORK OF THE PUMPING STATIONS FOR THE YEAR 1889.

Stations.	Pay of employés at the stations.	COAL.			LUBRICATING OILS.		LIGHTING STATIONS.		Repairs to boilers and machinery.	Small stores.	Total expenses.	Total gallons pumped.	Lift in feet, including suction and friction.	Gallons pumped 100 feet high, suction and friction included.	Cost of raising one million gallons 100 feet.	Percentage of work done at each station.	Height of surface of basins above pumps in feet.
		Tons.	Price per ton.	Cost.	Gallons.	Cost.	Oil.	Elect'ry.									
Fairmount.....	\$8,965 47				729	\$315 00	\$13 50		\$4,800 44	\$73 25	\$14,167 66	11,413,836,469	100.0	11,413,836,469	\$1 24	16.52	{ 90.00 115.00
Spring Garden.....	30,961 43	32,566	\$2 35	\$76,530 10	3,422	1,444 27	16 25	\$750 00	20,754 99	195 00	130,652 04	20,423,759,237	159.5	32,575,895,983	4 01	47.17	{ 102.00 †179.00 102.00
Belmont.....	10,934 86	8,990	2 33	20,946 70	373	159 45	11 00	575 00	7,650 83	86 50	40,364 34	4,157,551,297	216.2	8,988,625,904	4 49	13.00	198.00
Roxborough.....	.....	10,456	2 35	24,571 60	874	373 30	224 00	.....	.....	.....	.....	2,648,073,522	369.6	9,787,279,737	.....	14.15	317.00
Roxborough auxiliary*.....	.....	.....	.....	.....	.....	.....	.....	.....	5,690 64	73 00	41,710 19	.....	.....	.....	4 25	.....	*80.00
Mount Airy.....	2,970 00	672	3 13	2,103 36	204	82 00	.....	.....	1,350 79	16 75	6,522 90	321,748,162	133.4	429,212,048	15 19	00.60	†128.00
Chestnut Hill.....	1,500 00	328	2 70	885 60	49	22 05	13 00	.....	460 53	13 00	2,894 18	119,709,520	123.9	148,320,095	19 51	00.19	128.65
Frankford.....	9,609 58	2,861	2 32	6,637 52	679	266 35	147 00	.....	4,950 60	63 00	21,674 05	2,390,088,868	182.2	4,354,741,941	4 97	06.28	168.63
Kensington.....	4,402 50	1,448	2 27	3,286 96	159	67 72	3 00	.....	1,400 31	22 00	9,182 49	1,025,362,191	128.8	1,320,666,502	6 95	01.89	107.75
Totals and averages deducted from totals.....	\$79,899 70	57,394	2 35½	\$135,168 43	6,505	\$2,737 34	\$435 75	\$1,325 00	\$47,059 13	\$542 50	\$267,167 85	42,518,919,781	160.4	69,034,118,434	\$3 87	100.00	

* Repumpage from Roxborough.

† On Distribution.

DISTRICTS.

Offices, houses, tool wagons, and storage sheds of the several Districts kept in repair and painted.

MAIN OFFICE.

JUNIPER AND FILBERT STREETS.

All rooms were fitted up with electric lights, and wires and mouldings run, with necessary switch and key board. On the first floor a desk, book rack, shelves and closets for the use of the water inspectors were put in. Foundations were built for safes; one large safe cleaned, painted and varnished; windows glazed; doors hung; cases for records and shelves and drawers for drawings.

WORKS GENERAL.

The telephone lines from the several stations have been kept in good working order.

The electric lighting plants have had strict attention given them, the station at no time being without light. The horses of the Department have been carefully looked after, carts have been built, and wagons repaired. The iron fence at Fairhill square was taken down, part of it hauled to Mount Airy and put up there, the balance to Corinthian avenue basin and erected on Parrish street. The buildings, fences and sheds on the grounds at Twenty-ninth and Cambria streets, belonging to this Bureau, have had some repairs and paint.

APPENDIX D.

REPORT

ON THE

OPERATIONS IN CONNECTION WITH THE

DISTRIBUTION SYSTEM

DURING 1889.

BUREAU OF WATER,

January 20, 1890.

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

SIR:—The following report on the distribution system for the year 1889 is respectfully submitted.

The supply from the various reservoirs and pumping stations was distributed in the same manner as set forth in the report for the year 1888, with the exception that the Fifth, Sixth, Seventh, Eighth, Ninth, Tenth and part of the Fifteenth Wards were almost entirely supplied from the East Park Reservoir instead of wholly from the Corinthian, as formerly. The extending of the high pressure district in Germantown, down Thorp's lane and Chew street to Old York road, gave this section a much improved supply.

The following shows the sources, works, reservoirs and localities as they are now supplied :

Sources of Supply.	Pumping Works.	Reservoirs.	Wards Supplied.
Schuylkill River.....	Belmont.....	George's Hill.....	24th and 27th Wards.
Schuylkill River.....	Roxborough.....	Roxborough.....	21st and part of 28th Wards.
Schuylkill River.....	Roxborough.....	Mount Airy.....	22d and part of 32d and 33d Wards.
Schuylkill River.....	Spring Garden.....	By direct pump'e	29th and part of 15th, 19th, 20th, 25th, 32d and 33d Wards.
Schuylkill River.....	Fairmount.....	Fairmount.....	1st, 2d, 3d, 4th, 26th and 30th Wards.
Schuylkill River.....	Spring Garden.....	{ Corinthian... { East Park... { Lehigh.....	{ 5th, 6th, 7th, 8th, 9th, 10th, { 11th, 12th, 13th, 14th, { 16th, 17th, 18th, 31st and part of 15th, 19th, 20th, 25th and 33d Wards.
Delaware River.....	*Frankford.....	Frankford.....	23d and part of 19th, 20th, 25th and 33d Wards.

* Frankford water is sometimes run by gravity into the Lehigh reservoir; also into the same reservoir from the direct pumpage district.

MAINS.

The following mains for the better distribution and pumpage of water have been laid :

A thirty-six inch main from the East Park Reservoir to the Spring Garden Works to supply No. 8 and No. 11 engine with subsided water, to be pumped into the district supplied by direct pumpage, whenever the water in the river is so muddy as to require it. This main is called the "supplementary lift" main. The connection to No. 8 engine is not yet completed, but the work is being done, and will be finished as soon as possible.

A forty-eight inch connection has been put in, extending from No. 11 Corinthian main, in front of the engine-house, thence across the Reading Railroad to a point west of the connections on the standpipe hill, where it attaches to No. 7 pumping main to the East Park Reservoir. By means of this connection Fairmount can pump to the East Park Reservoir through the Poplar street forty-eight inch main, and the

cheap pumpage by water power at Fairmount be utilized to its fullest capacity.

At the time the above connection was put in, a forty-eight inch pumping main for No. 11 engine to the East Park Reservoir was laid across the Reading Railroad to a dead end, to be continued in the future to the reservoir. Another section of this main was also laid, extending from the foot of the outside slope of the East Park Reservoir to the top of the embankment, and thence to the intersection of the division embankments, where provision is made for building an overflow to run the water into any one or all three of the basins, as may be desired.

A thirty-six inch connection was put in at the Spring Garden Works, between No. 11 East Park pumping main and No. 10 main, through which No. 11 engine can pump to Lehigh Reservoir.

A connection between the "supplementary" main and the above named No. 10 main was also put in, for the purpose of supplying from the East Park Reservoir when No. 11 engine is not pumping to Lehigh basin. On the standpipe hill east of the Connecting Railroad a thirty-inch connection was put in between No. 7 and 8 mains, to enable the latter engine to pump to the East Park Reservoir.

All the engines at the Spring Garden Works are now so connected that any, or all of them, can be used to pump to the East Park Reservoir through No. 7 pumping main; but they are all dependent upon this one main.

No. 11 main should be completed as soon as possible, in order to have an additional main in case of accident to the one now in use.

An additional main (and necessary connections at the Roxborough Reservoir) was laid between Roxborough Reservoir and the intersection of Allen's lane and McCallum street, where it connects with the sixteen and twenty inch mains on Allen's lane to supply Mt. Airy Reservoir and a sixteen-inch supply main on McCallum street.

This main is thirty inches in diameter and thirteen thousand two hundred and fifty-eight (13,258) feet in length. It is laid upon the western side of Ann street and the northern side of Shawmont avenue, Livezey's lane and Allen's lane. It crosses Wissahickon creek east of Livezey's bridge, passing under the bottom of the creek.

This is the lowest point on the main, and the pressure was found to be 130 pounds to the square inch.

The laying of this main and connections was begun July 1st and completed December 4th. The digging of the trench was contracted for, and seven thousand and twenty-five (7,025) cubic yards were excavated by the contractor, at an average price of twenty-six and three-quarters ($26\frac{3}{4}$) cents per cubic yard. The contractor, however, did not complete the work. It was finished by men employed by the Bureau of Water, who excavated three thousand five hundred and twenty-six (3,526) cubic yards, at an average cost of one (1) dollar and fifteen and seven-eighths ($15\frac{7}{8}$) cents per cubic yard.

All the excavating done by the Water Bureau was exceedingly "hard digging," as was also a large portion of that done by the contractor. It is not known how much the latter expended on his work, and in consequence the total actual cost cannot be given.

The amount expended by the Bureau of Water on excavation was four thousand three hundred and sixty-three (4,363) dollars and ten (10) cents, which will probably be the cost to the city for the ditch work. The main was well laid. Not a leak has appeared since the water was turned in on December 7, 1889; and considering the difficulties of laying a main of this size in so narrow a street, the interruptions caused by the contractor's slowness in opening the ditch, the delays in getting the pipe, and the exceedingly wet weather (there having been seventy-three rainy days out of one hundred and fifty-seven from the beginning to the completion of the work,) it is a credit to the purveyors under whose charge it was done.

The main between the East Park Reservoir and American

street was begun November 21, 1889. That portion in York street, from American to Sixth street, is thirty-six inches in diameter, and from Sixth street to ninety-eight feet west of Germantown avenue forty-eight inches. It has been completed, with the exception of the connections at American, Sixth, Seventh and Ninth streets, which are delayed by want of the castings. The total length is two thousand six hundred and ninety-four feet. The excavation for this work is also done by contract, and three thousand nine hundred and sixty-six cubic yards of earth have been excavated at a cost of two thousand nine hundred and forty-three (2,943) dollars and twelve (12) cents, or one (1) dollar and nine (9) cents per lineal foot of ditch excavated.

The work on this main will be prosecuted as fast as the castings are received.

NEW MAINS REQUIRED.

All the mains asked for in the report for the year 1888 for improving the distribution of water should be laid; but the most important is the twelve (12) inch pipe on Ridge avenue, between Rodman and Hermit streets, to supply the high ground near Huntingdon street, from which quarter constant complaints are received of "no water."

A ten (10) inch pipe is also much needed in Pulaski avenue, from Tioga to Nicetown lane, as the supply for Tioga is now dependent upon a six (6) inch connection to the Reading Railroad Company's private supply pipe. This connection was put in July 15, to improve the pressure and give a supply of water (at times there was none). To an insufficient extent an improvement has been effected. A ten (10) inch pipe should be laid as soon as possible.

WORK PERFORMED.

MAINS.

One hundred and seventeen thousand five hundred and thirty-two (117,532) feet of service mains, five thousand one

hundred and seventy-six (5,176) feet of supply mains, and fourteen thousand one hundred and seventy-eight (14,178) feet of pumping mains have been laid during the past year, which, in addition to the connections and other new work, make a total of one hundred and forty-seven thousand one hundred and seventy-one (147,171) feet, or twenty-seven (27) miles, and four thousand six hundred and eleven (4,611) feet added to the distribution system; and a total of nine hundred and twenty-nine (929) miles and two thousand and thirty-seven (2,037) feet now in use.

There have been twenty-one thousand five hundred and seventy-seven (21,577) feet of pipe used for relaying old and defective service mains, and for alterations.

The total quantity used for relays and repairs was twenty-seven thousand two hundred and twenty-three (27,223) feet, and of that taken up, lowered, raised and shifted, thirty-thousand six hundred and thirteen (30,613) feet, making the total amount for repairs fifty-seven thousand eight hundred and thirty-six (57,836) feet.

The total quantity of pipe handled for all purposes throughout the year was two hundred and five thousand and seven (205,007) feet, and the weight fourteen million six hundred and eighty thousand nine hundred and eighty-eight (14,680,988) pounds.

ABANDONED PIPES.

Fourteen thousand eight hundred and eighty-seven (14,887) feet of pipe have been cut off from the distribution and abandoned, of which one thousand four hundred and thirty-eight (1,438) feet are three (3) inch, twelve thousand nine hundred and sixty-six (12,966) feet four (4) inch, four hundred and seventy-one (471) feet six (6) inch, and twelve (12) feet, forty-eight (48) inch pipe.

FIRE HYDRANTS.

A complete record of the fire hydrants throughout the city has been made, showing the exact location and pressure of

each. The pressures due to the total head from the reservoirs will be calculated, and by comparison with the recorded pressures will assist in a measure to determine the cause of complaints and short supply.

The calculations for the First District have been completed, and the other districts will be finished as soon as possible.

The enumeration shows an increase in the number of hydrants in use not recorded in previous reports of two hundred and fifty-seven (257).

Five hundred and thirteen (513) new and eight (8) old style fire hydrants have been put in new locations. Two hundred and thirteen (213) new and sixty-nine (69) old style have been substituted for defective ones of the old pattern, making a total of seven hundred and twenty-six (726) new and seventy-seven (77) old style hydrants put in during the year, and two hundred and seventy-one (271) old and three (3) new ones taken out. The total number in use December 31, 1889, was seven thousand four hundred and thirty-three (7,433), of which four thousand five hundred and eighty-five (4,585) are of the old pattern, and two thousand eight hundred and forty-eight (2,848) of the new. All the latter, equal to 38 per cent. of the total in use, were put in during the past five years.

DRILLS.

Nine thousand five hundred and forty-four (9,544) new attachments have been made, as follows:

$\frac{1}{2}$ inch	8,950	area of total openings.....	1,757 square inches.
$\frac{3}{8}$ inch	263	area of total openings.....	81 square inches.
$\frac{3}{4}$ inch	149	area of total openings.....	66 square inches.
1 inch	119	area of total openings.....	93 square inches.
$1\frac{1}{2}$ inch	17	area of total openings.....	30 square inches.
2 inch	46	area of total openings.....	145 square inches.
<hr/>			
Total,	9,544		2,172
Total, 1888,	8,788		2,049
<hr/>			
Inc., 1889,	756		123

One thousand one hundred and twenty-five (1,125) shut-offs have been made for repairs, for which permits were granted, and five hundred and ten (510) without permits; making a total of sixteen hundred and thirty-five (1,635) shut-offs within the year.

METERS.

Forty-six (46) meters have been set in new locations; twenty-nine (29) that were defective, or where a different style or size was required have been renewed, and eleven (11) taken out or dismantled by the removal of the piston where the use of water by meter was discontinued.

The total number of meters in use December 31, 1889, was three hundred and four (304); the number in stock is three hundred and twelve (312), making a total of six hundred and sixteen (616) meters in use and on hand, exclusive of four (4) private meters, and three (3) new style meters on trial.

The following tables will show in detail the work done.

Respectfully,

ALLEN J. FULLER,

Assistant in charge of Distribution.

IRON SERVICE AND SUPPLY MAINS LAID IN 1889.

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>			
Alter street, from 247 feet east of centre of Twenty-sixth, west.....		6	247
Argyle street, from west curb line of Fifth to Sixth.....		6	462
Bainbridge street, from dead end 33 feet east of centre of Chippewa, west.....		6	33
Bancroft street, from 183 feet south of centre of Moore, north.....		6	204
Bond street, from dead end 3 feet south of south house line of Moore, north.....		6	28
Broad street, west side, from Mifflin to Moore.....		6	452
Carlisle street, from Mifflin to Moore.....		6	450
Catharine street, from dead end east house line of Eighth, west.....		6	25
Chadwick street, from 281 feet south of centre of Moore, north.....		6	302
Chippewa street, from Bainbridge to Sutherland avenue..		6	278
Cross street, from 3 feet east of west house line of Twenty-first to Long lane (or Point Breeze avenue).....		6	427
Darien street, from north house line of Wolf to Jackson...		6	430
Deshong street, from dead end west house line of Twenty-sixth to Twenty-seventh.....		6	423
Devon street, from south curb line of Oakford to dead end 4 feet south of south house line of Federal.....		6	299
Dudley street, from Front to East Second.....		6	445
East Second street, from 3 feet south of south house line of McKean to Mifflin.....		6	414
Eighteenth street, from Wolf to Jackson.....		6	460
Eleventh street, from 6 feet south of south house line of Carpenter, north.....		6	25
Eleventh street, from south house line of Catharine, north		6	25
Erie street, from south house line of Catharine, north.....		6	25
Fallon street, from 2 feet south of south house line of Catharine, north.....		6	27
Federal street, from Ninth to Tenth.....		6	449
Forbes street, from north house line of Bainbridge to South Fourth street, from 3 feet south of south house line of McKean, north, to connect dead end.		6	64
Front street, from 3 feet south of north house line of McKean to Mifflin.....		6	423
Gerritt street, from dead end 300 feet west of centre of Twenty-second, west.....		6	80
Gerhard street, from Mifflin to Moore.....		6	450
Hoffman street, from Front to East Second.....		6	446

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Hubbell street, from centre of Catharine, north.....		6	27
Juniper street, from 12 feet 6 inches south of south house line of Federal street, north.....		6	36
Justice street, from Twenty-sixth to Twenty-seventh.....		6	446
Lebanon street, from 24 feet south of centre of Catharine, north.....		6	24
McClellan street, from west curb line of Nineteenth to dead end 3 feet east of east house line of Twentieth.....		6	446
McCurdy street, from Twenty-sixth street, west.....		6	26
McKean street, from east house line of Second, west.....		6	50
McKean street, from 5 feet east of east curb line of Moyamensing avenue, west.....		6	54
McKean street, from Fourth to Fifth.....		6	444
Mifflin street, from east house line of Ash to Otsego.....		6	1,157
Mifflin street, from 25 feet east of centre of Twentieth, west		6	50
Moore street, from Sixteenth to 5 feet west of east house line of Seventeenth.....		6	426
Montrose street, from Twenty-fourth to Twenty-fifth.....		6	496
Morris street, from west curb line of Eighteenth to Dorrance.....		6	284
Morris street, from centre of Seventeenth west to dead end.....		6	180
Moyamensing avenue, southeast side, from Snyder avenue to Mifflin.....		6	868
Moyamensing avenue, northwest side, from Snyder avenue to Mifflin.....		6	868
Otsego street, from south house line of Mifflin, north.....		6	24
Parker street, from Federal to dead end 3 feet south of south house line of Washington avenue.....		6	457
Paxton street, from dead end 52 feet east of east house line of Parker, west.....		6	72
Reed street, north side, from 373 feet east of east house line of Meadow to dead end 170 feet west of west house line of Swanson.....		6	998
Ristine street, from 251 feet 6 inches south of south house line of Jackson, north.....		6	282
Rosewood street, from Mifflin to Moore.....		6	450
Seigel street, from Nineteenth to Twentieth.....		6	446
Sterling street, from Fitzwater, north.....		6	25
Sixth street, from Ritner to Wolf.....		6	443
Snyder avenue, south side, from east house line of Second, west.....		6	50
Snyder avenue, north side, from east house line of Second, west.....		6	50
Tasker street, from Juniper to Broad.....		6	251
Thirty-sixth street, from north house line of Wharton to dead end 6 feet north of southeast house line of Gray's Ferry road.....		6	486
Titan street, from Eleventh to Twelfth.....		6	424

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Twentieth street, from south house line of Mifflin to centre of Moore.....		6	475
Twenty-eighth street, from 176 feet south of south house line of Wharton to Oakford.....		6	598
Twenty-fourth street, from 2 feet south of south house line of Carpenter to Montrose.....		6	238
Twenty-fifth street, from south curb line of Carpenter, north.....		12	40
Twenty-second street, east side, from Long lane to dead end 12 feet south of south house line of Dickinson.....		12	242
Twenty-seventh street, from 3 feet south of north house line of Wharton to dead end 46 feet south of south house line of Oakford.....		6	316
Twenty-sixth street, from centre of Ellsworth, north.....		6	251
Ward street, from 2 feet north of north house line of Moore to Morris.....		6	423
Watkins street, from centre of Seventeenth, west.....		6	169
Wharton street, from Twenty-second to 3 feet west of east house line of Twenty-third.....		6	448
Wilder street, from dead end 333 feet west of west house line of Twenty-second, west.....		6	21
Wolf street, from west house line of Mendenhall to centre of Eighteenth.....		6	146
Total			21,407
<i>Fire hydrant connections</i>		6	1,208
<i>Fire connections (private).</i>			
Long lane, southeast side, 344 feet southwest of west house line of Twenty-fifth, for C. E. Johnson & Co.....		4	14
Morris street, south side, from 23 feet 8 inches east of east house line of Seventh, for R. B. Swan & Co.....		4	18
Reed street, north side, 29 feet east of east house line of Swanson, for Delaware Sugar House.....		4	9
Swanson street, east side, from north house line of Christian, for Pennsylvania Railroad Company.....		4	17
Washington avenue, south side, 154 feet east of east house line of Fifth, for Southwark Foundry and Machine Company.....		6	23
Total			81

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply connections (private).</i>			
Mifflin street, south side, 137 feet 6 inches west of west curb line of Eighth, for Bureau of Gas.....		4	16
Reed street, south side, 26 feet east of east house line of Swanson, for Claus Spreckles.....		4	25
Washington avenue, south side, 155 feet east of east house line of Fifth, for Southwark Foundry and Machine Company.....		4	23
Total.....			64
<i>Pipe relaid.</i>			
Clarion street, from 2 feet south of south house line of Federal, north.....		6	44
Eleventh street, east side, from centre of Catharine, north		6	28
Eleventh street, west side, from 7 feet south of south house line of Federal, north.....		6	61
Eleventh street, east side, from 2 feet north of centre of Carpenter, north.....		6	26
Erie street, from centre of Catharine, north.....		6	33
Essex street, from Christian to Catharine.....		6	334
Fallon street, from 51 feet south of south house line of Catharine, north.....		6	51
Fallon street, from centre of Catharine, north.....		6	27
Harshaw street, from 3 feet south of south house line of Fitzwater, north.....		6	30
Hepburn street, from centre of Fitzwater, north.....		6	28
Hubbell street, from centre of Catharine, north.....		6	27
Hubbell street, from 2 feet north of north house line of Catharine to Fitzwater.....		6	347
Lancaster street, from centre of Reed, north.....		6	17
Lebanon street, from centre of Catharine, north.....		6	27
Lindsay street, from centre of Fitzwater, north.....		6	28
Martin street, from 7 feet 6 inches south of south house line of Fitzwater, north.....		6	33
Montcalm street, from 2 feet south of south house line of Catharine, north.....		6	58
Park street, from 3 feet south of south house line of Fitzwater, north.....		6	27
Pharo street, from 3 feet south of south house line of Fitzwater, north.....		6	28
Reed street, north side, from Otsego to east house line of Front.....		6	232
Reed street, north side, from 135 feet east of east house line of Otsego, west.....		6	160
Reed street, north side, from 2 feet west of west house line of Front to east curb line of Second.....		6	403

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe relaid—Continued.</i>			
Russell street, from centre of Bainbridge to Fitzwater....		6	357
Selfridge street, from centre of Fitzwater, north.....		6	28
Stewart street, from centre of Catharine, north.....		6	27
Webb street, from 6 feet south of south house line of Fitzwater, north.....		6	31
Total.....			2,492
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<i>Fire hydrant connections relaid.....</i>		6	518
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<i>Repairs, general.....</i>		4	21
“ “		6	806
“ “		8	4
“ “		10	10
“ “		12	28
“ “		16	10
Total.....			879
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<i>Pipe taken up.</i>			
Clarion street, from 2 feet south of south house line of Federal, north.....		3	39
Eleventh street, from centre of Catharine, north.....		4	27
Eleventh street, west side, from 7 feet south of south house line of Federal, north.....		3	61
Eleventh street, east side, from 2 feet north of centre of Carpenter, north.....		4	26
Erie street, from centre of Catharine, north.....		3	33
Essex street, from centre of Christian to south house line of Catharine.....		3	413
Fallon street, from centre of Catharine, north.....		3	27
Harshaw street, from 3 feet south of south house line of Fitzwater, north.....		4	30
Hepburn street, from centre of Fitzwater, north.....		4	28
Hubbell street, from centre of Catharine, north.....		3	27
Hubbell street, from 2 feet north of north house line of Catharine to Fitzwater.....		3	365
Lancaster street, from centre of Reed, north.....		4	17
Lebanon street, from centre of Catharine, north.....		4	27
Lindsay street, from centre of Fitzwater, north.....		3	28
Martin street, from 7 feet 6 inches south of south house line of Fitzwater, north.....		4	33
Montcalm street, from 2 feet south of south house line of Catharine, north.....		3	56

RECAPITULATION OF FIRST DISTRICT.

Purposes for which used.		Size—Inches.						Totals in feet and Pounds.	
		3	4	6	8	10	12		16
New pipe or feet added	Service mains.....			21,125			282	21,407	
	Fire-hydrant connections.....			1,208				1,208	
	Fire connections (private).....		58	23				81	
	Supply connections (private).....		64					64	
	Total... { feet..... pounds.....		122 2,318	22,356 737,748			282 20,304		22,760 760,370
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....			3,010				3,010	
	Repairs general.....		21	806	4	10	28	879	
	Pipe taken up.....	1,180	1,578	82				2,840	
	Total... { feet..... pounds.....	1,180 17,700	1,599 30,381	3,898 128,634	4 168	10 550	28 2,016	10 1,100	6,729 180,549
	Total handled... { feet..... pounds.....	1,180 17,700	1,721 32,699	26,254 866,382	4 168	10 550	310 22,320	10 1,100	29,489 940,919
Pipe cut off and abandoned.....		367	466	49				882	

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>			
Ackley street, from Girard avenue to Thompson.....		6	418
Ashland avenue, from 253 feet east of centre of Fifty-eighth street, west.....		6	300
Baltimore avenue, from Fifty-second to Fifty-eighth street		12	3,689
Brooklyn street, from Parrish, north.....		6	236
Dohan street, from dead end 221 feet west of west house line of Forty-eighth to centre of Forty-nint.....		6	263
Eaglesfield street from Thirty-ninth to Forty-first.....		6	1,335
Fairmount avenue, from Thirty-third street, west, to connect dead end.....		6	11
Farragut street, from Chester avenue to Springfield.....		6	495
Fiftieth street, from Baltimore avenue to Pentridge.....		6	485
Fifty-fifth street, from Merion avenue to Jefferson.....		6	222
Fifty-eighth street, from Baltimore avenue to Ashland avenue.....		6	1,364
Fifty-fourth street, from Hunter's lane to Lancaster avenue		6	285
Fifty-seventh street, from Ludlow, north, to connect dead end.....		6	9
Forty-eighth street, from southeast to northwest house line of Kingsessing avenue.....		6	74
Forty-eighth street, from Sherborne to Springfield avenue		6	782
Forty-eighth street, from Wyalusing to Lancaster avenue		6	759
Forty-fifth-and-one-quarter (or New) street, from Paschal avenue, northwest.....		6	230
Forty-fifth-and-one-half (or Oak) street, from Paschal avenue, northwest.....		6	20
Forty-fifth-and-one-half (or Oak) street, from 369 feet 8½ inches southeast of southeast house line of Kingsessing avenue, northwest.....		6	411
Forty-fourth street, from Spruce, north, to connect dead end.....		6	232
Forty-fourth street, from Lancaster to Westminster avenue	{	6	314
		12	14
Forty-ninth street, from Dohan, north, to connect dead end		6	10
Forty-second street, from Westminster avenue to Pennsgrove.....		6	211
Forty-seventh street, from dead end 139 feet 6 inches northwest of northwest house line of Kingsessing avenue to Baltimore avenue.....		6	1,607
Forty-sixth street, from Paschal avenue, north, to connect dead end.....		6	10
Forty-third street, from Westminster avenue to Wyalusing avenue.....		6	591

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Holly street, from Baring to south curb line of Spring Garden		6	434
Island road, from 37 feet south of centre of Woodland avenue, north		6	37
Jefferson street, from Lancaster avenue to Fifty-fifth.....		6	396
Kingsessing avenue, from southwest house line of Forty-eighth street, northeast, to connect dead end.....		6	327
Laird street, from Forty-fifth to Forty-sixth.....		6	274
Lancaster avenue, from dead end west of Fifty-fourth street to Jefferson.....		6	182
Liberty street, from Parrish to Ogden.....		6	383
Locust street, from Forty-third to Forty-fourth.....		16	376
Ludlow street, from Fifty-seventh, west.....		6	305
Melon street, from 24 feet 3 inches east of centre of Thirty-third, west.....		6	49
Merion avenue, from Fifty-fourth street to Fifty-fifth.....		6	574
Ogden street, from Forty-fifth to Forty-sixth.....		6	275
Otter street, from east house line of Forty-third to Belmont avenue.....		6	416
Parrish street, from 234 feet east of centre of Thirty-ninth, west.....		6	234
Paschal avenue, from Forty-five-and-a-quarter street to Forty-sixth.....		6	431
Paschal avenue, from 18 feet east of west house line of Sixty-eighth street, west.....		6	487
Pentridge street, from Fiftieth, northeast.....		6	361
Pennsgrove street, from Forty-second to Forty-third (connected to Woodland avenue by private pipe laid on Sixty-eighth).....		6	543
Reno street, from 231 feet east of centre of Thirty-ninth, west.....		6	232
Reno street, from Union to Fortieth.....		6	291
Renwick street, from 432 feet southeast of centre of Woodland avenue, northwest.....		6	432
Rhinehart street, from Forty-seventh, west.....		6	35
Sansom street, from Thirty-ninth to Fortieth.....		6	662
Sherborne street, from Forty-eighth to east house line of Forty-ninth.....		6	444
Sloan street, from Poplar to Eggesfield.....		6	247.
Spring street, from Twenty-second to Albion.....		6	230
Springfield street, from Forty-sixth to Forty-eighth.....		6	1,024
Sixty-ninth street, from 3 feet northwest of southeast house line of Woodland avenue, northwest.....		6	38
Seventieth street, from 3 feet northwest of southeast house line of Woodland avenue, northwest.....		6	75
Seventy-second street, from 3 feet southeast of centre of Woodland avenue, northwest.....		6	38
Trinity place, from centre of Forty-eighth street, northeast, to connect dead end.....		6	103

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Thirty-third street, from Wallace to Fairmount avenue....		6	411
Warrington avenue, from 36 feet 6 inches southwest of centre of Forty-seventh street, northeast.....		6	73
Wyalusing avenue, from east house line of Forty-third street to Belmont avenue.....		6	419
Total.....			25,215
<i>Fire hydrant connections.....</i>		6	1,371
<i>Fire connections (private).</i>			
Eighth street, east side, 101 feet north of north house line of Race—Bijou Theatre.....		4	18
Market street, north side, 330 feet east of east house line of Thirtieth—Pennsylvania Railroad Company.....		4	33
Market street, north side, 105 feet west of west house line of Seventeenth—Pennsylvania Railroad Company...		6	11
Spruce street, north side, 205 feet east of east house line of Thirty-sixth—University of Pennsylvania.....		6	36
Thirty-third street, east side, 150 feet south of south house line of Market—Croft & Allen.....		4	28
Twenty-fourth street, from 4 feet south of centre of Johnson, north—Bureau of Gas.....		4	124
Total.....			250
<i>Supply connections (private).</i>			
Chester street, east side, 99 feet north of north house line of Maple—U. S. Electric Light Company.....		4	14
Fourth street, west side, 60 feet north of north house line of Chestnut—Provident Life and Trust Company.....		3	
Market street, north side, 82 feet west of west house line of Forty-fourth—Pennsylvania Hospital for Insane...		6	44
Sansom street, north side, 154 feet east of east house line of Seventh—United States Express Company.....		4	14
Total.....			72

Street.	Location.	Size in inches.	Distance in feet.
<i>Motor connections (private).</i>			
Cherry street, south side, 39 feet west of west house line of Twentieth—St. Clement's Protestant Episc'l Church..		4	13
Chestnut street, south side, 29 feet 6 inches east of east house line of Eleventh—Gilbert & Bacon.....		3	20
Thirteenth street, west side, 274 feet south of south house line of Spruce.....		4	18
Total.....			51
<i>Drains.</i>			
Third street, west side, 233 feet north of north house line of Chestnut, from hydrant connection.....		1½	9
<i>Pipe relaid.</i>			
Albion street, from Spruce to 2 feet north of south house line of Locust, north.....		6	428
Albion street, from 3 feet 1 inch south of north house line of Locust, north.....		6	168
Bay street, from Sixth to Seventh.....		6	440
Cherry street, from Sixth, west.....		6	32
Cuthbert street, from 18 feet east of centre of Fifteenth, west.....		6	18
Fourth street, from 115 feet 3 inches south of south house line of Library, north.....		6	22
Landis street, from Fourth to Fifth.....		6	451
Manship street, from 80 feet south of south house line of Locust, north.....	}	3	32
		4	30
Market street, south side, from 50 feet west of west house line of Fourth, west.....		6	42
Middle alley, from Sixth to Seventh.....		6	437
Rodman street, from centre of Thirteenth, west.....		6	29
Silver street, from 18 feet east of centre of Thirteenth, west		6	25
Stamper street, from Second to Third.....		6	515
St. Mary street, from Sixth to Seventh.....		6	441
Summer street, from Sixteenth to Seventeenth.....		6	445
Total.....			3,555
<i>Fire hydrant connections, relaid.....</i>		6	1,093

Street. *	Location.	Size in inches.	Distance in feet.
<i>Repairs, general</i>		3	25
" "		4	30
" "		6	803
" "		8	113
" "		10	97
" "		12	41
" "		16	15
Total.....			1,124
<i>Pipe taken up.</i>			
Albion street, from Spruce to 2 feet north of south house line of Locust.....		3	428
Albion street, from 3 feet 1 inch south of north house line of Locust, north.....		3	168
Bay street, from Sixth to Seventh.....		3	440
Cherry street, from centre of Sixth, west.....		4	32
Cuthbert street, from 18 feet east of centre of Fifteenth, west.....		3	18
Fourth street, from 115 feet 3 inches south of south house line of Library, north.....		6	22
Landis street, from Fourth to Fifth.....		3	446
Market street, south side, from 50 feet west of west house line of Fourth, west.....		6	44
Middle alley, from Sixth street to Seventh.....		3	437
Rodman street, from Thirteenth, west.....		3	28
Silver street, from 18 feet east of centre of Thirteenth, west.....		3	25
Stamper street, between Second and Third		3	515
St. Mary street, from Sixth to Seventh.....		3	446
Summer street, from Sixteenth to Seventeenth.....		4	446
Total.....			3,495
<i>Fire hydrant connections taken up</i>		3	68
" " "		4	1,244
" " "		6	24
Total.....			1,336
<i>Pipe lowered.</i>			
Belmont Station blow-off pipe.....		6	100
Kingsessing avenue, from west house line of Forty-sixth street to Forty-seventh.....		6	458
St. Bernard place, from 136 feet west of Forty-ninth street, west.....		6	418

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe lowered—Continued.</i>			
St. Bernard place, north side, 185 feet west of Forty-ninth street, fire hydrant connection.....		6	16
Warren (or Pear) street, from west house line of Fifty-first, west.		6	391
Total			1,383
<i>Pipe cut off and abandoned.</i>			
Cherry street, from 50 feet east of centre of Sixth, west....		4	50
<i>Fire hydrant connections cut off and abandoned.....</i>			
" " " "		3	84
" " " "		4	456
" " " "		6	25
Total			565

RECAPITULATION OF SECOND DISTRICT.

	Size—Inches.								Totals in feet and pounds.	
	1½	3	4	6	8	10	12	16		
New pipe or feet added.	Service mains.....				21,136			3,703	376	25,215
	Fire-hydrant connections.....				1,371					1,371
	Fire connections (private).....			203	47					250
	Supply connections (private).....			28	44					72
	Motor connections (private).....		20	31						51
	Drains.....	9								9
	Total..... { feet.....	9	20	262	22,598			3,703	376	26,968
{ pounds.....	63	300	4,978	745,734			266,616	41,360	1,059,051	
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....		32	30	4,586					4,648
	Repairs general.....		25	30	803	113	97	41	15	1,124
	Pipe taken up.....		3,019	1,722	90					4,831
	Pipe lowered.....				1,383					1,383
	Total..... { feet.....		3,076	1,782	6,862	113	97	41	15	11,986
{ pounds.....		46,140	33,858	226,446	4,746	5,335	2,952	1,650	321,127	
Total handled.....	{ feet.....	9	3,096	2,044	29,460	113	97	3,744	391	38,954
	{ pounds.....	63	46,440	38,836	972,180	4,746	5,335	269,568	43,010	1,380,178
Pipe cut off and abandoned.....		84	506	25						615

THIRD DISTRICT.

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

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
American street, west side, from centre of Diamond, north		6	26
Ann street, from Amber to Frankford avenue.....		6	355
Arrott street, from Leiper to northwest house line of "P"		6	2,382
Bellmore street, from 13 feet southeast of northwest house line of Amber to Frankford avenue.....		6	396
Bevan street, from 220 feet south of south house line of Lehigh avenue, north.....		6	248
Cambria street, from dead end 120 feet west of west house line of Sixth to 12 feet 6 inches west of east house line of Marshall.....		6	80
Cambria street, from 13 feet 3 inches east of centre of Ninth, west.....		6	27
Carrie street, from 11 feet southwest of centre of Jenks, northeast.....		6	32
Cedar street, from 4 feet 6 inches southwest of northeast house line of Ann to Clearfield.....		6	951
Cherry street, from dead end 123 feet north of centre of Meadow to Foulkrod.....		6	759
Clarion street, from south house line of Ontario, northeast		6	63
Clearfield street, from Fourth to Leithgow.....		6	144
Clementine street, from 3 feet southeast of northwest house line of Jasper to Kensington avenue.....		6	532
Edgemont street, from 5 feet south of centre of Somerset, north.....		6	5
Elkhart street, from Joyce east, to connect dead end.....		6	13
Emerald street, from southwest house line of Ontario, northeast.....		6	412
Erie avenue, north side, from east to west house line of "K" street.....		6	50
Fillmore street, from Somerset to Gurney.....		6	265
Fisher street, from south house line of Somerset, north....		6	27
Fourth street, from Indiana to Clearfield.....		6	565
Fox street, from Somerset to dead end 12 feet northeast of southwest house line of Gurney.....		6	477
Front street, from dead end 66 feet 6 inches south of south house line of Westmoreland to Tioga.....		6	1,205
Glenwood street, from centre of Fifth, west.....		6	206
Glenwood street, from 19 feet southwest of centre of Sixth, northeast.....		10	10
Hewson street, from southeast house line of Wildey, northwest.....		6	41
Hope street, from 355 feet south of south house line of Ontario, north.....		6	383

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Jenks street, from 2 feet southeast of northwest house line of Geyer to Garden.....		6	267
Joyce street, from Elkhart to Clearfield.....		6	247
Kennedy street, from Tacony road to James.....		6	235
Lawrence street, from 27 feet 5 inches south of centre of Ontario, north.....		6	27
Lee street, from Somerset to Cambria.....		6	551
Lehigh avenue, from 37 feet 3 inches east of centre of Frankford avenue, west.....		6	37
Manakin street, from 2 feet south of south house line of Diamond, north.....		6	27
Margaretta street, from 25 feet southeast of centre of Cherry, northwest.....		6	25
Mullen street, from Somerset, north.....		6	32
Ninth street, from dead end 9 feet north of south house line of Cambria, north.....		6	41
Ontario street, from Frankford road to northwest house line of Emerald.....		8	581
Ontario street, from Front to Hope.....		6	180
Ontario street, from 288 feet west of west house line of Third, west.....		6	251
Orchard street, from 8 feet south of centre of Rawle, north.....		6	8
Orkney street, from 27 feet 5 inches south of centre of Ontario, north.....		6	27
Orleans street, from 14 feet southeast of northwest house line of Amber to Frankford avenue.....		6	415
Otsego street, from Somerset, north.....		6	378
Porter's avenue, from Cemetery lane, north.....		6	146
Rawle street, from centre of Orchard, west.....		6	13
Reese street, from centre of Glenwood avenue, north.....		6	260
Richfield street, from centre of Ninth, north.....		6	29
Ruth street, from southwest house line of Clementine, northeast.....		6	20
Second street, from centre of Cambria, north.....		6	125
Sedgely avenue, from east to west house line of Sixth street.....		8	48
		10	14
Sellers street, from dead end 18 feet 10 inches northwest of west house line of Johnson, northwest.....		6	356
Stella street, from 13 feet southeast of northwest house line of Amber to Frankford avenue.....		6	379
Stoughton street, from southwest house line of Clementine northeast.....		6	20
Tioga street, from 25 feet east of centre of Front, west.....		6	50
Tioga street, from centre of Sixth, west, to connect dead end.....		6	25
Tioga street, from dead end west house line of Marshall to Seventh.....		6	216
Trenton avenue, from centre of Pepper street to dead end 12 feet south of south house line of Wreckin.....		6	124

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Waln street, from Tackawana, north.....		6	311
Waterloo street, from Berks to Mascher.....		6	505
Westmoreland street, from 2 feet 9 inches east of east house line of Emerald, west.....		6	138
Westmoreland street, from 18 feet east of centre of Front, west.....		6	43
Westmoreland street, from 28 feet 9 inches east of centre of Sixth, west.....		6	56
Willey street, from Vienna to Susquehanna avenue.....		6	316
Wyoming street, from 8 feet west of east curb line of Kensington avenue and Oxford pike, west.....		6	18
Total.....			16,249
<i>Supply Mains.</i>			
Erie avenue, south side, from 19 feet 10 inches east of centre of "K" street, west.....		12	33
York street, south side, from 37 feet 8 inches west of west house line of American to centre of Sixth.....		36	1,688
York street, from centre of Sixth, west.....		48	1,006
Total.....			2,727
<i>Supply Main Connections.</i>			
Sixth street and Glenwood avenue, between 30-inch main on Sixth and 6-inch main on Glenwood avenue.....		10	15
Sixth street and Sedgely avenue, between 30-inch main on Sixth and 8-inch main on Sedgely avenue.....		10	17
Total.....			32
<i>Fire hydrant connections.....</i>		6	1,942
<i>Fire connections (private).</i>			
Ontario street, south side, 215 feet 4 inches west of west house line of Third—for Long Brothers & Co.....		4	15
Orianna street, west side, 120 feet 6 inches south of south house line of Cumberland—for Joseph Murphy.....		4	10
Second street, west side, 300 feet north of north house line of Somerset.....		4	20
Total.....			45

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply connections (private).</i>			
Frankford avenue, east side, 25 feet north of north house line of Laurel street—for Public Bath-house.....		4	23
<i>Drains.</i>			
Sixth street, east side, 281 feet 6 inches north of northwest house line of Glenwood avenue.....		6	6
York street, intersection of Fifth.....		6	6
Total.....			12
<i>Pipe relaid.</i>			
Allen street, from 5 feet southwest of southwest house line of Hanover, northeast.....		6	58
Allen street, from 8 feet 4 inches southwest of centre of Palmer, northeast.....		6	35
Bodine street, from 2 feet 6 inches south of south house line of Diamond, north.....		6	57
Brook street, from Buttonwood, north.....		6	23
Callowhill street, from Delaware avenue, to Front.....		10	311
China street, from Buttonwood, north.....		6	29
Hanover street from Beach to Richmond.....		6	427
Howard street, from 173 south of centre of Oxford, north.....		6	173
Keyser street, from Hanover, northeast.....		6	29
Kressler street, from 4 feet south of south house line of Diamond, north.....		6	29
Lawrence street, from 2 feet 6 inches south of south house line of Diamond, north.....		6	56
Leithgow street, from Diamond, north.....		6	28
Manakin street, from Diamond, north.....		6	30
Margaretta street, from Front, west.....		6	39
Orchard street, from Rawle, north.....		6	13
Orianna street, from 3 feet 4 inches south of south house line of Diamond, north.....		6	57
Orkney street, from 5 feet 7 inches south of south house line of Diamond, north.....		6	34
Philip street, from Oxford to Columbia avenue.....		6	534
Philip street, from 9 feet south of south house line of Diamond, north.....		6	64
Rawle street, from Lawrence to Orchard.....		6	141
Salmon street, from Somerset, north.....		6	21
Somerset street, from 57 feet northwest of northwest house line of Richmond to Edgemont.....		6	433
Thouron street, from Diamond, north.....		6	30

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe relaid—Continued.</i>			
Vincent street, from Buttonwood, north.....		6	22
Water street, from Vine to 110 feet north of north house line of Callowhill.....		6	679
Willey street, from Hanover, northeast.....		6	35
Total.....			3,387
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<i>Fire hydrant connections relaid.....</i>		6	380
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<i>Repairs, general.....</i>		4	43
“ “		6	1,225
“ “		10	177
“ “		12	102
Total.....			1,547
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<i>Pipe taken up.</i>			
Allen street, from 5 feet southwest of southwest house line of Hanover, northeast.....		4	58
Allen street, from 8 feet 4 inches southwest of centre of Palmer, northeast.....		4	35
Bodine street, from 2 feet 6 inches south of south house line of Buttonwood, north.....		4	57
Brook street, from Buttonwood, north.....		4	23
Callowhill street, from Delaware avenue to Front.....		3	236
China street, from Diamond, north.....		4	29
Clearfield street, from Germantown avenue, west... ..		6	21
Germantown avenue, from Second street, northwest.....	}	6	97
		10	52
Hanover street, from Beach, northwest.....		4	126
Hanover street, from Allen, northwest.....		4	53
Kensington avenue, east side, 26 feet north of Connecting Railroad, north.. ..		6	23
Keyser street, from Hanover, northeast.....		4	29
Kressler street, from 4 feet south of south house line of Diamond, north.....		4	29
Lawrence street, from 2 feet 6 inches south of south house line of Diamond, north		4	56
Leithgow street, from Diamond, north.....		4	28
Manakin street, from Diamond, north.....		4	30
Margaretta street, from Front, west.....		3	39
Orchard street, from Rawle, north.....		4	13
Orianna street, from 3 feet 4 inches south of south house line of Diamond, north.....		4	57

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe cut off and abandoned.</i>			
Hanover street, from 98 feet southeast of centre of Allen, northwest.....		4	98
Hanover street, from 150 feet southeast of centre of Richmond, northwest.....		4	150
Water street, from Vine, north.....		4	123
Willey street, from Hanover, northeast.....		4	25
Total.....			396
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<i>Fire hydrant connections cut off and abandoned.....</i>		4	752

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RECAPITULATION OF THIRD DISTRICT.

Purposes for which Used.	Size—Inches.									Totals in feet and pounds.	
	3	4	6	8	10	12	30	36	48		
New pipe or feet added.	Service mains.....			15,596	629	24					16,249
	Supply mains.....							1,688	1,006		2,727
	Supply main connections.....					32					32
	Fire hydrant connections.....			1,942							1,912
	Fire connections (private).....		45								45
	Supply connections (private).....		23								23
	Drains.....			12							12
	Total.....		68	17,550	629	56	33		1,688	1,006	21,030
		1,292	579,150	26,418	3,080	2,376		712,336	588,510	1,913,162	
Pipe used, but adding nothing to feet in ground.	Pipe relaid.....			3,456		311					3,767
	Repairs general.....		43	1,225		177	102				1,547
	Pipe taken up.....	39	2,912	698		52					3,601
	Pipe lowered.....			1,244		1,062	931	1,062			4,299
	Pipe shifted.....			25							25
	Total.....	39	2,955	6,548		1,602	1,033	1,062			13,230
		585	56,145	216,084		88,110	74,376	352,584			787,884
	Total handled.....	39	3,023	24,098	629	1,658	1,066	1,062	1,688	1,006	34,269
	585	67,437	795,234	26,418	91,190	76,762	352,584	712,336	588,510	2,701,046	
Pipe cut off and abandoned.....		1,148								1,148	

FOURTH DISTRICT.

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

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Allegheny avenue, north side, from dead end 134 feet 9 inches west of west house line of Sixteenth street to Seventeenth.....		6	289
Allegheny avenue, north side, from dead end 50 feet west of west house line of Nineteenth street to east house line of Twentieth.....		6	346
Arizona street, from Twenty fifth to Twenty-sixth.....		6	452
Arizona street, from dead end 1 foot east of east house line of Thirtieth, west.....		6	50
Aubrey street, from Thirteenth, west.....		6	19
Bancroft street, from north house line of Susquehanna avenue to 235 feet north of north house line of Dauphin		6	816
Bancroft street, from Clearfield to south house line of Park		6	257
Bergdoll street, from Brown to Parrish.....		6	385
Berks street, from Twenty-seventh to Connecticut avenue..		6	605
Bishop street, from Park avenue to Broad.....		6	329
Bouvier street, from Dauphin to York.....		6	551
Camac street, from Dauphin to south house line of York		6	525
Cambria street, from 24 feet east of centre of Twenty-second, west.....		6	50
Carlisle street, from centre of Susquehanna avenue, north, to connect dead end..		6	21
Carlisle street, dead end 34 feet 6 inches north of north house line of Kay to Cumberland.....		6	211
Carlisle street, from 168 feet south of south house line of Clearfield, north.....		6	196
Church street, from 26 feet 3 inches east of west house line of Twenty-seventh to Twenty-eighth.....		6	420
Clearfield street, from Sixteenth to Bancroft.....		6	163
Clearfield street, from 250 feet east of east house line of Twenty-second, west.....		6	293
Cleveland avenue, from Susquehanna avenue to south house line of Dauphin.....		6	570
Coffman street, from west house line of Park avenue to Broad.....		6	300
Colorado street, from Dauphin to York.....		6	550
Connecticut avenue, from Berks to Ridge avenue.....		6	438
Dauphin street, from dead end 22 feet east of centre of Eighteenth, west.....		6	22
Dauphin street, from 4 feet 7 inches west of east house line of Twenty-second, west.....		6	55

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Dauphin street, from 31 feet 10 inches southeast of centre of Sedgley avenue, northwest.....		6	55
Dauphin street, from centre of Twenty-fifth, west, to connect dead end.....		6	12
Delhi street, from centre of Diamond, north.....		6	28
Diamond street, from dead end east house line of Ninth, west, to connect dead end.....		6	14
Diamond street, north side, from 51 feet east of east house line of Harrison, west.....		6	53
Diamond street, north side, from dead end 1 foot 6 inches east of west house line of Harrison avenue to Twenty-ninth.....		6	161
Edgely street, from 137 feet east of east house line of Marston, west.....		6	152
Eighteenth street, from Susquehanna avenue to Dauphin..		6	590
Etting street, from Montgomery avenue to Berks.....		6	552
Fawn street, from dead end 210 feet north of north house line of Dauphin to south house line of York.....		6	291
Firth street, from Twelfth to Thirteenth.....		6	449
French street, from Twenty-ninth to Thirtieth.....		6	461
Glenwood avenue, from Berks to Ridge avenue.....		6	431
Glenwood avenue, from 17 feet 3 inches northeast of west house line of Broad, northeast.....		6	122
Grant street, from Twenty-fourth to Twenty-fifth.....		6	450
Gratz street, from 6 feet south of south house line of Susquehanna avenue to 5 feet 10 inches north of south house line of Dauphin.....		6	602
Herman street, from centre of Sedgely avenue, west.....		6	46
Indiana avenue, from 6 feet west of east house line of Twenty-second, west.....		6	49
Jefferson street, from Twenty-eighth to Twenty-ninth.....		6	460
Jessup street, from Cumberland to Huntingdon.....		6	555
Maple street, from centre of York, north.....		6	276
Marston street, from south house line of Berks, north.....		6	25
Marston street, from 15 feet 2 inches south of centre of Sedgely avenue, north.....		6	15
Marston street, from York to south house line of Cumberland.....		6	527
McFall street, from 86 feet south of centre of Church, north.....		6	86
Oxford street, from east to west house line of Twenty-ninth		6	70
Page street, from dead end 259 feet 6 inches west of west house line of Twenty-ninth to east house line of Thirtieth.....		6	141
Park street, from 200 feet east of east house line of Twenty-second, west.....		6	232
Park terrace, from Twenty-seventh street to Pennock.....		6	181
Philadelphia street, from dead end 388 feet north of north house line of Dauphin to York.....		6	137

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Philadelphia (or Helm) street, from 211 feet south of south house line of Indiana avenue, north, to connect dead end.....		6	211
Rush street, from 24 feet east of centre of Twenty-second, west.....		6	51
Sedgely avenue, from dead end 91 feet 8 inches northeast of east house line of Twenty-fourth street to York.....		8	253
Showaker street, from Twenty-seventh to east house line of Twenty-eighth.....		6	378
Sixteenth street, from Susquehanna avenue to Dauphin.....		6	590
Somerseth street, from 33 feet 8 inches west of east house line of Broad, west.....		6	81
Susquehanna avenue, south side, from Eighteenth street to Nineteenth.....		6	451
Susquehanna avenue, north side, from Broad street to Fifteenth.....		6	462
Susquehanna avenue, north side, from 97 feet 6 inches east of east house line of Twenty-second street, west.....		6	125
Taney street, from Montgomery avenue, north.....		6	288
Thirteenth street, from York to Cumberland.....		6	550
Twenty-second street, from Susquehanna avenue to York.....		6	1,135
Twenty-second street, from 208 feet south of south house line of Cambria to Park.....		6	1,608
Twenty-fourth street, from centre of Sedgely avenue, north.....		6	39
Twenty-fifth street, from Sedgely avenue to York.....		6	675
Twenty-sixth street, from dead end 13 feet north of north house line of Master to Jefferson.....		6	468
Twenty-seventh street, from 39 feet south of centre of Sedgely avenue, north.....		6	90
Twenty-seventh-and-one-half street (or New York avenue) from Berks to Glenwood avenue.....		6	278
Twenty-eighth street, from Mt. Pleasant to dead end 6 feet north of south house line of Thompson.....		6	209
Twenty-eighth street, from dead end 1 foot south of north house line of Thompson to dead end 131 feet south of south house line of Master.....		6	292
Twenty-eighth street, from south house line of Berks, north.....		6	25
Twenty-eighth street, from centre of Sedgely avenue, north.....		6	39
Twenty-eighth street, from York to south house line of Cumberland.....		6	527
Twenty-ninth street, from Master to Jefferson.....		6	502
Twenty-ninth street, from south to north house line of Oxford.....		6	50
Thirtieth street, from Herman to York.....		12	278
Thirty-first street, from 2 feet 9 inches south of south house line of Dakota, north.....		6	19
Valeria street, from dead end 57 feet 6 inches east of centre of Francis, west.....		6	58

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Willington street, from dead end 1 foot north of north house line of Susquehanna avenue, north, to connect dead end.....		6	256
Wright street, from dead end 21 feet east of centre of Twenty-sixth, west.....		6	21
York street, from 25 feet 6 inches east of centre of Thirtieth, west.....		6	51
Total.....			25,196
<i>Supply mains.</i>			
Supplementary lift, from East Park reservoir to dead end of old 36-inch connection 84 feet northeast of standpipe.....		36	1,865
Supplementary lift, from dead end of old 36-inch connection 102 feet south of standpipe to No. 11 engine.....		36	398
Supplementary lift, air chamber.....		30	38
Second section, from 231 feet west of east house line of Thirty-third street across New York Division of Pennsylvania Railroad.....		48	148
Total.....			2,449
<i>Pumping Mains.</i>			
East Park Reservoir (No. 12 main), from connection with No. 11 Main south of south side of reservoir to overflow at intersection of division banks.....		48	666
East Park Reservoir, from No. 12 main, intersection of south with west division bank to supply section No. 3.....		48	60
Spring Garden Station, from 40 feet 11 inches northeast of No. 11 engine house northwest.....		48	194
Total.....			920
<i>Service Main Connections.</i>			
Glenwood avenue and Broad street, between 6-inch main on Glenwood avenue and 12-inch main on east side of Broad street.....		6	27

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply Main Connections.</i>			
Spring Garden Station, 132 feet east of storehouse between 36-inch Lehigh or No. 10 main and East Park supplementary lift.....		36	73
Spring Garden Station, 10 feet 4 inches southeast of standpipe between 36-inch supplementary lift and 36-inch connection to standpipe.....		20	12
Total.....			85
<i>Pumping Main Connections.</i>			
East Park Reservoir, south of south side of reservoir between No. 11 and No. 12 mains.....		48	30
Spring Garden Station, from No. 11 East Park 48-inch main 49 feet northeast of engine house northeast to No. 10 Lehigh Reservoir 36-inch main.....		36	91
Spring Garden Station, Fairmount connection, from No. 7 to No. 11 mains, 84 feet 1 inch northeast of engine house		48	346
Total.....			467
<i>Fire hydrant connections</i>		6	1,595
<i>Fire connections (private).</i>			
Allegheny avenue, north side, 46 feet 6 inches east of Philadelphia and Reading Railroad (Germantown branch), for George V. Cresson.....		4	10
Fairmount avenue, north side, 81 feet east of east house line of Broad street, for Park Theatre.....		4	15
Twelfth street, west side, 218 feet 6 inches north of north house line of Susquehanna avenue, for Citizens' Passenger Railway Company.....		4	129
Twenty-first street, west side, 190 feet south of south house line of Spring Garden, for Wood & McGill.....		6	30
Total			184
<i>Drains.</i>			
East Park, north of Snyder's woods, draw-off on 36-inch main		6	9
East Park, north of Snyder's woods, draw-off on 48-inch main		6	9

Street.	Location.	Size in inches.	Distance in feet.
<i>Drains—Continued.</i>			
East Park, 7-16 feet south of Columbia avenue, draw-off on 36-inch main.....		6	13
East Park, south of Columbia avenue, draw-off on 48-inch main.....		6	12
East Park Reservoir, on west division bank.....		3	78
Spring Garden Station, from iron springs.....	}	4	158
		6	24
		3	8
Spring Garden Station, in front of engine house.....	}	4	8
		6	153
		2	14
Spring Garden Station, on air chamber.....	}	12	5
Thirtieth street, west side, 18 feet 4 inches north of south house line of Ogden, from 10-inch main.....		6	11
Total.....			472
<i>Pipe Relaid.</i>			
Address street, from centre of Mount Vernon, north.....		6	24
Carlton street, from Twelfth to Thirteenth.....		6	551
Dauphin street, from 12 feet west of centre of Twenty-fifth, west.....		6	13
East Park Reservoir, southeast chamber.....		48	21
Franklin street, from 4 feet 5 inches south of south house line of Thompson, north.....		6	48
Hart street, from Tenth to Warnock.....		6	221
Hutchinson street, from 11 feet south of south house-line of Jefferson, north.....		6	26
Oxford street, from 170 feet 9 inches west of west house line of Twenty-eighth to east house line of Twenty-ninth.....		6	229
Pemberton street, from centre of Mt. Vernon, north.....		6	27
Percy street, from Poplar to Girard avenue.....		6	737
Sixth street, from 14 feet north of south house line of Diamond, north.....		6	36
Spring Garden Station, connection between No. 6 and No. 11 pumping main.....		36	17
Spring Garden Station, from 49 feet northeast to engine house northeast on No. 11, 48-inch pumping main.....		48	62
Spring Garden Station, 10 feet east No. 11 boiler house...		4	45
Thompson street, south side, from east to west house line of Franklin.....		6	57
Thompson street, north side, from east to west house line of Franklin.....		6	57
Total.....			2,221

Street.	Location.	Size in inches.	Distance in feet.
<i>Fire hydrant connections relaid</i>		6	259
<i>Repairs, general</i>		4	74
"	"	6	1,150
"	"	8	11
"	"	10	23
"	"	12	43
"	"	16	16
"	"	30	8
"	"	36	47
"	"	48	95
Total			1,467
<i>Pipe taken up.</i>			
Address street, from centre of Mt. Vernon, north.....		4	24
East Park Reservoir, southeast chamber.....		48	21
Franklin street, from 4 feet 5 inches south of south house line of Thompson, north.....		4	48
Hart street, from Tenth to Warnock.....		4	221
Hutchinson street, from 11 feet south of south house line of Jefferson, north.....		4	26
Percy street, from Poplar to Girard avenue.....		4	787
Sixth street, from 14 feet north of south house line of Diamond, north.....		4	36
Spring Garden Station on No. 11 48-inch pumping main..		48	22
Spring Garden Station suction pipe to No. 11 engine.....		36	9
Spring Garden Station discharge pipe from No. 11 engine		10	24
Thompson street, south side, from east to west house line of Franklin.....		4	57
Thompson street, north side, from east to west house line of Franklin.....		4	57
Total			1,332
<i>Fire hydrant connections taken up</i>		4	204
"	"	6	8
Total.....			212
<i>Pipe lowered.</i>			
Berks street, from 149 feet east of centre of Glenwood avenue, west.....		6	174
Glenwood avenue, from Berks, northeast.....		6	151
Sedgely avenue, from 136 feet southwest of west house line of Twenty-fifth to 60 feet northeast of north house line of Dauphin.....		8	445

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe lowered—Continued.</i>			
Seventeenth street, from Park to Allegheny avenue.....		6	179
Thompson street, from 88 feet west of west house line of Twenty-seventh, west		36	151
Twenty-eighth street, from 25 feet south of centre of Berks north		6	25
Total			1,125
<i>Pipe raised.</i>			
Diamond street, from 46 feet east of east house line of Eighth to east house line of Ninth.....		6	330
Oxford street, from 15 feet west of west house line of Twenty-eighth, west.....		6	156
Total			486
<i>Pipe cut off and abandoned.</i>			
Carlton street, from Twelfth to Thirteenth.....		4	404
Darien street, from centre of Diamond, north.....		6	15
East Park Reservoir, southeast chamber.....		48	12
Eighth street, from south house line of Diamond, north...		6	57
Oxford street, from 170 feet 9 inches west of west house line of Twenty-eighth to east house line of Twenty- ninth.....		6	229
Pemberton street, from centre of Mt. Vernon, north.....		4	25
Twenty-fourth street, from 179 feet south of south house line of Callowhill, south.....		6	24
Total.....			766
<i>Fire hydrant connections cut off and abandoned.....</i>			
“ “ “ “		4	782
“ “ “ “		6	58
Total.....			840

RECAPITULATION OF FOURTH DISTRICT.

Purposes for which used.	Size—Inches.												Totals in feet and pounds.		
	2	3	4	6	8	10	12	16	20	30	36	48			
New pipe or feet added.	Service mains.....				24,665	253		278						25,196	
	Supply mains.....									38	2,263	148		2,449	
	Pumping mains.....											920		920	
	Service main connections.....				27									27	
	Supply main connections.....									12		73		85	
	Pumping main connections.....											91	376	467	
	Fire-hydrant connections.....				1,595										1,595
	Fire connections (private).....			154	30										184
	Drains.....	14	86	166	201			5							472
	Total... { feet.....	14	86	320	26,518	253		283		12	38	2,427	1,444		31,395
{ pounds.....	140	1,290	6,080	875,091	10,626		20,376		1,908	12,616	1,024,194	844,740		2,797,964	
Pipe used, but adding nothing to feet in ground.	Pipe relaid.....			45	2,335						17	83		2,480	
	Repairs general.....			74	1,150	11	23	43	16		8	47		1,467	
	Pipe taken up.....			1,460	8		24					9	43	1,744	
	Pipe lowered.....				529	445						151		1,125	
	Pipe raised.....				486										486
	Total... { feet.....			1,579	4,508	456	47	43	16		8	224	221		7,102
{ pounds.....			30,001	148,764	19,152	2,585	3,096	1,760		2,656	94,528	129,285		431,827	
Total handled... { feet.....	14	86	1,899	31,026	709	47	326	16	12	46	2,651	1,665		38,497	
{ pounds.....	140	1,290	36,081	1,023,858	29,778	2,585	23,472	1,760	1,908	15,272	1,118,722	974,025		3,228,891	
Pipe cut off and abandoned.....			1,211	383									12	1,606	

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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 street, from dead end southwest house line of Manayunk avenue to 2 feet southwest of southwest house line of Vincent.....		6	208
Belair street, from Roxborough avenue to dead end 8 feet northwest of centre of Cotton.....		6	215
Bowman street, from dead end 233 feet northeast of centre of Thirty-fifth, northeast.....		6	48
Centre street, from Clay, northeast, to connect dead end...		6	23
Charles street, from Pechin, northeast.....		6	221
Clay street, from Centre to 12 feet northwest of southeast house line of Church.....		6	255
Cotton street, from southwest to northeast house line of Belair.....		6	40
Dexter street, from dead end 460 feet 6 inches northwest of northwest house line of Lyceum avenue to southeast house line of Green lane.....		6	195
Freeland avenue, from dead end 247 feet northwest of northwest house line of Roxborough avenue, northwest.....		6	331
Grape street, from Belair, northeast.....		6	20
Hamilton street, from Centre to Church.....		6	217
Hamilton street, from Leverington to Jefferson.....		6	728
Hernit street, from Manor to 9 feet northeast of southwest house line of Manayunk avenue.....		6	156
Hill street, from 12 feet southeast of northwest house line of Levering to Lyceum avenue.....		6	432
James avenue, from dead end 251 feet northeast of northeast house line of Houghton avenue, northeast.....		6	48
Kram's avenue, from dead end 402 feet northeast of northeast house line of Mitchell to Ridge avenue.....		6	201
Manayunk avenue from southeast house line of Martin street to dead end southeast house line of Lyceum avenue.....		10	340
Markle street, from Pechin, northeast.....		6	25
Markle street, from northeast house line of Mitchell to Ridge avenue.....		6	414
Martin street, from Manayunk avenue northeast to dead end.....		6	15
Pechin street, from Markle to dead end northwest house line of Kingsley.....		6	634
Pechin street, from dead end northwest house line of Martin to dead end southeast house line of Lyceum avenue.....		6	300
Ripka avenue, from dead end 12 feet northeast of southwest house line of Hamilton street, northeast, to connect.....		6	8

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Roxborough avenue, from 35 feet northeast of northeast house line of Fleming street to Belair.....		12	157
Roxborough avenue, from Ridge avenue to 12 feet northeast of southwest house line of Houghton.....		6	580
Terrace street, from dead end 144 feet northwest of northwest house line of Cedar to southeast house line of Penn.....		6	52
Tioga street, from Township Line road to Twenty-third.....		6	348
Total.....			6,211
<i>Pumping Mains.</i>			
Livezey's lane, from Allen's lane to Wizard avenue; Wizard avenue, from Livezey's lane to Shawmont avenue; Shawmont avenue, from Wizard avenue to Ann street; Ann, from Shawmont avenue to Reservoir.....		30	10,901
<i>Supply Main connections.</i>			
Roxborough reservoir, southeast side, between 30-inch reservoir connection and 30-inch main to Mt. Airy....		30	61
<i>Pumping Main connections.</i>			
Roxborough reservoir, from 20-inch pumping main 200 feet southwest of centre of southwest end of reservoir to Williams lane, to Ann street, connecting at Ann to 20-inch Manayunk main and to 20-inch Mt. Airy main.....		20	970
<i>Fire hydrant connections.....</i>		6	212
<i>Fire Connections (private).</i>			
Ridge avenue, northeast side, 220 feet southeast of southeast house line of Crawford, for John and James Dobson.....		4	13

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe Relaid</i>			
Fire hydrant connections.....		6	47
<i>Repairs, general.</i>			
" ".....		4	4
" ".....		6	99
" ".....		20	32
" ".....		30	8
Total.....			143
<i>Pipe lowered.</i>			
Hemlock street, from Righter, northeast.....		6	654
Krams avenue, from 251 feet southwest of southwest house line of Ridge avenue, northeast.....		6	72
Leverington avenue, from centre of Selig, northeast.....		6	334
Leverington avenue, from Pechin to 409 feet northeast of southwest house line of Mitchell.....		6	898
Linden street, from 191 feet northwest of northwest house line of Jefferson, northwest.....		6	109
Manayunk avenue, from southeast house line of Green lane to northwest house line of Conarroe.....		6	245
Mitchell street, from 275 feet southeast of centre of Leverington avenue, northwest.....		6	275
Queen lane, from southwest to northeast house line of Thirty-fourth.....		6	65
Ridge avenue, northeast side, from centre of Roxborough avenue, northwest.....		6	75
Ridge avenue, southwest side, from 22 feet northwest of northwest house line of Roxborough avenue, northwest.....		12	240
Righter street, from 368 feet southeast of centre of Hemlock, northwest.....		6	168
School lane, from 412 feet southeast of northeast house line of Ridge avenue, northwest.....		6	412
Thirty-fifth street, from Fairview avenue, northwest.....		6	100
Total.....			3,647
<i>Fire hydrant connections lowered.</i>		6	44
<i>Pipe cut off and abandoned</i>			
Fire hydrant connections.....		6	14

RECAPITULATION OF FIFTH DISTRICT.

Purposes for which used.	Size.—Inches.						Totals in feet and pounds.
	4	6	10	12	20	30	
New pipe or feet added.	Service mains		5,714	340	157		6,211
	Pumping mains.....					10,901	10,901
	Supply main connections.....					61	61
	Pumping main connections.....					970	970
	Fire hydrant connections.....		212				212
	Fire connections (private).....	13					13
	Total.....						
	13	5,926	340	157	970	10,962	18,368
	247	195,558	18,700	11,304	154,230	3,639,384	4,019,423
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....		47				47
	Repairs, general.....	4	99			8	143
	Pipe lowered.....		3,471		240		3,691
	Total.....						
		4	3,597		240	32	8	3,881
	76	118,701		17,280	5,088	2,656	143,801
Total handled.....							
	17	9,523	340	397	1,002	10,970	22,249
	323	314,259	18,700	28,584	159,318	3,612,040	4,165,224
Pipe cut off and abandoned.....		14					14

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>			
Abington avenue, from southwest house line of Twenty-third street to Stenton avenue.....		6	546
Alfred street, from Penn to Coulter.....		6	350
Atlantic street, from Seventh, west.....		6	183
Baker street, from dead end 5 feet 8 inches southwest of centre of Nice to Clinton.....		6	256
Bouvier street, from Ontario to south house line of Estaugh		6	250
Boyer street, from Mount Pleasant to Mount Airy avenue		6	865
Broad street, east side, from Cayuga to Rockland.....		12	2,845
Bruner street, from southwest house line of Wayne, northeast.....		6	63
Carlisle street, from south house line of Ontario, north.....		6	25
Carlisle street, from Tioga to Venango.....		6	551
Cayuga street, from 30 feet west of east house line of Broad, west, to connect dead end.....		6	4
		12	50
Chelten avenue, from dead end 3 feet southwest of southwest house line of Boyer street to Stenton avenue.....		6	2,469
Chew street, from 215 feet southeast of southeast house line of Tulpehocken, northwest.....		6	240
Chew street, from Russell to Meehan avenue.....		12	443
Clinton avenue, from Baker street to Barr.....		6	508
Crefeldt street, from Chestnut Hill avenue to southeast house line of Norris.....		6	725
Delaware street, from Twentieth to Twenty-first.....		6	531
Eighteenth street, from Ontario to Tioga.....		6	550
Eighteenth street, from Venango to Pacific.....		6	274
Emlen street, from Westview avenue, northwest, to connect dead end.....		6	150
Erie avenue, north side, from Sixteenth street to Seventeenth.....		6	453
Fifteenth street, from south house line of Ontario, north.....		6	25
Green street, from Carpenter to Ellet.....		6	769
Hancock street, from southeast to northwest house lines of Pastorius.....		6	45
Juniata street, from southwest house line of Wayne, northeast.....		6	50
Lafayette street, from dead end 417 feet northeast of northeast house line of Wayne to Green.....		6	671
Little Wayne street, from southeast house line of Lehman, northwest.....		6	17
Locust street from Chew to Bloyd.....		6	367
Lynch street, from southeast house line of Seymour, northwest.....		6	25

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Meehan avenue, from dead end 2 feet southwest of southwest house line of Chew, northeast		6	42
Mead street, from Twenty-seventh to Twenty-eighth.....		6	668
Mermaid lane, from Germantown avenue to northeast house line of Twenty-fifth street.....		6	1,268
Mount Pleasant street, from Boyer to Devon.....		6	636
Nice street, from Baker to Barr.....		6	526
Ontario street, from east house line of Broad to Sixteenth..		6	979
Osceola street, from Pastorius, northwest,.....		6	20
Pacific street, from centre of Seventeenth, west.....		6	29
Penn street, from Morris to Patton avenue.....		6	182
Pulaski avenue, from Erie, north.....		6	243
Pulaski avenue, from School lane to Cheltenham.....		6	765
Rittenhouse street, from Pulaski avenue to Wayne.....		6	406
Seelgwick street, from Green, northeast, to connect dead end.....		6	25
Seventeenth street, from 97 feet south of north house line of Erie avenue, north.....		6	69
Seventh street, from south house line of Atlantic to Venango.....		6	293
Seymour street, from Knox, northeast.....		6	262
Sixteenth street, from dead end 63 feet south of north house line of Erie avenue, north.....		6	35
Tenth street, from 140 feet south of south house line of Ontario, north.....		6	165
Walnut lane, from 730 feet southwest of southwest house line of Wayne street, northeast (connected to private pipe laid by H. H. Houston).....		6	218
Washington lane, from dead end southwest house line of Adams street northeast.....		6	25
Wayne street, from Bruner, northwest.....		6	36
Westmoreland street, from Twenty-first to Twenty-second..		6	439
Westview avenue, from Emlen to dead end, 111 feet 6 inches northeast of northeast house line of Quincy to Emlen.....		6	929
Willow avenue, from 206 feet 10 inches southeast of southeast house line of Woodbine, northwest.....		6	262
Wisteria street, from 194 feet 6 inches southwest of southwest house line of Baynton avenue, northeast.....		6	220
Woodbine street, from Willow avenue, northeast.....		6	212
Total.....			23,254
<i>Pumping Mains.</i>			
Allen's lane, from Livezey's lane to McCallum.....		30	2,357

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Main Connections.</i>			
Nicetown lane and Reading Railroad, between 12-inch main on Nicetown lane, and 6-inch main on Reading Railroad		6	12
<i>Pumping Main Connections.</i>			
Allen's lane and Mc'allum street, between 30-inch main on Allen's lane, and 16-inch main on Mc'allum street		16	36
Allen's lane, 4 feet northeast of northeast house line of Mc'allum, between 30-inch main on northwest side, and 20-inch main on southeast side of Allen's lane.....		20	12
Allen's lane, 32 feet 9 inches northeast of northeast house line of Mc'allum, between 30-inch main on northwest side, and 16-inch main on southeast side of Allen's lane.....		16	22
Total.....			70
<i>Bypass Connections.</i>			
Johnson street, southeast side, between 10-inch main on Germantown avenue, and 12-inch main on Johnson...		12	40
<i>Fire hydrant connections</i>		6	893
<i>Drains.</i>			
Walnut lane, southeast side, southwest of abutment of Pennsylvania Railroad bridge, from 6-inch main.....		1	24
<i>New Check Valve.</i>			
Livezey's lane, 265 feet southwest of southwest house line of Mc'allum, on 30-inch main.....		30	.....
<i>Pipe Relaid.</i>			
Adams street, from Rittenhouse to Harvey.....		6	588
Broad street, from Rockland to East Logan.....		12	971
East Logan street, from York road to Broad.....		6	175

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe relaid—Continued.</i>			
Johnson street, from Germantown avenue, northeast, to 12 feet 7 inches northeast of northeast house line of Morton.....		12	882
Walnut lane, from 12 feet 6 inches northeast of northeast house line of Hancock to Morton.....		6	1,017
Wissahickon avenue, from 20 feet southeast of abutment of Philadelphia and Reading Railroad (Richmond Branch) bridge, northwest, under tracks.....		10	147
Woodbine avenue, from 254 feet 9 inches southwest of southwest house line of Wilson, northeast.....		6	277
York road, from Fisher's lane to 187 feet 6 inches northwest of northwest house line of Olney road.....		6	3,175
Total.....			7,232
<hr/>			
<i>Fire hydrant connections relaid.....</i>		6	393
<hr/>			
<i>Repairs, general.....</i>		3	8
“ “		4	25
“ “		6	349
“ “		8	4
“ “		10	33
“ “		12	10
“ “		16	23
“ “		20	34
Total.....			486
<hr/>			
<i>Pipe taken up.</i>			
Wissahickon avenue, from 20 feet southeast of abutment of Philadelphia and Reading Railroad (Richmond Branch) bridge, northwest.....		6	107
Woodbine street, from 254 feet 9 inches southwest of southwest house line of Wilson, northeast.....		3	269
York road, from Fisher's lane to Olney.....		3	2,188
Total.....			2,564
<hr/>			
<i>Fire hydrant connections taken up.....</i>		3	15
“ “ “		4	408
“ “ “		6	14
Total.....			437

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe lowered.</i>			
Allen's lane, northwest side, from 32 feet southwest of southwest house line of Wayne, northeast, private pipe.....		3	20
Knox street, from 340 feet southeast of southeast house line of Manheim, northwest.....		6	180
Lafayette street, from Wayne, northeast.....		6	300
Nineteenth street, from Itschner to Westmoreland.....		6	355
School lane, between Gypsy lane and Wissahickon avenue, Seymour street, from 170 feet 9 inches southwest of southwest house line of Green, northeast.....		6	1,768
Upsal street, from northeast house line of Green, northeast.....		6	103
Upsal street, from 505 feet northeast of northeast house line of Green, northeast.....		10	150
Upsal street, from 455 feet northeast of northeast house line of Green, northeast.....		10	148
Upsal street, from 455 feet northeast of northeast house line of Green, northeast.....		10	355
Total.....			3,379
<i>Fire hydrant connections, lowered.....</i>			
		6	53
<i>Pipe raised.</i>			
Upsal street, from 150 feet northeast of northeast house line of Green, northeast.....		10	355
<i>Pipe cut off and abandoned.</i>			
Adams street, from Rittenhouse to Harvey.....		4	588
Broad street, from Rockland to East Logan.....		4	971
East Logan street, from Broad to York road.....		4	175
Johnson street, from Germantown avenue to Morton.....		4	884
School lane, from Gypsy lane to Wissahickon avenue.....		4	6,000
Walnut lane, from Hancock to Morton.....		4	1,017
York road, from Fisher's lane to Olney.....		3	987
Total.....			10,622

RECAPITULATION OF SIXTH DISTRICT.

Purposes for which used.	Size—Inches.										Totals in feet and pounds.		
	1	3	4	6	8	10	12	16	20	30			
New pipe or feet added.	Service mains.....				19,916			3,338				23,254	
	Pumping mains.....										2,357	2,357	
	Service main connections.....				12							12	
	Pumping main connections.....							58	12			70	
	Bye pass connections.....							40				40	
	Fire hydrant connections.....				893							893	
	Drains.....	24										24	
	Total.....												
{ Feet.....	24			20,821			3,378	58	12		2,357	26,650	
{ Pounds.....	120			687,093			243,216	6,380	1,908		782,524	1,721,241	
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....				5,623		147	1,853				7,623	
	Repairs general.....		8	25	349	4	33	10	23	34		486	
	Pipe taken up.....		2,472	408	121							3,001	
	Pipe lowered.....		20		2,759			653				3,432	
	Pipe raised.....							355				355	
	Total.....												
	{ Feet.....		2,500	433	8,874	4	1,188	1,863	23	34			14,899
	{ Pounds.....		37,500	8,227	292,182	163	65,340	134,136	2,530	5,406			545,489
Total handled.....													
{ Feet.....	24	2,500	433	29,675	4	1,188	5,241	81	46		2,357	41,549	
{ Pounds.....	120	37,500	8,227	979,275	168	65,340	377,352	8,910	7,314		782,524	2,266,730	
Pipe cut off and abandoned.....		987	9,635									10,622	

RECAPITULATION OF WORK ON THE WATER PIPES.

Purposes for which used.		Size—Inches.														Total in feet and pounds.		
		1	1½	2	3	4	6	8	10	12	16	20	30	36	48			
New pipe or feet added.	Service mains.....						108,152	882	364	7,758	376						117,532	
	Supply mains.....									33				3,951	1,154		5,176	
	Pumping mains.....												13,258		920		14,178	
	Service main connections.....						39										39	
	Supply main connections.....									32						73	178	
	Pumping main connections.....											58	12	61	91	376	1,507	
	Bypass connections.....										40						40	
	Fire-hydrant connections.....						7,221										7,221	
	Fire connections (private).....					473	100										573	
	Supply connections (private).....					115	44										159	
	Motor connections (private).....				20	31											51	
	Drains.....	24	9	14	86	166	213				5						517	
Total..... { feet.....		21	9	14	106	785	115,769	882	396	7,836	434	994	13,357	4,115	2,450		147,171	
{ pounds.....		120	63	140	1,390	14,915	3,820,377	37,041	21,780	561,192	47,740	158,046	4,434,521	1,736,530	1,433,250		12,270,811	
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....				32	75	19,059		458	1,853				17	83		21,577	
	Repairs general.....				33	197	4,432	132	340	224	64	66	16	47	95		5,046	
	Pipe taken up.....				6,710	8,080	899		76					9	43		15,817	
	Pipe lowered.....				20		9,366	445	1,715	1,171			1,062	151			13,930	
	Pipe raised.....						486		355								841	
	Pipe shifted.....						25										25	
	Total..... { feet.....					6,795	8,352	34,267	577	2,944	3,248	64	66	1,078	224	221		57,836
	{ pounds.....					101,925	158,688	1,130,811	24,234	161,920	233,856	7,040	10,494	357,896	94,528	129,285		2,410,677
Total handled... { feet.....		24	9	14	6,901	9,137	150,036	1,159	3,340	11,084	498	1,060	14,435	4,339	2,671		205,007	
{ pounds.....		120	63	140	103,515	173,603	4,951,188	61,278	183,700	798,048	54,780	168,540	4,792,420	1,831,058	1,562,535		14,680,988	
Pipe cut off and abandoned.....					1,438	12,966	471								12		14,887	

RECAPITULATION BY DISTRICTS.

DISTRICTS.	SIZE—INCHES.														TOTALS.	
	1	1½	2	3	4	6	8	10	12	16	20	30	36	48	Feet.	Pounds.
New pipe or feet added.	First.....				122	22,356			282						22,760	760,370
	Second.....		9		20	262	22,698		3,703	376					26,968	1,059,051
	Third.....				68	17,550	629	56	33				1,688	1,006	21,030	1,913,162
	Fourth.....			14	86	320	26,518	253	283		12	38	2,427	1,444	31,395	2,797,064
	Fifth.....					13	5,926		340		157	970	10,962		18,368	4,019,423
	Sixth.....	24					20,821			3,378	58		12	2,357	26,650	1,721,241
	Total {	24	9	14	106	785	115,760	882	396	7,836	434	904	13,357	4,115	2,450	147,171
pounds.....	120	63	140	1,590	14,915	3,820,377	37,044	21,780	564,192	47,740	158,046	4,434,524	1,736,530	1,433,250		12,270,311
Pipe used but adding nothing to feet in the ground.	First.....			1,180	1,599	3,898	4	10	28	10					6,729	180,549
	Second.....			3,076	1,782	5,862	113	97	41	15					11,986	321,127
	Third.....			39	2,935	6,548		1,602	1,033			1,062			13,239	787,884
	Fourth.....				1,579	4,508	456	47	43	16		8	224	221	7,102	431,827
	Fifth.....				4	3,597			240			32	8		3,881	143,801
	Sixth.....				2,500	433	8,854	4	1,188	1,863	23	34			14,899	545,489
	Total {				6,795	8,352	34,267	577	2,944	3,248	64	66	1,078	224	221	57,836
pounds.....				101,925	158,688	1,130,811	21,234	161,920	233,856	7,040	10,494	357,896	94,328	129,285		2,410,677
Total handled {	24	9	14	6,901	9,137	150,036	1,459	3,340	11,084	498	1,060	14,435	4,339	2,671	205,007	
pounds.....	120	63	140	103,515	173,603	4,951,188	61,278	183,700	798,048	54,780	168,540	4,792,420	1,831,058	1,562,535		14,680,988
Pipe cut off and abandoned.....				1,438	12,966	471								12	14,887	

NEW FIRE HYDRANTS. FIRST DISTRICT.

Street.	Location.	Ward.	Size of main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New No. 1.	New No. 2.	New No. 3.
Argyle street, north side, 240 feet west of west house line of Fifth.....		1	6	8 ft. 6 in.		1		
Bainbridge street, north side of market house, 150 feet east of east house line of Fourth.....		4	6	12 ft.		1		
Bainbridge street, north side of market house, 103 feet west of west house line of Fourth.....		4	6	13 ft.		1		
Bainbridge street, north side, southeast house line of Passyunk avenue.....		4	6	13 ft.				1
Bainbridge street, north side, 1 foot west of west house line of Fifth.....		4	6	14 ft. 8 in.				1
Baltimore street, east side, 283 feet north of north house line of Federal.....		26	4	7 ft. 6 in.		1		
Broad street, west side, north house line of Moore.....		26	6	6 ft. 6 in.				1
Broad street, northeast corner of Ellsworth.....		2	6	7 ft.				1
Carlisle street, east side, 72 feet south of south house line of Moore.....		26	6	8 ft.		1		
Carpenter street, south side, west house line of Eleventh.....		2	6	13 ft.				1
Carpenter street, north side, east house line of Twenty-fifth.....		30	12	15 ft.				1
Catharine street, south side, 4 feet east of east house line of Second.....		3	8	16 ft.				1
Catharine street, south side, east house line of Essex.....		3	6	15 ft.				1
Chippewa street, east side, north house line of Bainbridge.....		30	6	16 ft.				1
Christian street, north side, 11 feet east of southeast house line of Gray's Ferry road.....		30	6	23 ft.				1
Cross street, north side, southeast house line of Long lane.....		26	6	8 ft.		1		

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of main in inches.	CONNECTION.		STYLE.			
				6 in.		Old.	New No. 1.	New No. 2.	New No. 3.
Darien street, east side, 88 feet south of south house line of Jackson.....		1	6	8 ft. 6 in.			1		
Deshong street, north side, 1 foot west of west house line of Twenty-sixth.....		26	6	8 ft.			1		
Dickinson street, south side, west house line of Ash.....		1	6	15 ft.				1	
Dickinson street, north side, east house line of Sixteenth.....		26	6	15 ft.				1	
Dickinson street, south side, east house line of Seventeenth.....		26	6	14 ft.				1	
Dickinson street, north side, 127 feet 6 inches east of east house line of Nineteenth.....		26	6	15 ft. 6 in.			1		
Dudley street, north side, 58 feet east of east house line of East Second.....		1	6	8 ft.			1		
East Second street, west side, south house line of Mifflin.....		1	6	16 ft.				1	
Eighteenth street, west side, south house line of Washington avenue.....		26	6	16 ft. 6 in.				1	
Eleventh street, northwest corner of Mifflin.....		1	6	16 ft. 6 in.				1	
Ellsworth street, north side, east house line of Fifteenth.....		26	6	14 ft.				1	
Fallon street, west side, south house line of Catharine.....		3	6	17 ft. 6 in.			1		
Federal street, south side, east house line of Tenth.....		26	6	17 ft.				1	
Federal street, south side, west house line of Eleventh.....		26	6	15 ft. 6 in.				1	
Federal street, south side, east house line of Thirteenth.....		26	6	16 ft.				1	
Federal street, south side, east house line of Twenty-third.....		26	6	14 ft.				1	
Fifteenth street, east side, 1 foot north of south house line of Dickinson.....		26	6	14 ft.				1	

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Fifteenth street, west side, south house line of Catharine.....		30	6	10 ft.				1
Fitzwater street, north side, 166 feet 9 inches west of west house line of Eighteenth.....		30	6	16 ft.				1
Fitzwater street, south side, 17 feet east of southeast house line of Gray's Ferry road.....		30	6	16 ft. 6 in.				1
Forbes street, east side, 132 feet north of north house line of Bainbridge.....		30	6	11 ft.				1
Fourth street, west side, north house line of Bainbridge.....		4	6	15 ft.				1
Front street, west side, south house line of Mifflin.....		1	6	16 ft.				1
Front street, west side, south house line of Morris.....		1	6	16 ft. 6 in.				1
Gerhard street, west side, 51 feet north of north house line of Mifflin.....		1	6	8 ft. 6 in.		1		
Hoffman street, north side, 66 feet east of east house line of Second.....		1	6	8 ft.		1		
Hubbell street, east side, 2 feet south of south house line of Fitzwater.....		3	6	5 ft.		1		
Justice street, north side, west house line of Twenty-sixth.....		26	6	12 ft.				1
McClellan street, south side, 103 feet east of east house line of Twentieth.....		26	6	10 ft.		1		
McKean street, south side, 176 feet west of west house line of Fourth.....		1	6	15 ft.		1		
McKean street, south side, east house line of Eleventh.....		1	6	16 ft.				1
Mt. Holly street, east side, 2 feet south of south house line of Wharton.....		26	4	8 ft. 6 in.		1		
Mifflin street, south side, 231 feet east of east house line of Meadow.....		1	6	15 ft.		1		
Mifflin street, south side, west house line of Meadow.....		1	6	14 ft.				1

NEW EIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches	CONNECTION.		STYLE.		
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Montrose street, south side, east house line of Twenty-fifth.....		30	6	9 ft.		1		
Moore street, northeast corner of Broad.....		26	6	16 ft. 6 in.			1	
Moore street, south side, east house line of Fifteenth.....		26	6	14 ft. 6 in.			1	
Morris street, south side, east house line of Cuba.....		1	6	14 ft. 6 in.			1	
Morris street, south side, east house line of Dorrance.....		26	6	15 ft.		1		
Moyamensing avenue, southeast side, 3 feet south of south house line of Mifflin.....		1	6	9 ft.			1	
Moyamensing avenue, northwest side, south house line of Mifflin.....		1	6	9 ft.			1	
Nineteenth street, west side, south house line of Dickinson.....		26	12	15 ft.			1	
Nineteenth street, east side, 3 feet south of south house line of Reed.....		26	12	15 ft.			1	
Nineteenth street, west side, south house line of Christian.....		30	6	15 ft.			1	
Nineteenth street, west side, 1 foot south of south house line of Fitzwater.....		30	6	15 ft.			1	
Parker street, west side, 102 feet south of south house line of Washington avenue.....		2	6	11 ft. 6 in.		1		
Reed street, north side, 6 feet west of west house line of Delaware avenue.....		1	6	5 ft.		1		
Reed street, north side, 29 feet west of west house line of Meadow.....		1	6	5 ft.		1		
Reed street, north side, 67 feet east of east house line of Swanson.....		1	6	5 ft.		1		
Reed street, north side, west house line of Otsego.....		1	6	5 ft.		1		
Ristine street, east side, 245 feet south of south house line of Jackson.....		1	6	8 ft. 6 in.		1		

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New No. 1.	New No. 2.	New No. 3.
Rosewood street, east side, 175 feet north of north house line of Milflin.....		26	6	8 ft. 10 in.		1		
Russell street, east side, south house line of Bainbridge.....		4	6	4 ft.		1		
Second street, west side, 232 feet south of south house line of Snyder avenue.....		1	6	16 ft.		1		
Second street, west side, north house line of Snyder avenue.....		1	6	15 ft. 6 in.			1	
Seventeenth street, east side, south house line of Reed.....		26	6	14 ft.			1	
Siegel street, north side, 127 feet east of east house line of Reed.....		26	6	10 ft.		1		
Sixteenth street, east side, south house line of Moore.....		26	6	15 ft.			1	
Sixteenth street, east side, south house line of Reed.....		26	6	15 ft.			1	
Sixth street, west side, south house line of Wolf.....		1	6	14 ft.			1	
South Marshall street, south side, 5 feet 8 inches east of east house line of Broad.....		2	4	9 ft.		1		
Tasker street, north side, 174 feet east of Fifth.....		1	6	14 ft. 6 in.		1		
Tenth street, west side, south house line of Washington avenue.....		2	6	15 ft.			1	
Third street, east side, south house line of Wharton.....		1	6	15 ft.			1	
Thirteenth street, west side, south house line of Dickiusion.....		26	6	15 ft.			1	
Titan street, north side, west house line of Eleventh.....		26	6	8 ft. 6 in.		1		
Twelfth street, east side, 2 feet south of south house line of Federal.....		26	6	15 ft.			1	
Twelfth street, east side, north house line of Ellsworth.....		2	6	15 ft.			1	

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Twelfth street, west side, south house line of Carpenter.....		2	6	15 ft. 6 in.			1	
Twelfth street, west side, south house line of Fitzwater.....		3	6	15 ft. 9 in.			1	
Twentieth street, east side, 2 feet north of north house line of Wharton....		26	6	15 ft.			1	
Twentieth street, southeast corner of Reed.....		26	6	17 ft.				1
Twenty-fourth street, west side, north house line of Carpenter.....		30	6	15 ft.			1	
Twenty-fourth street, west side, opposite north house line of St. Alban's place.....		30	6	15 ft.			1	
Twenty-third street, east side, south house line of Fitzwater.....		30	6	14 ft. 6 in.			1	
Wharton street, south side, west house line of Eleventh.....		26	6	14 ft.			1	
Wharton street, north side, east house line of Sixteenth.....		26	6	14 ft.			1	
Wharton street, north side, east house line of Seventeenth.....		26	6	15 ft.			1	
Total.....				1,207 ft. 9 in.		33	59	2

New Fire Hydrants—Continued.
SECOND DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New No. 1.	New No. 2.	New No. 3.
Ackley street, east side, 5 feet south of south house line of Cathedral.....		24	6	8 ft. 3 in.	1			
Albion street, west side, 158 feet north of north house line of Spruce.....		8	6	5 ft. 3 in.	1			
Albion street, east side, opposite centre of Spring.....		10	6	6 ft. 8 in.	1			
Arch street, south side, east house line of Eleventh.....		9	30	9 ft.				1
Arch street, south side, west house line of Thirteenth.....		9	30	9 ft.				1
Ashland street, northwest side, 253 feet northeast of northeast house line of Fifty-eighth.....		27	6	16 ft. 4 in.	1			
Baltimore avenue, south side, 5 feet 10 inches west of west house line of Fifty-third.....		27	12	20 ft. 10 in.				1
Baltimore avenue, south side, 17 feet east of east house line of Fifty-eighth.....		27	12	9 ft.				1
Baring street, south side, west house line of Thirty-fourth.....		24	6	17 ft. 8 in.				1
Bay street, north side, 144 feet west of west house line of Sixth.....		5	6	3 ft. 9 in.	1			
Egglefield street, north side, 246 feet west of west house line of Fortieth.....		24	6	8 ft. 7 in.	1			
Egglefield street, south side, 5 feet 6 inches west of west house line of Thirty-ninth.....		24	6	10 ft. 8 in.	1			
Eighth street, east side, 3 feet south of south house line of Chestnut.....		8	10	13 ft.				1
Eleventh street, east side, north house line of Marble alley.....		9	10	14 ft. 6 in.				1
Eleventh street, east side, 4 feet south of south house line of Chestnut.....		8	10	14 ft. 6 in.				1
Fifteenth street, west side, south house line of Locust.....		8	6	14 ft.				1

NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Fiftieth street, southeast side, 5 feet northwest of northwest house line of Pentridge.....		27	6	22 ft.			1	
Fifty-eighth street, east side, 41 feet north of north rail of Media Railroad.....		27	6	9 ft. 4 in.		1		
Fifty-eighth street, east side, 15 feet north of north house line of Ashland avenue.....		27	6	20 ft. 10 in.		1		
Fifty-third street, west side, south house line of Wyalusing avenue.....		24	6	17 ft. 5 in.			1	
Filbert street, north side, east house line of Twentieth.....		9	6	14 ft. 6 in.			1	
Filbert street, south side, 8 feet east of east house line of Eighth.....		9	6	10 ft. 6 in.			1	
Filbert street, north side, east house line of State.....		24	6	13 ft. 4 in.			1	
Forty-eighth street, west side, 200 feet southwest of southwest house line of Lancaster avenue.....		24	6	21 ft. 10 in.		1		
Forty-fifth street, west side, 2 feet north of north house line of Aspen.....		24	6	14 ft.			1	
Forty-five-and-one-quarter street, west side, 206 feet north of north house line of Paschall.....		27	6	9 ft. 5 in.		1		
Forty-seventh street, west side, south house line of Warrington.....		27	6	21 ft. 9 in.			1	
Forty-third street, west side, south house line of Wyalusing avenue.....		24	6	14 ft. 5 in.			1	
Forty-third street, west side, north house line of Pennsgrove.....		24	6	14 ft. 2 in.			1	
Front street, west side, 5 feet north of north house line of Dock.....		5	8	17 ft. 6 in.			1	
Front street, west side, north house line of Lombard.....		5	8	17 ft.			1	
Front street, east side, north house line of South.....		5	8	17 ft.			1	
Haverford street, south side, west house line of Fifty-third.....		24	12	21 ft. 9 in.			1	

NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New No. 1.	New No. 2.	New No. 3.
Jefferson street, south side, 4 feet west of southwest house line of Lancaster avenue.....		24	6	12 ft.			1	
Kingsessing avenue, south side, 11 feet east of east house line of Forty-seventh.....		27	6	23 ft. 10 in.			1	
Kingsessing avenue, northwest side, 8 feet northeast of northeast house line of Forty-eighth.....		27	6	22 ft. 10 in.		1		
Lancaster avenue, northeast side, west house line of Thirty-second.....		24	6	20 ft. 10 in.			1	
Lancaster avenue, northeast side, west house line of Thirty-third.....		24	8	24 ft. 11 in.			1	
Lancaster avenue, northeast side, east house line of Thirty-fifth street.....		24	8	24 ft. 11 in.			1	
Lancaster avenue, north side, opposite centre of Thirty-seventh street.....		24	8	25 ft.			1	
Lancaster avenue, south corner Powelton.....		24	8	26 ft.			1	
Lancaster avenue, northeast side, east house line of Thirty-eighth street.....		24	8	24 ft.			1	
Lancaster avenue, south side, west house line of Fifty-fourth.....		24	6	14 ft. 11 in.			1	
Landis street, north side, 121 feet west of west house line of Fourth.....		5	6	3 ft. 10 in.		1		
Locust street, north side, 3 feet west of west house line of Broad.....		8	6	14 ft. 6 in.			1	
Market street, south side, 2 feet west of west house line of Twentieth.....		9	6	8 ft. 8 in.			1	
Market street, north side, 3 feet west of west house line of Twenty-first.....		9	6	8 ft.			1	
Market street, south side, 4 feet west of west house line of Nineteenth.....		9	6	7 ft. 6 in.			1	
Merion street, north side, east house line of Fifty-fifth.....		24	6	11 ft. 11 in.		1		
Middle alley, south side, 179 feet 6 inches west of west house line of Sixth.....		5	6	4 ft. 9 in.		1		

NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

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Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Nineteenth street, west side, 4 feet north of north house line of Chestnut.....		9	6	14 ft. 6 in.			1	
Otter street, north side, 5 feet 6 inches east of east house line of Belmont avenue.....		24	6	10 ft. 10 in.		1		
Pentridge street, southeast side, 325 feet northeast of northeast house line of Fiftieth.....		27	6	15 ft. 5 in.		1		
Paschall avenue, south side, opposite centre of Forty-five-and-one-half or Oak.....		27	6	8 ft. 8 in.			1	
Pennsgrove street, south side, 66 feet west of west house line of Forty-second.....		24	6	10 ft. 11 in.			1	
Pino street, north side, 104 feet east of east house line of Eleventh.....		7	6	14 ft. 6 in.		1		
Race street, south side, 4 feet west of west house line of Hillsdale.....		6	6	14 ft.		1		
Reno street, north side, 5 feet east of east house line of Fortieth.....		24	6	7 ft. 11 in.		1		
Renwick street, west side, 389 feet southeast of southeast house line of Woodland avenue....		27	6	8 ft. 11 in.		1		
Sansom street, south side, 3 feet west of west house line of Ninth.....		8	6	11 ft.			1	
Second street, east side, south house line of Dock.....		5	6	14 ft.			1	
Seventeenth street, east side, north house line of Barker.....		9	6	13 ft. 10 in.			1	
Seventeenth street, west side, 1 foot north of north house line of Filbert.....		9	6	14 ft. 6 in.			1	
Seventeenth street, east side, 5 feet south of south house line of Arch.....		9	6	14 ft. 6 in.			1	
Sixth street, west side, north house line of Jayne.....		6	6	14 ft.			1	
Sherborne street, north side, 12 feet east of east house line of Forty-ninth.....		27	6	18 ft. 4½ in.		1		
Sloan street, west side, 5 feet north of north house line of Poplar.....		24	6	7 ft. 7 in.		1		

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NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6 in	Old.	New No. 1.	New No. 2.	New No. 3.
Springfield avenue, south side, east house line of Forty-seventh.....		27	6	22 ft. 6 in.				1
Stamper's street, north side, 181 feet 6 inches east of east house line of Third.....		5	3	4 ft. 4 in.		1		
Tenth street, east side, 3 feet south of south house line of Chestnut.....		8	6	14 ft. 6 in.				1
Tenth street, east side, 163 feet north of north house line of Chestnut.....		9	6	14 ft. 6 in.				1
Thirteenth street, east side, 6 feet north of north house line of Leiper.....		9	6	17 ft. 6 in.				1
Thirteenth street, west side, south house line of Sansom.....		8	6	14 ft. 6 in.				1
Thirteenth street, west side, north house line of Filbert.....		9	6	14 ft.				1
Thirteenth street, west side, south house line of Walnut.....		8	6	14 ft.				1
Thirteenth street, west side, 5 feet south of south house line of Pine.....		7	6	13 ft. 8 in.				1
Thirty-fifth street, west side, north house line of Baring.....		24	8	14 ft. 6 in.				1
Thirty-sixth street, east side, southwest house line of Lancaster avenue.....		24	6	16 ft. 10½ in.				1
Thirty-sixth street, west side, north house line of Locust.....		27	6	19 ft.				1
Thirty-seventh street, east side, 5 feet north of north house line of Sansom.....		27	6	18 ft.		1		
Thirty-ninth street, west side, north house line of Sansom.....		27	6	17 ft. 10 in.				1
Twelfth street, west side, south house line of Arch.....		9	6	14 ft.				1
Twelfth street, east side, north house line of Filbert.....		9	6	14 ft.				1
Twelfth street, east side, north house line of Market.....		9	6	14 ft.				1

NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6 in.	Old	New, No. 1.	New, No. 2.	New, No. 3.
Twelfth street, east side, south house line of Chestnut.....		8	6	14 ft.			1	
Twelfth street, east side, south house line of Sansom.....		8	6	14 ft.			1	
Twelfth street, east side, 218 feet south of south house line of Spruce.....		7	6	14 ft. 2 in.			1	
Twelfth street, west side, south house line of Pine.....		7	6	14 ft.			1	
Twenty-second street, west side, north house line of St. James' place.....		8	12	22 ft. 6 in.			1	
Vine street, south side, east house line of Fifty-fifth.....		24	6	25 ft. 1 in.			1	
Vine street, north side, 2 feet west of west house line of Fifty-fourth.....		24	6	28 ft. 6 in.			1	
Wallace street, north side, 4 feet east of east house line of Thirty-fourth.....		24	6	14 ft. 3 in.			1	
Westminster avenue, south side, west house line of Forty-fourth.....		24	12	13 ft. 8 in.			1	
Total.....				1,370 ft. 6 in.		25	68	

New Fire Hydrants—Continued.
THIRD DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.	
Albert street, north side, 5 feet east of east house line of Kensington.....		31	6	16 ft. 10 in.			1		
Almond street, west side, north house line of Cumberland.....		31	6	14 ft. 9 in.			1		
Ann street, south side, east house line of Thompson.....		25	6	13 ft. 8 in.			1		
Ann street south side, east house line of Frankford.....		25	6	15 ft. 3 in.			1		
Arrott street, north side, west house line of Oakland.....		23	6	14 ft. 8 in.			1		
Arrott street, north side, west house line of Leiper.....		23	6	14 ft. 3 in.			1		
Arrott street, north side, west house line of Horrocks.....		23	6	14 ft. 6 in.			1		
Arrott street, north side, west house line of Large.....		23	6	14 ft. 6 in.			1		
Arrott street, north side, east house line of "P".....		23	6	14 ft. 4 in.			1		
Bevan street, west side, east house line of Canal.....		16	4	8 ft. 8 in.			1		
Beaver street, north side, 221 feet south of south house line of Lehigh avenue.....		25	6	10 ft.		1			
Belgrade street, southeast side, northeast house line of Montgomery avenue.....		18	6	12 ft. 1 in.			1		
Bellmore street, south side, west house line of Amber.....		25	6	9 ft. 3 in.			1		
Bridge street, west side, 275 feet north of Philadelphia & Trenton Railroad.....		23	6	14 ft.		1			
Bridge street, west side, south house line of Thomas.....		25	6	14 ft. 6 in.			1		
Brown street, south side, east house line of Second.....		11	6	15 ft. 7 in.			1		

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
					6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Buttonwood street, south side, west house line of St. John.....		11	6	12 ft. 8 in.			1	
Buttonwood street, north side, 42 feet west of west house line of Dillwyn.....		12	6	11 ft. 4 in.		1		
Buttonwood street, south side, east house line of Old York road.....		12	6	15 ft.			1	
Cambria street, north side, east house line of Marshall.....		19	6	14 ft. 9 in.			1	
Canal street, north side, south house line of George.....		16	6	12 ft. 6 in.			1	
Cedar street, west side, south house line of Hewson.....		18	4	18 ft.			1	
Cedar street, east side, north house line of Ann.....		25	6	17 ft. 10 in.			1	
Charlotte street, west side, south house line of Thompson.....		17	4	8 ft. 6 in.			1	
Cherry street, west side, opposite Margaretta.....		23	6	14 ft. 6 in.			1	
Cherry street, east side, 150 feet south of south house line of Foulkrod.....		23	6	14 ft. 7 in.		1		
Clearfield street, south side, west house line of Richmond.....		25	6	18 ft. 9 in.			1	
Clearfield street, north side, east house line of Clifton.....		25	6	18 ft. 2 in.			1	
Clearfield street, north side, west house line of Amber.....		25	6	16 ft. 10 in.			1	
Clearfield street, north side, west house line of Fourth.....		33	6	15 ft. 3 in.			1	
Clementine street, north side, 281 feet east of east house line of Kensington avenue.....		25	6	10 ft. 10 in.		1		
Clementine street, south side, west house line of Jasper.....		25	6	11 ft. 5 in.			1	
Collins street, north side, west house line of Sargent.....		31	6	11 ft. 10 in.			1	

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Columbia avenue, south side, east house line of Mascher.....		19	6	9 ft.			1	
Columbia avenue, south side, east house line of Hancock.....		19	6	15 ft. 9 in.			1	
Diamond street, south side, east house line of Fourth.....		19	6	15 ft.			1	
Diamond street, south side, east house line of Lawrence.....		19	6	15 ft. 7 in.			1	
Diamond street, south side, east house line of Fifth.....		19	6	14 ft. 9 in.			1	
Diamond street, south side, east house line of Kessler.....		19	6	14 ft. 6 in.			1	
Edgemont street, east side, north house line of York.....		18	6	13 ft. 10 in.			1	
Elkhart street, south side, opposite Joyce.....		25	6			1		
Emerald street, east side, south house line of Cumberland.....		31	12	7 ft. 8 in.			1	
Emerald street, west side, 349 feet north of north house line of Ontario.....		25	6	14 ft. 5 in.			1	
Fillmore street, west side, southwest house line of Gurney.....		33	6	13 ft. 4 in.			1	
Fourth street, west side, north house line of Huntingdon.....		19	6	14 ft. 7 in.			1	
Fourth street, west side, 161 feet north of north house line of Indiana avenue.....		38	6	14 ft. 7 in.		1		
Fox street, west side, 185 feet south of south house line of Gurney.....		38	6	9 ft. 3 in.		1		
Fox street, east side, south house line of Gurney.....		38	6	9 ft. 6 in.			1	
Fox street, south side, west house line of Trenton avenue.....		31	4	11 ft. 8 in.			1	
Frankford avenue, west side, south house line of Master.....		17	10	20 ft.			1	

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE .			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.	
Front street, east side, 117 feet 6 inches north of north house line of Callowhill.....		11	10	18 ft. 6 in.	.....	1			
Front street, east side, opposite north house line of Ellen.....		16	10	18 ft. 6 in.	.....			1	
Front street, west side, south house line of Master.....		17	6	18 ft. 11 in.	.....			1	
Front street, west side, south house line of Westmoreland.....		33	6	19 ft.	.....			1	
Front street, west side, south house line of Ontario.....		33	6	19 ft.	.....			1	
Front street, west side, south house line of Tioga.....		33	6	19 ft.	.....			1	
Germantown avenue, west side, south house line of Susquehanna avenue.....		20	6	19 ft. 3 in.	.....			1	
Germantown avenue, southwest side, north house line of Cumberland.....		28	6	18 ft. 8 in.	.....			1	
Girard avenue, southeast side, north house line of Ash.....		18	4	9 ft. 5 in.	.....			1	
Girard avenue, northwest side, southwest house line of Morton.....		18	4	8 ft. 7 in.	.....			1	
Glenwood avenue, south side, west house line of Fifth.....		33	6	19 ft.	.....			1	
Hancock street, west side, 99 feet 2 inches south of south house line of Jefferson.....		17	6	14 ft. 8 in.	.....			1	
Hancock street, east side, south house line of Oxford.....		17	6	15 ft. 8 in.	.....			1	
Hancock street, west side, north house line of Lehigh avenue.....		33	36	42 ft. 6 in.	.....			1	
Hanover street, northeast side, southeast house line of Allen.....		18	6	14 ft. 4 in.	.....			1	
Hanover street, southwest side, southeast house line of Richmond.....		18	6	15 ft. 8 in.	.....			1	
Hanover street, southwest side, southeast house line of Wildey.....		18	6	14 ft. 10 in.	.....			1	

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Hewson street, northeast side, north west house line of Wildey.....		18	6	9 ft. 2 in.			1	
Hope street, west side, 355 feet south of south house line of Ontario.....		33	6	8 ft.		1		
Howard street, east side, 36 feet south of south house line of Harrison.....		19	6	14 ft. 7 in.			1	
Huntingdon street, south side, east house line of Cedar.....		31	6	18 ft. 5 in.			1	
Huntingdon street, north side, east house line of Fillmore.....		19	6	15 ft. 4 in.			1	
Huntingdon street, north side, 39 feet 6 inches west of west house line of Fox.....		31	6	14 ft. 8 in.			1	
Huntingdon street, south side, west house line of Lee.....		19	6	14 ft. 8 in.			1	
Huntingdon street, southeast corner of Waterloo.....		19	6	16 ft.				1
Huntingdon street, south side, west house line of Mutter.....		19	6	13 ft.			1	
Huntingdon street, north side, east house line of Lawrence.....		19	6	14 ft. 6 in.			1	
James street, south side, west house line of Bridge.....		23	6	15 ft. 10 in.			1	
James street, west side, 3 feet south of south house line of Margaretta.....		23	6	16 ft. 5 in.	1			
Jasper street, east side, south house line of Ella.....		31	6	14 ft. 3 in.			1	
Jefferson street, northwest corner of Cadwalader.....		17	6	15 ft. 8 in.				1
Jefferson street, south side, west house line of Fourth.....		17	6	15 ft.			1	
Jefferson street, north side, west house line of Fifth.....		17	6	14 ft.			1	
Jenks street, north side, west house line of Dwyer.....		25	6	10 ft. 4 in.		1		

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
"K" street, west side, north house line of Venango		33	6	15 ft. 3 in.			1	
"K" street, east side, south house line of Erie avenue.....		33	6	14 ft. 2 in.			1	
"K" street, east side, 166 feet north of north house line of Erie avenue.....		33	6	13 ft. 7 in.			1	
Kennedy street, east side, south house line of James		23	6	14 ft. 7 in.			1	
Kensington avenue, east side, south house line of Erie avenue.....		33	6	11 ft. 7 in.			1	
Lawrence street, west side, south house line of Lehigh avenue.....		19	6	14 ft. 9 in.			1	
Lee street, east side, 239 feet south of south house line of Cambria.....		33	6	9 ft. 1 in.			1	
Lehigh avenue, south side, east house line of Frankford avenue.....		31	6	10 ft. 11 in.			1	
Letterly street, north side, west house line of Coral.....		31	4	11 ft. 7 in.			1	
Lewis street, south side, west house line of Tacony road.....		23	6	19 ft. 8 in.			1	
Margaretta street, south side, west house line of Front.....		11	6	16 ft. 3 in.			1	
Marshall street, east side, south house line of Huntington.....		19	6	15 ft. 7 in.			1	
Mascher street, west side, south house line of Dauphin.....		19	6	14 ft. 7 in.			1	
Mascher street, east side, south house line of Putnam.....		19	6	14 ft. 4 in.			1	
Montgomery avenue, north side, west house line of Third.....		19	6	14 ft.			1	
Mulberry street, southeast side, south house line of Penn.....		23	6	13 ft.			1	
Neff street, south side, west house line of Edgemont.....		25	6	13 ft. 6 in.			1	

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Neff street, north side, east house line of Mercer.....		25	6	14 ft. 10 in.			1	
New Market street, east side, south house line of Ellen.....		16	6	15 ft. 7 in.			1	
Ninth street, east side, north house line of Cambria.....		33	6	15 ft.			1	
Norris street, south side, west house line of Girard avenue.....		18	6	22 ft. 10 in.			1	
Ontario street, north side, west house line of Emerald.....		25	8	18 ft. 9 in.			1	
Ontario street, south side, 202 feet west of west house line of Third.....		33	6	14 ft. 6 in.			1	
Orianna street, east side, 64 feet south of south house line of York.....		19	4	8 ft. 7 in.		1		
Orkney street, west side, north house line of Indiana.....		33	6	7 ft. 7 in.			1	
Orleans street, southeast side, northwest house line of Amber.....		25	6	9 ft.			1	
Orleans street, northwest corner of Frankford avenue.....		25	6	16 ft. 3 in.				1
Orthodox street, north side, east house line of Tackawanna.....		23	6	18 ft.			1	
Orthodox street, northeast corner of James.....		23	6	17 ft. 2 in.				1
Otsego street, east side, south house line of Gurney.....		33	6	10 ft. 2 in.			1	
Phillip street, east side, south house line of Diamond.....		19	6	8 ft. 7 in.			1	
Porter's avenue, centre of street, on dead end, north of Cemetery lane.....		25	6			1		
Reese street, on dead end 230 feet north of north house line of Glenwood avenue.....		33	6	14 ft. 6 in.			1	
Richmond street, east side, 292 feet 3 inches north of north house line of Clearfield.....		25	6	18 ft. 4 in.			1	
Second street, west side, 100 feet west of west house line of Cambria.....		33	6	19 ft.	1			
Sellers street, north side, 343 feet northwest of northwest house line of Johnson.....		23	6	16 ft. 7 in.	1			

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.	
Seltzer street, south side, east house line of Front.....		33	4	9 ft. 6 in.			1		
Silver street, north side, 1 foot 6 inches west of west house line of Front.....		33	4	11 ft. 5 in.			1		
Sixth street, east side, south house line of Norris.....		19	4	8 ft. 2 in.			1		
Sixth street, west side, north house line of Westmoreland.....		33	6	14 ft.			1		
Sixth street, west side, 260 feet north of north house line of Glenwood avenue.....		33	10	14 ft.			1		
Somerset street, north side, west house line of Edgemont.....		25	6	21 ft.			1		
Somerset street, north side, east house line of "C".....		33	6	14 ft. 9 in.			1		
Stella street, south side, east house line of Frankford avenue.....		25	6	8 ft. 7 in.			1		
Susquehanna avenue, south side, west house line of Tulip.....		31	6	13 ft. 4 in.			1		
Thomas street, west side, south house line of Ruan.....		23	6	13 ft. 11 in.			1		
Thompson street, south side, west house line of Frankford avenue.....		16	6	15 ft. 6 in.			1		
Waln street, south side, 288 feet 8 inches north of north house line of Tackawanna.....		23	6	11 ft. 8 in.	1				
Water street, east side, north house line of Vine.....		11	6	15 ft.			1		
Water street, west side, 130 feet south of south house line of Callowhill.....		11	6	12 ft. 8 in.		1			
Water street, west side, 110 feet north of north house line of Callowhill.....		11	6	12 ft. 5 in.		1			
Waterloo street, west side, 110 feet east of east house line of Mascher.....		19	6	9 ft.		1			
Worth street, north side, 100 feet west of west house line of Margaretta.....		23	6	16 ft. 9 in.			1		
Total.....				1941 ft. 8 in.	4	16	118	4	

New Fire Hydrants—Continued.
FOURTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 2.
Allegheny avenue, north side, 4 feet 5 inches east of east house line of Seventeenth.....		28	6	8 ft. 1 in.			1	
Amboy street, west side, 209 feet south of south house line of Columbia avenue.....		20	6	11 ft. 5 in.		1		
Arizona street, south side, east house line of Twenty-sixth.....		28	6	8 ft. 9 in.			1	
Bancroft street, east side, 244 feet 3 inches north of north house line of Susquehanna avenue.....		28	6	8 ft. 9 in.		1		
Bancroft street, west side, 7 feet south of south house line of Park.....		28	6	8 ft. 3 in.		1		
Bergdoll street, west side, south house line of Parrish.....		15	6	8 ft.		1		
Berks street, south side, 77 feet 6 inches east of east house line of Twenty-third.....		32	6	14 ft.			1	
Bouvier street, west side, 13 feet 8 inches south of south house line of York.....		28	6	8 ft.		1		
Broad street, west side, south house line of Brown.....		15	12	37 ft.			1	
Broad street, west side, south house line of Huntington.....		28	6	11 ft. 8 in.			1	
Broad street, west side, south house line of Somerset.....		28	6	15 ft.			1	
Broad street, east side, north house line of Somerset.....		28	12	18 ft. 5 in.			1	
Brown street, south side, east house line of Franklin.....		13	6	15 ft. 2 in.			1	
Camac street, west side, 1 foot south of south house line of York.....		28	6	8 ft. 6 in.			1	
Cambria street, south side, 5 feet east of east house line of Twelfth.....		28	6	14 ft.			1	
Carlisle street, east side, south house line of Columbia avenue.....		29	6	11 ft.			1	

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Carlisle street, west side, north house line of Dauphin.....		28	6	12 ft.			1	
Carlton street, north side, 6 feet 3 inches east of east house line of Thirteenth.....		14	6	4 ft. 11 in.		1		
Clearfield street, north side, east house line of Twenty-second.....		28	6	14 ft. 5 in.			1	
Cleveland avenue, east side, 199 feet south of south house line of Dauphin.....		28	6	8 ft.			1	
Coffman street, north side, west house line of Park avenue.....		28	6	12 ft.		1		
Colorado street, west side, 13 feet 6 inches south of south house line of York.....		28	6	8 ft. 8 in.		1		
Connecticut avenue, north side, 18 feet west of southwest house line of Ridge avenue.....		32	6	6 ft. 6 in.		1		
Diamond street, north side, 1 foot east of east house line of Marshall.....		20	6	18 ft.			1	
Diamond street, south side, east house line of Seventh.....		20	6	15 ft. 7 in.			1	
Diamond street, north side, 6 feet east of east house line of Germantown Railroad.....		20	6	14 ft. 5 in.			1	
Diamond street, south side, east house line of Warnock.....		20	6	13 ft. 5 in.			1	
Diamond street, north side, east house line of Twelfth.....		32	6	16 ft.			1	
Diamond street, south side, east house line of Camac.....		32	6	14 ft. 7 in.			1	
Diamond street, north side, east house line of Park avenue.....		32	6	14 ft. 9 in.			1	
Eighteenth street, east side, south house line of Dauphin.....		28	6	11 ft. 7 in.			1	
Eighth street, east side, south house line of Poplar.....		13	6	15 ft. 4 in.			1	
Eighth street, west side, 2 feet south of south house line of Susquehanna avenue.....		20	6	17 ft. 3 in.			1	

NEW FIRE HYDRANTS--FOURTH DISTRICT--Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Eleventh street, west side, south house line of Cambria street.....		28	6	15 ft. 6 in.			1	
Etting street, east side, 21 feet south of south house line of Berks.....		82	6	5 ft. 4 in.			1	
Fairmount avenue, south side, east house line of Franklin.....		13	10	14 ft. 5 in.			1	
Fifteenth street, east side, south house line of Green.....		15	6	15 ft. 6 in.			1	
Fifteenth street, east side, south house line of Cambridge.....		29	6	15 ft.			1	
Firth street, south side, west house line of Twelfth.....		28	6	9 ft.		1		
Franklin street, west side, north house line of Noble.....		13	6	17 ft. 6 in.			1	
Franklin street, east side, south house line of Buttonwood.....		13	6	15 ft. 8 in.			1	
Franklin street, east side, south house line of Spring Garden.....		13	6	15 ft.			1	
Franklin street, east side, 114 feet 6 inches north of north house line of Green.....		13	6	15 ft. 9 in.		1		
Franklin street, east side, 6 feet south of south house line of Diamond.....		20	6	14 ft. 6 in.			1	
French street north side, 123 feet east of east house line of Thirtieth*.....		32	6	9 ft. 10 in.		1		
Glenwood street, northwest side, 1 foot southwest of southwest house line of Ridge avenue.....		32	6	10 ft. 6 in.			1	
Grant avenue, south side, 1 foot 6 inches west of west house line of Twenty-fourth.....		29	6	10 ft. 6 in.			1	
Gratz street, east side, 243 feet 6 inches north of north house line of Susquehanna avenue.....		28	6	6 ft. 8 in.		1		
Green street, north side, east house line of Franklin.....		13	6	14 ft. 6 in.			1	
Harrison avenue, east side, north house line of Diamond.....		82	6	16 ft. 10 in.			1	

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.	
Hart street, south side, east house line of Warnock.....		20	6	7 ft. 8 in.	.....	1			
Herman street, south side, 1 foot 2 inches west of west house line of Twenty-sixth.....		28	6	15 ft.	.....			1	
Herman street, north side, 147 feet east of east house line of Twenty-seventh.....		28	6	15 ft. 5 in.	.....			1	
Herman street, south side, 81 feet 3 inches east of east house line of Twenty-eighth.....		28	6	13 ft. 10 in.	.....			1	
Hutchinson street, west side, 6 feet south of south house line of Jefferson.....		20	6	11 ft. 6 in.	.....			1	
Jefferson street, north side, east house line of Seventh.....		20	6	14 ft. 9 in.	.....			1	
Jefferson street, south side, west house line of Franklin.....		20	6	14 ft. 5 in.	.....			1	
Jefferson street, south side, 128 feet east of east house line of Twenty-second.....		29	6	15 ft. 6 in.	.....			1	
Jefferson street, south side, west house line of Twenty-eighth.....		29	6	14 ft. 3 in.	.....			1	
Jessup street, west side, 68 feet 9 inches south of south house line of Huntington.....		28	6	10 ft. 5 in.	.....	1			
Kessler street, west side, south house line of Parrish.....		13	6	12 ft. 6 in.	.....			1	
Marshall street, west side, north house line of Green.....		13	6	15 ft. 6 in.	.....			1	
Marshall street, west side, 2 feet north of north house line of Fairmount avenue.....		13	6	19 ft.	.....			1	
Marshall street, west side, north house line of Brown.....		13	6	16 ft. 6 in.	.....			1	
Marshall street, east side, 2 feet 6 inches south of south house line of Poplar.....		13	6	15 ft.	.....			1	
Marshall street, east side, south house line of Oxford.....		20	6	14 ft.	.....			1	
Master street, north side, 6 feet west of west house line of Franklin.....		20	6	14 ft. 4 in.	.....			1	

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Mervine street, west side, north house line of Diamond.....		32	6	15 ft. 2 in.			1	
Mt. Vernon street, north side, 41 feet 6 inches west of west house line of Andress.....		14	6	15 ft.		1		
Mt. Vernon street, north side, east house line of Broad.....		14	6	14 ft.			1	
Norris street, north side, east house line of Seventh.....		20	6	14 ft. 4 in.			1	
Oxford street, south side, west house line of Franklin.....		20	6	14 ft. 6 in.			1	
Parrish street, north side, east house line of Franklin.....		13	6	17 ft. 10 in.			1	
Percy street, east side, 147 feet south of south house line of Girard avenue.....		20	6	4 ft. 6 in.		1		
Philadelphia street, west side, south house line of York.....		28	6	12 ft. 4 in.			1	
Poplar street, south side, west house line of Franklin.....		13	6	15 ft.			1	
Poplar street, south side, west house line of Twenty-second.....		15	6	19 ft.		1		
Sedgely avenue, northwest side, north house line of Dauphin street.....		28	8	17 ft. 7 in.			1	
Sedgely avenue, southeast side, 183 feet northeast of north house line of Dauphin street.....		28	8	20 ft. 5 in.			1	
Sedgely avenue, northwest side, west house line of Twenty-fifth street.....		28	8	17 ft. 2 in.			1	
Sedgely avenue, northwest side, south house line of Fletcher street.....		28	8	16 ft.			1	
Sedgely avenue, northwest side, 5 feet northeast of northeast house line of Ridgo avenue.....		32	8	19 ft.			1	
Seventh street, west side, south house line of Penn.....		20	6	16 ft. 3 in.			1	
Seventh street, east side, south house line of Columbia avenue.....		20	6	14 ft. 8 in.			1	

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

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Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Showaker street, north side, east house line of Twenty-eighth.....		28	6	9 ft.		1		
Sixteenth street, west side, north house line of Page.....		32	6	15 ft. 5 in.			1	
Sixteenth street, west side, 274 feet 6 inches south of south house line of Dauphin.....		28	6	14 ft.			1	
Sixteenth street, east side, 6 feet south of south house line of York.....		28	6	15 ft.			1	
Somerset street, north side, east house line of Eleventh.....		28	6	14 ft. 6 in.			1	
Snsquohanna avenue, south side, 5 feet 6 inches west of west house line of Fifteenth.....		32	6	14 ft. 10 in.			1	
Tenth street, east side, south house line of Diamond.....		20	6	14 ft.			1	
Thirteenth street, west side, north house line of Diamond street.....		32	6	15 ft. 10 in.			1	
Thirteenth street, west side, south house line of Cumberland.....		28	6	8 ft. 8 in.			1	
Thompson street, south side, 10 feet west of east house line of Seventh.....		20	4	6 ft. 2 in.			1	
Thompson street, south side, 6 feet east of east house line of Franklin.....		20	4	6 ft. 4 in.			1	
Twentieth street, east side, 159 feet 8 inches south of south house line of Oxford.....		29	6	14 ft. 8 in.		1		
Twenty-eighth street, west side, 1 foot north of south house line of Poplar.....		15	6	15 ft. 6 in.			1	
Twenty-eighth street, east side, north house line of Thompson.....		29	6	13 ft. 4 in.			1	
Twenty-ninth street, east side, south house line of Jefferson.....		29	6	21 ft. 6 in.			1	
Twenty-ninth street, west side, south house line of Oxford.....		29	6	21 ft. 6 in.			1	
Twenty-second street, east side, north house line of Susquehanna avenue.....		28	6	16 ft. 5 in.			1	

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NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-inch.	Old.	New No. 1.	New No. 2.	New No. 3.
Twenty-second street, east side, north house line of Dauphin.....		28	6	16 ft. 3 in.			1	
Twenty-second street, east side, 8 feet south of south house line of Rush.....		28	6	18 ft. 1 in.			1	
Twenty-second street, west side, south house line of Cambria.....		28	6	6 ft. 10 in.				
Twenty-sixth street, east side, north house line of Master.....		29	6	16 ft.			1	
Twenty-sixth street, west side, 6 feet south of south house line of Ridge avenue.....		32	6	14 ft. 3 in.			1	
Twenty-third street, east side, south house line of Parrish.....		15	6	14 ft. 7 in.			1	
Valeria street, north side, 5 feet east of southeast house line of Francis.....		15	6	11 ft. 10 in.		1		
Wallace street, north side, west house line of Franklin.....		13	6	14 ft. 8 in.			1	
Wallace street, south side, west house line of Ridge avenue.....		14	6	15 ft.			1	
Wallace street, south side, 4 feet 6 inches east of east house line of Twenty-second.....		15	6	15 ft.			1	
Warnock street, west side, 2 feet north of north house line of Somerville.....		28	6	12 ft.			1	
Willington street, east side, north house line of Jefferson.....		29	6	16 ft. 5 in.			1	
Willington street, east side, 274 feet north of north house line of Montgomery avenue.....		32	6	12 ft.		1		
Willington street, west side, 251 feet north of north house line of Susquehanna avenue.....		28	6	6 ft. 8 in.			1	
Willow street, north side, 13 feet east of east house line of Broad.....		14	6	28 ft. 6 in.		1		
Total.....				1,595 ft. 1 in.		23	92	

New Fire Hydrants—Continued.

FIFTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Charles street, southeast side, 14 feet northeast of northeast house line of Pochin.....		21	6	14 ft. 6 in.			1	
Clay street, southwest side, 8 feet northwest of northwest house line of Centre.....		21	6	11 ft.			1	
Freeland avenue, southwest side, 272 feet 9 inches northwest of northwest house line of Roxborough avenue.....		21	6	14 ft. 6 in.			1	
Hamilton street, southwest side, 3 feet northwest of northwest house line of Ripka.....		21	6	11 ft. 6 in.			1	
Hill street, northeast side, 10 feet northwest of northwest house line of Levering.....		21	6	11 ft. 6 in.			1	
Manayunk avenue, southwest side, 92 feet northwest of northwest house line of Conarroe street.....		21	6	14 ft. 6 in.			1	
Markle street, southeast side, 6 feet northeast of northeast house line of Mitchell.....		21	6	14 ft.			1	
Pechin street, southwest side, 13 feet northwest of northwest house line of Markle.....		21	6	14 ft. 6 in.			1	
Roxborough avenue, southeast side, 14 feet northeast of southwest house line of Belair street.....		21	12	19 ft.			1	
Roxborough avenue, southeast side, 5 feet southwest of southwest house line of Haughton street.....		21	6	20 ft.			1	
Shawmont street, southwest side, 1103 feet southeast of east house line of Ridge avenue.....		21	30	19 ft. 6 in.		1		
Shawmont street, northwest side, 2,851 feet northeast of east house line of Ridge avenue.....		21	30	9 ft.		1		
Shawmont street, northeast side, 4,978 feet southeast of east house line of Ridge avenue.....		21	30	9 ft. 9 in.		1		
Shawmont street, northwest side, 547 feet southwest of Allen's lane.....		21	30	14 ft.		1		
Tioga street, north side, 5 feet east of east house line of Twenty-third.....		23	6	14 ft. 6 in.			1	
Total.....				211 ft. 9 in.		4	11	

New Fire Hydrants—Continued. -
SIXTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Abington avenue, northwest side, northeast house line of Twenty-third street.....		22	6	15 ft. 6 in.			1	
Abington avenue, southeast side, 2 feet 4 inches southwest of southwest house line of Stenton ave....		22	6	14 ft. 9 in.			1	
Adams street, southwest side, 5 feet 10 inches northwest of northwest house line of Rittenhouse.....		22	6	15 ft. 7 in.			1	
Alfred street, northeast side, 2 feet northwest of northwest house line of Penn.....		22	6	10 ft. 6 in.			1	
Ashmead street, southeast side, 61 feet northeast of northeast house line of Wakefield.....		22	6	9 ft.		1		
Atlantic street, on dead end, 158 feet west of west house line of Seventh.....		33	6			1		
Baker street, northwest side, 4 feet 9 inches northeast of northeast house line of Nice.....		33	6	7 ft. 8 in.	1			
Bouvier street, west side, south house line of Estaugh.....		28	6	9 ft.		1		
Boyer street, southwest side, southeast house line of Durham.....		22	6	13 ft. 6 in.			1	
Broad street, west side, 3 feet north of north house line of Ontario.....		28	6	9 ft. 7 in.			1	
Broad street, east side, 75 feet 10 inches north of north house line of Cayuga street.....		33	12	10 ft. 2 in.			1	
Broad street, east side, 2 feet 6 inches north of north house line of Wingohocking.....		22	12	10 ft. 2 in.			1	
Broad street, east side, 200 feet 1 inch south of south house line of Courtland.....		22	12	10 ft.		1		
Broad street, east side, 2 feet 6 inches north of north house line of Courtland.....		22	12	7 ft. 10 in.			1	
Broad street, east side, 3 feet 3 inches north of north house line of Wyoming.....		22	12	9 ft. 3 in.			1	
Broad street, east side, 2 feet 9 inches north of north house line of Loudon.....		22	12	11 ft. 6 in.			1	

NEW FIRE HYDRANTS—SIXTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Broad street, east side, 2 feet 6 inches north of north house line of Rockland.....		22	12	9 ft. 3 in.			1	
Broad street, east side, south house line of Ruscomb.....		22	12	9 ft. 1 in.			1	
Broad street, east side, 2 feet 9 inches south of south house line of East Logan.....		22	12	10 ft.			1	
Carlisle street, east side, 2 feet south of south house line of Venango.....		28	6	11 ft. 5 in.			1	
Chelton avenue, southeast side, 231 feet 5 inches northeast of northeast house line of Boyer.....		22	6	25 ft.			1	
Chelton avenue, southeast side, northeast house line of Sullivan.....		22	6	25 ft. 6 in.			1	
Chelton avenue, northwest side, 2 feet southwest of southwest house line of Anderson.....		22	6	24 ft. 10 in.			1	
Chelton avenue, northwest side, 4 feet 2 inches southwest of southwest house line of Stenton.....		22	6	29 ft. 2 in.			1	
Chelton avenue, northwest side, northeast house line of Sprague.....		22	6	15 ft. 10 in.		1		
Chew street, south corner of Russell.....		22	12	20 ft.			1	
Clinton street, southwest side, 14 feet 8 inches northwest of northwest house line of Baker.....		33	6	11 ft.			1	
Crefeldt street, northeast side, 530 feet northwest of northwest house line of Chestnut Hill ave.....		22	6	14 ft. 10 in.		1		
Delaware street, north side, east house line of Twenty-first.....		28	6	14 ft. 6 in.			1	
Eighteenth street, east side, 3 feet 7 inches south of south house line of Tioga.....		28	6	14 ft. 6 in.			1	
Eighteenth street, east side, south house line of Pacific.....		28	6	14 ft.			1	
Erie avenue, northwest corner of Pulaski ave.....		28	6	9 ft. 6 in.			1	
Germantown avenue, southwest side, southeast house line of Rising Sun lane.....		28	6	10 ft.			1	

NEW FIRE HYDRANTS—SIXTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.		
				6-in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Green street, northeast side, 2 feet southeast of southeast house line of Ellet.....		22	6	15 ft.				1
High street, southeast side, 356 feet 10 inches northeast of northeast house line of Germantown ave..		22	6	15 ft. 3 in.		1		
High street, northwest side, 542 feet 5 inches northeast of northeast house line of Hancock.....		22	6	15 ft.		1		
High street, southeast side, southeast house line of Morton.....		22	6	17 ft. 2 in.				1
Johnson street, southeast side, 155 feet southwest of southwest house line of Morton.....		22	12	15 ft. 2 in.				1
Knox street, southwest side, northwest house line of Seymour.....		22	6	14 ft. 10 in.				1
Lafayette street, northwest side, 342 feet 5 inches southwest of southwest house line of Green.....		22	6	13 ft. 3 in.		1		
Lehman street, southeast side, northeast house line of Godfrey.....		22	6	7 ft. 6 in.				1
Locust street, southeast side, southwest house line of Bloyd.....		22	6	15 ft. 8 in.				1
Livezey's lane, northwest side, 2,256 feet 3 inches southwest of southwest house line of McCallum....		22	30	10 ft. 4 in.		1		
Mead street, northwest side, northeast house line of Twenty-eighth.....		22	6	14 ft. 2 in.		1		
Mead street, southeast side, 14 feet 4 inches southwest of southwest house line of Twenty-seventh...		22	6	15 ft.				1
Mermaid lane, southeast side, southwest house line of Twenty-fifth.....		22	6	14 ft. 8 in.				1
Mermaid lane, northwest side, southwest house line of Twenty-sixth.....		22	6	14 ft. 8 in.				1
Mill street, northwest side, 411 feet 5 inches northeast of northeast house line of Germantown ave..		22	6	11 ft. 3 in.		1		
Mt. Pleasant avenue, southeast side, 2 feet 4 inches southwest of southwest house line of Devon.....		22	6	15 ft.		1		
Nice street, southwest side, 409 feet northwest of northwest house line of Baker.....		33	6	9 ft. 6 in.				1
Pastorious street, southeast side, 2 feet northeast of northeast house line of Germantown avenue....		22	6	6 ft. 6 in.				1

NEW FIRE HYDRANTS—SIXTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches	CONNECTION.		STYLE.			
				6-in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Pulaski avenue, southwest side, 89 feet northwest of northwest house line of School lane.....		22	6	19 ft.		1			
Rittenhouse street, northwest side, 151 feet southwest of southwest house line of Wayne.....		22	6	15 ft. 10 in.		1			
School lane, northwest side, 4 feet 5 inches southwest of southwest house line of Germantown ave....		22	8	9 ft. 9 in.				1	
Seymour street, southeast side, southwest of Lynch.....		22	6	13 ft 6½ in.					1
Stenton avenue, southwest side, northwest house line of Hartwell.....		22	6	17 ft. 3 in.	1				
Tenth street, west side, 110 feet south of south line of Ontario.....		33	6	14 ft.		1			
Uber street, west side, south house line of Ontario.....		28	6	11 ft.					1
Walnut lane, southeast side, 730 feet southwest of southwest house line of Wayne street.....		22	6	21 ft.		1			
Westview street, northwest side, 247 feet 1 inch southwest of southwest house line of Quincy street....		22	6	14 ft.		1			
Westview street, northwest side, 2 feet northeast of northeast house line of Emlen street.....		22	6	14 ft.					1
Woodbine avenue, southeast side, 3 feet 4 inches northeast of northeast house line of Willow ave.....		22	6	12 ft. 2 in.					1
Woodbine avenue, southeast side, southwest house line of Wilson street.....		22	6	14 ft. 10 in.					1
York road, northeast side, 580 feet 8 inches southeast of southeast house line of Olney road.....		22	6	8 ft. 7 in.		1			
York road, northeast side, 1,192 feet 6 inches southeast of southeast house line of Olney road.....		22	6	11 ft.		1			
York road, northeast side, 873 feet 7 inches northwest of northwest house line of Fisher's lane.....		22	6	13 ft.		1			
York road, northeast side, 26 feet 6 inches northwest of northwest house line of East Logan street...		22	3	12 ft.	1				
Total.....				893 ft. 3¼ in.	4	20	43		

FIRE HYDRANTS RENEWED.

FIRST DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6 in.	Removed. Replaced by.				
					Old.	No. 3.	Old.	New, No. 1.	New, No. 2.
Broad street, west side, 130 feet south of south house line of Rainbridge		30	6	1		1			
Broad street, west side, 5 feet south of south house line of Ellsworth.....		26	6	5 ft. 8 in.	1				1
Broad street, east side, 195 feet south of south house line of Federal.....		26	6	4 ft.		1		1	
Broad street, east side, 6 feet south of south house line of Christian.....		2	6	6 ft. 6 in.	1				1
Carpenter street, north side, 19 feet east of east house line of Fifteenth.....		30	6	4 ft.	1		1		
Carpenter street, south side, 96 feet east of east house line of Thirteenth.....		2	6	15 ft.	1				1
Carpenter street, north side, 122 feet west of west house line of Sixth.....		2	6			1		1	
Catharine street, south side, west house line of Lebanon.....		3	6	12 ft.	1			1	
Catharine street, south side, 8 feet east of east house line of Twentieth.....		30	6	14 ft. 6 in.	1				1
Charles street, west side, 145 feet south of south house line of Washington avenue.....		2	3	3 ft.	1			1	
Christian street, south side, 199 feet east of east house line of Nineteenth.....		30	6	20 ft. 5 in.	1				1
Christian street, north side, 102 feet east of east house line of Eighteenth.....		30	6	20 ft. 5 in.	1				1
Christian street, north side, 5 feet east of east house line of Twentieth		30	6	20 ft.	1				1
Christian street, north side, 8 feet east of east house line of Sixteenth.....		30	12	19 ft.	1				1

FIRE HYDRANTS RENEWED—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.				
					Removed.		Replaced by		
					Old.	No. 3.	Old.	New, No. 1.	New, No. 2.
Christian street, south side, 8 feet west of northwest side of Gray's Ferry road.....		30	6	20 ft. 6 in.	1				1
Clarion street, west side, 118 feet south of south house line of Wharton.....		26	4	4 ft.	1		1		
Dutton street, east side, 238 feet north of north house line of Reed.....		1	6	4 ft. 1 in.	1			1	
Eighth street, west side, 48 feet south of south house line of Taylor.....		1	6	14 ft.	1			1	
Eighth street, west side, 49 feet north of north house line of Cross.....		1	6		1		1		
Ellsworth street, north side, 199 feet west of west house line of Nineteenth.....		26	6	15 ft.	1			1	
Federal street, north side, 7 feet east of east house line of Seventeenth.....		26	6	15 ft.	1				1
Federal street, north side, 102 feet east of east house line of Eleventh.....		26	6	15 ft.	1			1	
Federal street, north side, 9 feet east of east house line of Ninth.....		26	6	15 ft.	1				1
Fitzwater street, south side, 162 feet west of west house line of Seventeenth.....		30	6	14 ft. 6 in.	1				1
Fitzwater street, north side, opposite centre of Webb.....		30	6	14 ft.	1				1
Guilford street, west side, 65 feet north of north house line of Monroe.....		4	6	4 ft.	1		1		
Hoffman street, north side, 152 feet east of east house line of Tenth.....		1	6	8 ft. 6 in.	1			1	
Kimball street, north side, 2 feet east of east house line of Twentieth.....		30	4	9 ft.	1			1	
Long lane, southeast side, 78 feet southwest of south house line of Wharton.....		26	6		1		1		

FIRE HYDRANTS RENEWED—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6 in.	Removed.		Replaced by		
					Old.	New, No. 3.	Old.	New, No. 1.	New, No. 2.
Madison square, south side, 18 feet east of east house line of Eighteenth.....		30	6	8 ft. 6 in.	1			1	
Mechan street, west side, 182 feet 6 inches north of north house line of Morris.....		1	6	5 ft. 6 in.	1		1		
Montrose street, south side, 68 feet east of east house line of Sixteenth		30	4		1		1		
Nineteenth street, west side, 50 feet north of north house line of Wharton.....		26	12		1		1		
Otsego street, south side, 143 feet north of north house line of Washington avenue.....		2	6	14 ft.	1			1	
Otsego street, south west corner of Mifflin.....		1	6	4 ft. 6 in.	1				1
Riggs street, north side, 16 feet west of west house line of Verner.....		30	6	9 ft.	1			1	
Second street, east side, 138 feet north of north house line of Christian.....		3	10	15 ft.	1			1	
Second street, east side, 24 feet north of north house line of Federal.....		2	6	15 ft.	1			1	
Second street, west side, 10 feet south of south house line of Mifflin.....		1	6	15 ft.	1				1
Seventh street, northwest corner of Plover.....		2	6			1			1
Sevanteenth street, west side, 10 feet north of north house line of Ellsworth.....		26	6		1		1		
Sevanteenth street, east side, 2 feet 6 inches south of south house line of Christian.....		30	6	15 ft.	1				1
Sixteenth street, east side, 6 feet south of south house line of Wharton.....		26	6	15 ft.	1				1
South street, north side, 38 feet east of east house line of Twenty-third.....		7	6	15 ft.	1			1	

FIRE HYDRANTS RENEWED—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.				
				6 in.	Removed.		Replaced by		
					Old.	New, No. 3.	Old.	New, No. 1.	New, No. 2.
Tasker street, south side, 1 foot 6 inches west of southeast house line of Moyamensing avenue		1	6	14 ft. 6 in.	1				1
Taylor street, south side, 141 feet west of west house line of Eighth.....		1	6	11 ft.	1			1	
Tenth street, west side, 157 feet north of north house line of Fitzwater.....		4	6	15 ft.	1			1	
Tenth street, west side, 134 feet south of south house line of Fitzwater.....		3	6	15 ft.	1			1	
Thirteenth street, east side, 6 feet south of south house line of Brinton.....		4	6	4 ft.	1		1		
Twelfth street, east side, 179 feet north of north house line of Washington avenue.....		2	6	14 ft. 6 in.	1				1
Twenty-first street, northeast corner of Wharton.....		26	6			1			1
Twenty-seventh street, west side, 22 feet south of south house line of Oakford.....		26	6	15 ft.	1				1
Wilder street, north side, 68 feet east of east house line of Seventh.....		1	4		1		1		
Worth street, south side, 103 feet east of east house line of Fourth.....		1	4		1		1		
Total.....				517 ft. 7 in.	50	4	13	19	22

Fire Hydrants Renewed—Continued.

SECOND DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.									
			Old.	New.		6 in.	Removed.				Replaced by.				
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Albion street, west side, 99 feet north of north house line of Locust		8	3	6	4 ft.	1						1			
Allen street, north side, opposite centre of Budd		24	6			1					1				
Arch street, south side, 37 feet west of west house line of Third		6	30					1						1	
Arch street, north side, 178 feet west of west house line of Fifth		6	10		19 ft. 6 in.	1								1	
Arch street, north side, east house line of Broad		6	8		19 ft.	1						1			
Arch street, south side, 205 feet east of east house line of Fourth		6	8		19 ft.	1								1	
Arch street, southeast corner of Eighth		9	30					1							1
Belmont Pumping Station, in front of engine house		24	36			1					1				
Broad street, east side, 113 feet south of south house line of Pine		7	6		5 ft.	1						1			
Broad street, east side, 6 feet south of south house line of Race		10	20						1						1
Chestnut street, south side, 179 feet east of east house line of Fifth		5	10			1					1				
Chestnut street, north side, 56 feet east of east house line of Broad		9	10		7 ft. 6 in.	1								1	
Chestnut street, north side, 155 feet west of west house line of Fifteenth		9	16		14 ft.	1						1			

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.				Replaced by			
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Chestnut street, south side, 185 feet east of east house line of Seventeenth.....		8	16		14 ft.	1					1			
Chestnut street south side, 7 feet 6 inches west of west house line of Thirty-ninth.....		27	8		22 ft. 5 in.	1					1			
Chestnut street, north side, 65 feet west of west curb line of Fifty-fourth.....		27	8			1				1				
Cherry street, south side, 114 feet east of east house line of Seventh.....		6	6		11 ft.	1					1			
Dock street, northeast side, 3 feet west of west house line of Exchange place.....		5	6		7 ft. 6 in.	1					1			
Dock street, south side, 144 feet west of west house line of Second.....		5	6		7 ft.	1							1	
Dock street, northeast side, south house line of Walnut.....		5	6		8 ft. 6 in.	1							1	
Dohan street, north side, 190 feet 6 inches west of west house line of Forty-eighth.....		24	6		2 ft. 6 in.	1					1			
Eighth street, east side, 112 feet north of north house line of Locust.....		8	10			1				1				
Eighth street, west side, 3 feet north of south house line of Jayne.....		9	10		14 ft. 6 in.	1							1	
Eighth street, east side, 139 feet south of south house line of Arch.....		9	10		14 ft. 6 in.	1					1			
Eighth street, west side, 100 feet south of south house line of Cherry.....		10	10		14 ft. 6 in.	1					1			
Eleventh street, west side, north house line of Rodman.....		7	10		14 ft. 6 in.	1							1	

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.			Replaced by				
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Eleventh street, east side, south house line of Hunter.....		9	10		14 ft. 6 in.	1						1		
Eleventh street, west side, south house line of Cuthbert.....		9	10		14 ft. 6 in.	1						1		
Fifth street, east side, 28 feet north of north house line of Ranstead		6	10		14 ft.	1							1	
Fifth street, west side, 3 feet south of south house line of Commerce		6	10		14 ft.	1							1	
Fifteenth street, west side, north house line of Moravian.....		8	6		14 ft.	1						1		
Fifteenth street, west side, 6 feet north of north house line of Melloy.....		9	6		7 ft. 6 in.	1							1	
Fifteenth street, east side, 14 feet south of south house line of Brighton.....		8	6		13 ft.	1						1		
Fifty-second street, east side, 273 feet north of north house line of Pine.....		27	6			1					1			
Fifty-second street, east side, 65 feet north of north house line of Master.....		24	36					1						1
Filbert street, south side, 8 feet east of centre of Saunders avenue..		24	6		14 ft. 6 in.	1								1
Filbert street, north side, 343 feet 6 inches east of east house line of Thirty-sixth.....		24	6		4 ft.	1					1			
Filbert street, south side, 100 feet west of west house line of Fortieth		24	6		13 ft. 6 in.	1								1

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.				Replaced by			
					Old.		No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Fourth street, west side, 4 feet north of south house line of Commerce.....		6	6		6 ft. 6 in.	1							1	
Fourth street, west side, 161 feet south of south house line of Arch.....		6	6		6 ft. 6 in.	1					1			
Fortieth street, east side, 22 feet 6 inches south of south house line of Ogden.....		24	6		16 ft. 9 in.	1					1			
Forty-first street, west side, 193 feet south of south house line of Pine.....		27	6			1				1				
Forty-second street, west side, 12 feet south of south house line of Wallace.....		24	6			1				1				
Forty-seventh street, west side, 93 feet south of south house line of Rinehart.....		27	6		21 ft. 2 in.	1							1	
Front street, west side, north house line of Union.....		5	8		17 ft.	1								1
Front street, west side, 127 feet north of north house line of Lombard.....		5	8		17 ft.	1					1			
Front street, west side, south house line of Relief.....		5	8		17 ft.	1					1			
Front street, west side, 145 feet south of south house line of Walnut.....		5	8		17 ft. 6 in.	1								1
Girard avenue, north side, 80 feet west of west house line of Forty-second.....		24	12			1				1				
Gulielma street, north side, 199 feet east of east house line Fifteenth.....		7	3		3 ft.	1				1				

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.			Replaced by				
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Haverford street, north side, 18 feet east of east house line of Thirty-seventh.....		24	4			1					1			
Heston street, north side, 33 feet west of west house line of Fifty-second.....		24	6			1					1			
Jayne street, northeast corner of Decatur.....		6	6		2 ft.	1							1	
Kingsessing avenue, north side, 186 feet east of east house line of Forty-sixth.....		27	6		22 ft. 6 in.	1							1	
Lancaster avenue, north side, 91 feet east of east house line of Forty-eighth.....		24	6			1					1			
Lancaster avenue, north side, east house line of Saunders.....		24	8		26 ft.	1							1	
Lancaster avenue, south side, 178 feet west of west house line of Thirty-eighth.....		24	8		24 ft 10 in.	1							1	
Library street, north side, 222 feet east of east house line of Fifth.....		5	10				1						1	
Locust street, north side, west house line of Dean.....		8	6		14 ft.	1					1			
Lombard street, north side, 8 feet west of west house line of Wetherill.....		7	6					1						1
Lombard street, north side, 198 feet west of west house line of Third.....		5	6			1					1			
Lombard street, north side, east house line of Radcliff.....		7	6			1					1			

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

1911

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.				Replaced by			
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Market street, northwest corner of Second.....		6	6		4 ft.		1						1	
Market street, southwest corner of Fifth.....		6	6					1						1
Market street, north side, 221 feet west of west house line of Eleventh.....		9	6		9 ft. 4 in.	1					1			
Market street, south side, 26 feet west of west house line of Thirty-second.....		27	10		33 ft.	1							1	
Melrose street, south side, 243 feet west of west house line of Fifty-fourth.....		24	6		14 ft. 4 in.	1					1			
North street, north side, 298 feet west of west house line of Fifth.....		6	6					1					1	
Parrish street, south side, 27 feet 6 inches west of west house line of Union.....		24	6		14 ft. 6 in.	1					1			
Pine street, south side, 2 feet east of east house line of Albion.....		7	6		7 ft. 4 in.	1					1			
Race street, south side, 211 feet west of west house line of Fifteenth.....		10	6		12 ft. 7 in.	1					1			
Race street, north side, 2 feet east of west house line of Crown.....		6	6		14 ft. 6 in.	1							1	
Race street, south side, west house line of Bread.....		6	6		13 ft.	1					1			
Race street, south side, 193 feet east of east house line of Eighth.....		10	6			1					1			
Rockland street, south side, 219 feet west of west house line of Thirty-fifth.....		24	6			1					1			

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION. 6 in.	STYLE.								
			Old.	New.		Removed.				Replaced by				
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Saunders street, west side, south house line of Baring.....		24	6		17 ft.	1								1
Second street, east side, south house line of Gothic.....		5	6		14 ft.	1								1
Second street, east side, 209 feet north of north house line of Spruce.....		5	6		14 ft.	1					1			
Second street, west side, 162 feet south of south house line of Dock		5	6		14 ft.	1								1
Second street, east side, 200 feet north of north house line of Arch		5	6			1				1				
Seventeenth street, east side, south house line of Jones.....		9	6		14 ft.	1					1			
Seventh street, east side, opposite centre of Goodwater.....		5	4		19 ft. 6 in.		1				1			
Sixth street, west side, north house line of Jayne.....		6	6				1							1
Sixth street, east side, 61 feet south of south house line of North...		6	6		14 ft. 6 in.	1								1
Spruce street, south side, 240 feet west of west house line of Twentieth.....		7	12		14 ft. 6 in.	1					1			
Summer street, south side, 198 feet west of west house line of Sixteenth.....		10	4	6	10 ft. 9 in.	1					1			
Tenth street, east side, south house line of Clinton.....		7	3	6	7 ft. 9 in.	1								1
Tenth street, west side, south house line of Barley.....		7	6		6 ft. 6 in.	1								1
Tenth street, east side, south house line of Rodman.....		7	6		13 ft. 6 in.	1								1

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.				Replaced by			
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Third street, west side, 301 feet north of north house line of Spruce		5	6		14 ft.	1							1	
Third street, east side, 276 feet south of south house line of Walnut		5	6		14 ft.	1							1	
Thirteenth street, east side, 3 feet south of north house line of Rodman		7	6		14 ft.	1					1			
Thirteenth street, west side, 143 feet south of south house line of Spruce		7	6		14 ft.	1							1	
Thirteenth street, east side, 199 feet south of south house line of Locust		8	6		14 ft. 6 in.	1					1			
Thirteenth street, east side, 122 feet south of south house line of Chestnut		8	6		14 ft. 6 in.	1							1	
Thirtieth street, west side, north house line of Race		24	6			1							1	
Thirty-eighth street, west side, 6 feet north of north house line of Ludlow		27	12			1				1				
Thirty-ninth street, west side, 28 feet south of south house line of Ludlow		27	6		18 ft.	1							1	
Thirty-sixth street, east side, 141 feet north of north house line of Market		24	6		4 ft.	1				1				
Thirty-sixth street, west side, 137 feet south of south house line of Brown		24	6			1				1				
Twelfth street, west side, north house line of Rodman		7	6		14 ft. 6 in.	1							1	

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.								
			Old.	New.		6 in.	Removed.				Replaced by.			
							Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Twelfth street, east side, north house line of Ohio.....		7	6		14 ft. 6 in.	1					1			
Twelfth street, west side, 199 feet north of north house line of Spruce.....		8	6		14 ft. 6 in.	1							1	
Twelfth street, east side, 172 feet south of south house line of Walnut.....		8	6		14 ft. 1 in.	1				1				
Twelfth street, east side, 154 feet north of north house line of Market.....		9	6		14 ft. 6 in.	1					1			
Twelfth street, east side, 96 feet 6 inches south of south house line of Cherry.....		10	6		13 ft. 2 in.	1							1	
Twelfth street, west side, 143 feet south of south house line of Race.....		10	6		14 ft. 6 in.	1							1	
Twelfth street, west side, north house line of Cuthbert.....		9	6		14 ft. 6 in.	1							1	
Wallace street, north side, 42 feet 6 inches west of west house line of Thirty-fourth.....		24	6		14 ft. 3 in.	1					1			
Walnut street, north side, 124 feet east of east house line of Third.....		5	6			1				1				
Warren street, north side, 347 feet east of east house line of Fifty-second.....		21	6		14 ft. 1 in.	1					1			
Woodland avenue, north side, 51 feet east of east house line of Forty-second.....		27	6		6 ft. 6 in.	1				1				
Total.....					1,092 ft. 10 in.	102	3	6	1	25	86	48	8	

Fire Hydrants Renewed—Continued.

THIRD DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION. 6 in.	STYLE.							
			Old.	New.		Removed.			Replaced by.				
						Old.	No. 1.	No. 2.	No. 3.	Old.	New, No. 1.	New, No. 2.	
Ann street, southwest side, southeast house line of Edgemont.....		25	6		15 ft.	1							1
Ann street, southwest side, 27 feet 3 inches northwest of northwest house line of Jasper.....		31	6						1				1
Allegheny avenue, south side, 21 feet 6 inches west of west house line of Gaul.....		25	6			1					1		
Cadwallader street, west side, 24 feet 9 inches south of south house line of Jefferson.....		17	4		4 ft. 6 in.	1					1		
Callowhill street, north side, west house line of Delaware avenue.....		11	3	10	15 ft. 4 in.	1							1
Church street, northeast side, 257 feet 6 inches southeast of southeast house line of Josephine.....		23	6		12 ft. 8 in.	1							1
Columbia avenue, north side, east house line of Third.....		19	6		14 ft. 10 in.	1							1
Dauphin street, southwest side, southeast house line of Coral.....		31	6		14 ft. 7 in.	1							1
Delaware avenue, west side, north house line of Vine.....		11	6		11 ft. 5 in.	1							1
Emerald street, east side, 12 feet north of north house line of Harrowgate lane.....		25	6			1					1		
Firth street, north side, 141 feet west of west house line of Amber.....		31	4						1			1	

FIRE HYDRANTS RENEWED—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	SEYLE.							
			Old.	New.		6 in.	Removed by.			Replaced by.			
					Old.		No. 1.	No. 2.	No. 3.	Old.	New, No. 1.	New, No. 2.	
Fourth street, east side, 156 feet 9 inches south of south house line of Montgomery avenue.....		19	6		14 ft. 5 in.	1						1	
Frankford avenue, southeast side, northeast house line of Church.....		23	4		10 ft. 9 in.	1							1
Front street, west side, 70 feet 6 inches south of south house line of Canal.....		16	10			1					1		
Front street, west side, 30 feet south of south house line of Dana.....		11	6			1					1		
Gaul street, west side, 294 feet north of north house line of Clearfield.....		31	6			1					1		
Germantown avenue, southwest side, 134 feet southeast of southeast house line of Norris.....		19	6		18 ft. 8 in.	1						1	
Germantown avenue, southwest side, 22 feet southeast of east house line of Tenth.....		28	6			1					1		
Girard avenue, south side, east house line of Charlotte.....		16	10					1				1	
Glenwood street, west side, 122 feet 6 inches south of south house line of Noble.....		11	4		8 ft. 8 in.	1						1	
Hancock street, east side, 243 feet north of north house line of Diamond.....		19	6		15 ft. 10 in.	1							1
Hope street, east side, 143 feet south of south house line of Diamond.....		19	4		6 ft. 9 in.	1						1	
Howard street, west side, 153 feet north of north house line of Davis.....		19	6				1					1	
Lehigh avenue, south side, 127 feet west of west house line of Emerald.....		31	6		10 ft. 9 in.	1						1	

FIRE HYDRANTS RENEWED—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.						
			Old.	New.		6-inch.	Removed.			Replaced by		
					Old.		No. 1.	No. 2.	No. 3.	Old.	New No. 1.	New No. 2.
Lehigh avenue, north side, west house line of Filmore.....		33	6		20 ft. 2 in.				1			1
Leithgow street, east side, south house line of Clearfield.....		33	6				1					1
Montgomery avenue, southwest side, 188 feet 6 inches southeast of south-east house line of Girard avenue.....		18	10		15 ft. 9 in.	1					1	
New Market street, west side, 22 feet south of south house line of Poplar..		11	6		15 ft. 5 in.	1						1
New Market street, east side, south house line of Margaretta.....		11	6		14 ft. 4 in.	1						1
Philip street, west side, 223 feet south of south house line of Columbia avenue.....		19	4	6	5 ft. 1 in.							
Poplar street, southwest corner of Fifth.....		12	16		10 ft. 6 in.	1						1
Randolph street, west side, 171 feet 4 inches south of south house line of Montgomery avenue.....		19	6		17 ft. 6 in.	1						1
Salmon street, southeast side, 179 feet 4 inches northeast of northeast house line of N. H.		25	4		11 ft. 4 in.	1						1
Sixth street, east side, south house line of Dauphin.....		19	6		15 ft.	1						1
Sixth street, east side, 57 feet 2 inches south of south house line of York..		19	6		15 ft. 9 in.	1						1
St. John street, west side, 104 feet 6 inches north of north house line of Brown.....		11	6		12 ft. 6 in.	1				1		
Tacony road, southeast side, northeast house line of Lewis.....		23	6		4 ft. 6 in.	1						1

FIRE HYDRANTS RENEWED—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES		CONNECTION.	STYLE.						
			Old.	New.		6 in.	Removed.			Replaced by.		
							Old.	No. 1.	No. 2.	No. 3.	Old.	New, No. 1.	New, No. 2.
Thompson street, southeast side, 58 feet 9 inches northeast of north house line of Mommouth.....		25	6						1		1	
Tioga street, south side, 4 feet east of east house line of Almond.....		25	6		6 ft.	1				1		
Turner street, west side, 259 feet south of south house line of Venango....		33	6						1			1
Unity street, north side, west house line of Waln.....		23	6			1				1		
Venango street, southwest side, 15 feet 6 inches southeast of southeast house line of Almond.....		25	6		18 ft. 7 in.	1					1	
Water street, west side, south house line of Callowhill.....		11	4	6	8 ft. 4 in.	1						1
Wayne street, south side, 24 feet east of east house line of Bright.....		25	6			1				1		
York street, north side, 7 feet east of east house line of Thompson.....		31	6			1				1		
York street, northeast side, southeast house line of Jasper.....		31	6		14 ft. 9 in.	1						1
Total.....					379 ft. 8 in.	37	1	2	5	11	18	21

Fire Hydrants Renewed—Continued.

FOURTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION. 6-inch.	STYLE.						
					Removed.			Replaced by			
					Old.	No. 1.	No. 2.	Old.	New No. 1.	New No. 2.	
Broad street, east side, 6 feet north of north house line of Fairmount avenue.....		14	20	3 ft.	1						1
Buttonwood street, north side, 50 feet west of west house line of Franklin.....		13	6		1			1			
Columbia avenue, south side, 35 feet west of west house line of Twenty-second.....		29	6	19 ft. 6 in.	1				1		
Franklin street, west side, 403 feet south of south house line of Girard avenue.....		20	6	14 ft. 5 in.	1						1
Girard avenue, north side, 384 feet west of Philadelphia and Reading Railroad.....		29	10			1			1		
Hamilton street, north side, 12 feet west of west house line of Twenty-fourth.....		15	6	20 ft. 1 in.	1						1
Herman street, south side, opposite centre of Dover.....		28	6	2 ft. 6 in.	1						1
Lorain street, west side, 14 feet south of south house line of Green.....		13	4		1			1			
Mt. Vernon street, south side, 145 feet 2 inches west of west house line of Eleventh.....		14	6	14 ft. 2 in.	1				1		
Myrtle street, north side, 8 feet east of east house line of Ontario.....		14	4	6 ft.	1				1		
Oxford street, north side, 10 feet west of west house line of Seventh.....		20	6	14 ft. 10 in.	1						1
Parrish street, south side, 4 feet east of east house line of Seventh.....		13	6	13 ft. 5 in.	1						1
Parrish street, north side, 17 feet west of west house line of Twenty-second.....		15	6		1			1			

FIRE HYDRANTS RENEWED—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.						
				6-inch.	Removed.			Replaced by			
					Old.	No. 1.	No. 2.	Old.	New No. 1.	New No. 2.	
Parrish street, north side, 17 feet west of west house line of Twenty-second		15	6	8 ft. 2 in.	1						1
Percy street, east side, 212 feet south of south house line of Master.....		20	6	4 ft. 7 in.	1				1		
Ridge avenue, southwest side, 156 feet southeast of east house line of Thirty-first.....		28	12	.....	1			1			
Seventh street, west side, 121 feet 8 inches north of north house line of Green.....		13	6	14 ft. 10 in.	1						1
Seventh street, east side, 165 feet 5 inches south of south house line of Girard avenue....		20	6	14 ft. 8 in.	1						1
Seventh street, east side, 112 feet 3 inches south of south house line of Jefferson.....		20	6	11 ft. 8 in.	1				1		
Seventh street, west side, 52 feet south of south house line of Diamond.....		20	6	14 ft. 6 in.	1				1		
Spring Garden street, south side, 171 feet east of east house line of Twentieth.....		15	10	27 ft.	1						1
Thirtieth street, west side, opposite centre of Ogden.....		15	10	3 ft. 5 in.	1				1		
Twenty-fourth street, southwest corner of Biddle.....		15	6	.....			1				
Twenty-second street, west side, 198 feet north of north house line of Parrish.....		15	6	17 ft.	1				1		
Twenty-sixth street, east side, 59 feet north of north house line of Poplar.....		15	6	.....	1			1			
Twenty-third street, east side, 35 feet south of south house line of Jefferson.....		29	10	15 ft.	1				1		
Water street, south side, 132 feet east of east house line of Eighteenth.....		29	6	8 ft.	1				1		
Wood street, north side, 155 feet 6 inches east of east house line of Nineteenth.....		15	4	12 ft. 6 in.	1				1		
Total.....				259 ft.	26	1	1	5	12		11

Fire Hydrants Renewed.—Continued.
FIFTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.					
				6 in.	Removed.		Replaced by			
					Old.	New, No. 3.	Old.	New, No. 2.	New, No. 3.	
Leverington avenue, southeast side, 103 feet southwest of southwest house line of Mitchell st...		21	6	14 ft. 6 in.	1			1		
Main street, northeast side, 26 feet 6 inches southeast of southeast house line of Centre		21	6			1				1
Queen lane, northwest side, 120 feet southwest of southwest house line of Cresson street.....		28	6		1		1			
Ridge avenue, northeast side, 3 feet northwest of northwest house line of Osborne street.....		21	6	7 ft. 1 in.	1			1		
Ridge avenue, northeast side, 33 feet northwest of northwest house line of Lyceum avenue.....		21	6	13 ft. 6 in.	1			1		
Ridge avenue, southwest side, 62 feet northwest of northwest house line of Green lane.....		21	16		1			1		
Ridge avenue, northeast side, 5 feet southeast of southeast house line of Cemetery lane.....		21	6	12 ft.	1			1		
Ridge avenue, southwest side, 365 feet southeast of southeast house line of Domino lane.....		21	20		1		1			
Spencer street, southeast side, 118 feet northeast of northeast house line of Ridge avenue.....		28	6		1		1			
Total				47 ft. 1 in.	8	1	3	5		1

Fire Hydrants Renewed—Continued.

SIXTH DISTRICT.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.						
			Old.	New.		6 in.		Replaced by				
					Old.	No. 3.	Old.	New, No. 1.	New, No. 2.	New, No. 3.		
Adams street, northeast side, 215 feet southeast of southeast house line of Harvey.....		22	6	.....	16 ft. 3 in.	1	.....	.....	1	.....	.....	.....
Baynton street, southeast side, 304 feet southwest of southeast house line of Wistar.....		22	6	.....	15 ft. 6 in.	1	.....	.....	1	.....	.....	.....
Bringhurst street, northwest side, 4 feet 4 inches northeast of northeast house line of Wakefield.....		22	6	.....	12 ft. 5 in.	1	.....	.....	.....	.....	1	.....
Bringhurst street, southeast side, 385 feet 4 inches northeast of northeast house line of Wakefield.....		22	6	.....	10 ft. 1 in.	1	.....	.....	1	.....	.....	.....
Bringhurst street, northwest side, 236 feet 8 inches southwest of southwest house line of Mercer.....		22	6	.....	11 ft. 6 in.	1	.....	.....	1	.....	.....	.....
Chelton avenue, northwest side, 469 feet southwest of Chew.....		22	6	.....			.....	1	.....	.....	1	.....
Chelton avenue, southeast side, 14 feet southwest of northeast house line of Cedar avenue.....		22	6	.....			.....	1	.....	.....	.....	1
Clinton street, northeast side, 5 feet southeast of southeast house line of Barr....		33	6	.....	1 ft. 8 in.	1	.....	.....	1	.....	.....	.....
East Chelton avenue, southeast side, 91 feet 4 inches southwest of Reading R. R.....		22	6	.....			.....	1	.....	.....	.....	.....
Germantown avenue, northeast side, 88 feet northwest of Mill.....		22	6	.....			.....	1	.....	.....	.....	.....
Graver's lane, northwest side, 143 feet 6 inches southwest of southwest house line of Twenty-third.....		22	6	.....	14 ft. 6 in.	1	.....	.....	.....	.....	1	.....

FIRE HYDRANTS RENEWED—SIXTH DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.					
			Old.	New.		6-inch.	Removed.		Replaced by		
					Old.		No. 3.	Old.	New No. 1.	New No. 2.	New No. 3.
Green street, northeast side, 63 feet southeast of Maplewood avenue.....		22	6			1		1			
Itschner street, northwest side, 308 feet west of Nineteenth.....		28	6			1		1			
Lehman street, northwest side, 163 feet northeast of northeast house line of Wayne.....		22	4		11 ft. 9 in.	1			1		
Marshall street, west side, 17 feet 10 inches south of south house line of Eric avenue.....		33	6		3 ft.	1				1	
Nicetown lane, southeast side, northeast house line of Pacific.....		28	6			1		1			
Ontario street, northwest corner of Twentieth.....		28		6	3 ft. 1 in.	1				1	
Pastorious street, northwest side, 11 feet 4 inches southwest of southwest house line of Osceola.....		22	4		11 ft. 3 in.	1			1		
Pastorious street, southeast side, 4 feet 6 inches southwest of southwest house line of Hancock.....		22	4		11 ft. 9 in.	1			1		
Queen lane, northwest side, 4 feet northeast of northeast house line of Lawrence.		22	6		15 ft. 8 in.	1				1	
School lane, southeast side, 196 feet southwest of southwest house line of Germantown avenue.....		22	4		13 ft. 7 in.	1			1		
School lane, southeast side, 414 feet southwest of Green.....		22	6			1		1			
School lane, southeast side, 290 feet 6 inches southwest of Wissahickon avenue...		21	4	6	19 ft. 4 in.						
School lane, northwest side, 888 feet 9 inches southwest of Wissahickon ave.....		21	4	6	11 ft.						

FIRE HYDRANTS RENEWED—SIXTH DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION.	STYLE.							
			Old.	New.		6-inch.	Removed.		Replaced by				
					Old.		No. 3.	Old.	New No. 1.	New No. 2.	New No. 3.		
School lane, southeast side, 1,306 feet 6 inches southwest of Wissahickon ave.....		21	4	6	19 ft.								
School lane, northwest side, 1,714 feet southwest of Wissahickon avenue.....		21	4	6	12 ft.								
School lane, southeast side, 2,267 feet southwest of Wissahickon avenue.....		21	4	6	19 ft. 3 in.								
School lane, northwest side, 2,787 feet southwest of Wissahickon avenue.....		21	4	6	8 ft.								
School lane, southeast side, 3,202 feet southwest of Wissahickon avenue.....		21	4	6	15 ft. 9 in.								
School lane, northwest side, 3,806 feet southwest of Wissahickon avenue.....		21	4	6	9 ft. 9 in.								
School lane, northwest side, 4,234 feet southwest of Wissahickon avenue.....		21	4	6	8 ft. 4 in.								
School lane, southeast side, 4,700 feet southwest of Wissahickon avenue.....		21	4	6	17 ft.	1		1					
School lane, northwest side, 4,997 feet southwest of Wissahickon avenue.....		21	4	6	14 ft.	1		1					
School lane, northwest side, 550 feet northeast of northeast house line of Gypsy lane.....		21	4	6	16 ft. 3 in.	1		1					
School lane, northwest side, 87 feet northeast of northeast house line of Gypsy lane.....		21	4	6	14 ft. 2 in.	1		1					
Upsal street, southeast side, 169 feet southwest of southwest house line of Norton		22	6		3 ft. 1 in.	1			1				
Upsal street, southeast side, southwest house line of Nash.....		22	6			1						1	
Walnut street, southeast side, 612 feet 6 inches northeast of northeast house line of Hancock.....		22	6		16 ft. 9 in.	1			1				

FIRE HYDRANTS RENEWED—SIXTH DISTRICT—Continued.

Street.	Location.	Ward.	SIZE OF MAIN IN INCHES.		CONNECTION. 6-inch.	STYLE.						
			Old.	New.		Removed.		Replaced by.				
						Old.	No. 3.	Old.	New No. 1.	New No. 2.	New No. 3.	
Washington lane, southeast side, 354 feet southwest of Morton street.....		22	6			1		1				
Willow avenue, southwest side, 19 feet southeast of Armat.....		22	6			1		1				
Willow avenue, northeast side, 380 feet 1¼ inches northwest of northwest house line of Armat.....		22	4	6	15 ft. 10 in.	1					1.	
York road, northeast side, 18 feet northwest of northwest house line of Fisher's lane.....		22	3	6	12 ft.	1					1	
York road, northeast side, 11 feet southeast of southeast house line of Olney road.....		22	3	6	9 ft. 9 in.	1			1			
Total.....					393 ft. 3 in.	32	2	12	12	9	1	

RECAPITULATION OF FIRE HYDRANTS SET, RENEWED, AND REMOVED.

	Districts.	STYLE.				Total.
		Old.	No. 1, 1 Way.	No. 2, 2 Way.	No. 3, 3 Way.	
Set.	First.....		33	59	2	94
	Second.....		25	68		93
	Third.....	4	16	113	4	137
	Fourth.....		23	92		115
	Fifth.....		4	11		15
	Sixth.....	4	20	43		67
	Total.....		8	121	386	6	521
Renewed.	First.....	13	19	22		54
	Second.....	25	36	48	3	112
	Third.....	11	13	21		45
	Fourth.....	5	12	11		28
	Fifth.....	3		5	1	9
	Sixth.....	12	12	9	1	34
	Total.....	69	92	116	5	282
	Total new hydrants.....	77	213	502	11	803
Removed.	First.....	51				51
	Second.....	60				60
	Third.....	77		1		78
	Fourth.....	70			2	72
	Fifth.....	1				1
	Sixth.....	12				12
	Total.....	271		1	2	274
	Total added during 1889.....					247

FIRE HYDRANTS, BY PURVEYORS' DISTRICTS.

DISTRICTS.	STYLE.						Totals.
	Old.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	
First.....	751	105	262	208	.....	.....	1,326
Second.....	1,159	133	268	197	1	35	1,793
Third.....	1,194	136	267	202	2	.....	1,801
Fourth.....	766	85	240	245	1	6	1,343
Fifth.....	240	21	70	12	.....	.....	343
Sixth.....	475	128	118	106	.....	.....	827
Totals.....	4,585	608	1,225	970	4	41	7,433

FIRE HYDRANTS BY WARDS.

WARDS.	STYLE.					Totals.
	Old.	No. 1.	No. 2.	No. 3.	No. 4. No. 5.	
First.....	228	30	41	44		343
Second.....	93	15	44	31		183
Third.....	59	9	16	11		95
Fourth.....	55	6	15	24		100
Fifth.....	97	14	25	32	3	171
Sixth.....	60	7	22	41	1 6	137
Seventh.....	114	9	26	15	1	165
Eighth.....	99	15	34	20	4	172
Ninth.....	66	20	44	22	3	155
Tenth.....	78	21	19	14	10	142
Eleventh.....	65	6	4	1	1	77
Twelfth.....	61	3	9	10		86
Thirteenth.....	85	5	20	16		126
Fourteenth.....	70	6	11	19		106
Fifteenth.....	149	25	40	68	1 4	287
Sixteenth.....	57	4	17	8	1	87
Seventeenth.....	68	8	17	9		102
Eighteenth.....	137	12	25	21		195
Nineteenth.....	201	30	60	39		330
Twentieth.....	155	9	45	28		237
Twenty-first.....	211	17	65	10		303
Twenty-second.....	381	107	94	81		663
Twenty-third.....	167	15	28	21		231
Twenty-fourth.....	413	24	64	26	4	531
Twenty-fifth.....	207	29	42	17		295
Twenty-sixth.....	174	33	98	71		376
Twenty-seventh.....	243	24	36	19	3	325
Twenty-eighth.....	182	29	85	71		367
Twenty-ninth.....	159	16	42	47	1	265
Thirtieth.....	121	11	46	25		203
Thirty-first.....	113	14	30	27		184
Thirty-second.....	77	9	21	26	1	134
Thirty-third.....	137	26	40	56	1	260
Totals.....	4,585	608	1,225	970	4 41	7,433

STATEMENT OF THE NUMBER OF FIRE HYDRANTS BY DISTRICTS AND WARDS.

During 1889, and total previous thereto.

	FIRST DISTRICT.						SECOND DISTRICT.						THIRD DISTRICT.						FOURTH DISTRICT.						FIFTH DISTRICT.			SIXTH DISTRICT.			Total.														
	Wards.						Wards.						Wards.						Wards.						Wards.			Wards.																	
	1	2	3	4	26	30	Total.	5	6	7	8	9	10	24	27	Total.	11	12	16	17	18	19	20	23	25	28	31	33	Total.	13		14	15	20	28	29	32	Total.	21	28	Total.	22	28	33	Total.
Prior to 1889.....							1,283								1,760														1,742							1,300				329			772	7,186	
During 1889.....	27	7	5	6	36	13	94	8	2	4	12	18	1	30	18	93	7	2	5	8	10	23	1	19	23	1	11	27	137	16	5	8	21	38	11	16	115	14	1	15	52	9	6	67	521
Total							1,377								1,853														1,879							1,415				344			839	7,707	
Taken out in 1889.....							51								60														78							72				1			12	274	
Total in city							1,326								1,793														1,801							1,343				345			827	7,433	

Number of attachments for fire purposes previously reported.....	368
Made during 1889 {	
First District.....	5
Second District.....	6
Third District.....	3
Fourth District.....	4
Fifth District.....	1
Sixth District.....	0
Total	387

ATTACHMENTS, ETC., MADE BY THE PURVEYORS,

In accordance with permits issued by the Bureau of Water.—Arranged by months.

MONTHS.	NEW ATTACHMENTS.							SHUT OFFS BY PERMIT.					WORK DONE WITHOUT PERMIT.					
	½ inch.	SIZE.					Total.	Required for larger attachment.	REPAIRS.					Total.	DRAWS.			
		¾ inch.	1 inch.	1½ inch.	2 inch.	Total.			Re-drive.	Discontinued.	Transfer.	Not drawn.	Drawn and re-driven.		Discontinued and abandoned.	Delinquent.	Leak.	Total.	Drawn and re-driven.
January.....	167	3	3	3	1	177	1	13	19	1	4	9	47	3	1	8	12	
February.....	80		2		1	83	2	8		3	1	6	20			10	10	
March.....	450	12	5	6	1	448	9	15	7		1	40	72	4		10	14	2
April.....	752	36	4	4	1	799	14	18	6	3		61	102	6		16	22	75
May.....	886	28	11	13	1	945	16	15	30	4	1	61	127	7	1	16	24	55
June.....	826	39	16		2	887	13	17	9	5	9	31	84	6		17	23	
July.....	609	17	13	28	1	673	11	8	10	9		65	93	1		19	20	2
August.....	807	17	20	19	1	867	9	23	8	6		54	165	9	4	20	33	279
September.....	977	21	17	12	1	1,036	11	21	7		1	48	88	3	33	13	49	44
October.....	1,277	37	20	14	2	1,356	9	32	34	9		42	126	4	17	12	33	14
November.....	1,492	37	35	16	2	1,587	15	57	41	5		31	149	5		15	20	14
December.....	657	16	3	4	5	686	4	34	47			27	112	12		28	40	45
Totals.....	8,950	263	149	119	17	9,514	114	266	218	45	17	465	1,125	60	56	184	300	510

ATTACHMENTS, ETC., MADE BY THE PURVEYORS,

In accordance with permits issued by the Bureau of Water.

Arranged by Districts.

DISTRICTS.	NEW ATTACHMENTS.							Reamed for larger attachment.	SHUT OFFS BY PERMIT.						WORK DONE WITHOUT PERMIT.				Drawn and re-driven.
	SIZE.						Total.		Re-drive.	Discontinued.	REPAIRS.			Total.	DRAWN.				
	½ inch.	¾ inch.	1 inch.	1½ inch.	2 inch.	Total.					Transfer.	Not drawn.	Drawn and re-driven.		Total.	Discontinued and abandoned.	Inclined.	Leak.		Total.
First.....	1,813	28	30	11	1	2	1,918		55	24	4		60	143	6	39	26	71	80
Second.....	1,481	63	51	32	7	10	1,644	43	71	137	16		96	363	26	1	53	80	232
Third.....	1,961	40	21	32	6	19	2,082	1	66	21	4	6	95	193	21	3	43	70	
Fourth.....	2,649	104	21	23	2	11	2,813	66	55	25	5	11	172	334	4	13	58	75	80
Fifth.....	320	2	3	2		1	328	2	8	4	2		24	40			4	4	22
Sixth.....	693	26	20	16	1	3	759	2	11	7	14		18	52					96
Totals.....	8,950	263	149	119	17	46	9,544	111	296	218	45	17	465	1,125	60	56	184	300	510

ACCOUNT OF NEW STOPS FOR 1889.

DISTRICTS.	BUREAU OF WATER.		VINEY.				Total.
	2-Way.	Butterfly.	2-Way.	3-Way.	4-Way.	5-Way.	
	First	129			9	2		3	143
Second.....	96			3			99
Third.....	88		2	28	2		120
Fourth.....	102	5	2	10	10	2	131
Fifth.....	33	1					34
Sixth.....	94	2					96
Totals.....	542	8	4	50	14	5	623

REPAIRS TO MAINS, STOPS, AND FIRE HYDRANTS; ALSO, STOPS AND FIRE HYDRANTS REMOVED DURING 1889.

DISTRICTS.	Repairs to Mains.	STOPS.			FIRE HYDRANTS.		
		Repaired.	Renewed.	Removed.	Repaired.	Renewed.	Removed.
First	57	507	36	6	463	54	51
Second.....	78	272	40		333	112	60
Third.....	264	567	47	5	1,063	45	78
Fourth.....	269	394	12	6	1,168	28	72
Fifth	8	26	9	5	31	9	1
Sixth.....	54	9	19		62	34	12
Totals.....	730	1,775	163	22	3,143	282	274

NUMBER OF COMPLAINTS AND EXAMINATIONS DURING 1888 AND 1889.

MONTHS.	Hydrants.		Service Pipes.		Wash Pavcs.		Spigots.		Water Clos.ets.		Horse Troughs.		No. Leaks.		Total.	
	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.
January.....	392	119	177	79	79	10	1	6	1	2	5	2	76	52	731	270
February.....	301	138	194	80	66	31		4	1	2	4	4	126	23	692	282
March.....	190	102	192	47	19	17	4	2	1	3		5	86	36	492	212
April.....	114	97	99	43	12	4		5		2		1	26	37	251	189
May.....	117	148	61	63	7	5	1					7	17	79	203	302
June.....	125	130	74	18	8	4	1	1	1			3	41	69	250	255
July.....	133	144	51	57	4	5		6	2			6	35	78	228	296
August.....	112	150	49	71	8	5	4	4	3		2	4	35	46	213	280
September.....	116	108	83	59	1	2		3					66	44	266	216
October.....	139	191	80	53	2	2	1	4	1	2	1	1	32	45	256	301
November.....	120	128	64	66	2	3	2	5			2	1	45	56	235	259
December.....	134	117	71	47	16	1	3	5	3	1	7	5	37	27	271	293
Totals.....	1,993	1,575	1,198	713	214	89	17	45	13	12	21	39	622	592	4,083	3,035

NUMBER OF VALVES RAISED IN THE SEVERAL
DISTRICTS DURING THE YEAR 1889.

Also, in each year since 1873.

DISTRICTS.	6-inch Barton.	8-inch Barton.	6-inch Viney.	3-inch.	1-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	36-inch.	Total.
First						2				1				3
Second.....	5			4	1	8			1					19
Third.....	3				12	38								53
Fourth.....	7		2		10	25		4				1		49
Totals for 1889.....	15		2	4	23	73		4	1	1		1		124
“ 1888.....	6			8	26	74		10	1	2		1		128
“ 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	98
“ 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 16 years..	44	1	2	175	387	1,206	15	94	24	18	9	18	4	1,997

TABULAR STATEMENT OF WORK CONNECTED WITH THE DISTRIBUTION,

For the ten years, 1880 to 1889, 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.						1/2 in.	5/8 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	Total.	
	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.												
1880.....	23,045	844,946	9,557	262,826	32,642	1,107,772	3,927,623	192,816,906	4,161,768	20,136,708	138	70	5,358	34	2,687	118	49	89	.....	.....	2,913
1881.....	56,616	2,832,623	3,832	199,649	60,418	3,032,272	3,981,239	195,649,529	4,225,216	203,168,980	249	114	5,502	42	3,166	137	59	121	.....	.....	3,483
1882.....	56,860	5,394,165	7,740	481,092	64,600	5,880,257	4,081,180	202,202,522	4,289,816	209,019,247	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	4,144,395	205,251,167	4,365,696	212,773,301	281	130	5,752	63	4,576	97	71	133	.....	.....	4,877
1884.....	84,451	7,153,385	18,079	1,380,271	102,530	8,535,656	4,228,816	212,406,552	4,468,236	22,308,957	324	147	5,887	560	5,529	185	84	140	.....	7	5,915
1885.....	137,967	12,234,074	93,783	3,263,537	231,850	15,499,611	4,365,833	224,640,526	4,701,076	236,868,538	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	6,190	284	7,482	258	104	133	.....	32	8,009
1887.....	122,790	14,780,082	34,098	1,329,083	153,888	16,109,165	4,623,434	257,659,165	5,115,065	276,040,016	546	429	6,715	253	7,892	317	121	143	2	54	8,532
1888.....	133,552	6,256,379	45,943	1,486,631	179,495	7,843,010	4,759,986	261,015,541	5,294,500	283,881,026	772	214	6,929	267	8,260	193	139	118	23	55	8,788
1889.....	147,171	12,270,311	57,833	2,410,677	215,007	14,689,988	4,917,157	276,285,855	5,499,507	298,514,014	601	217	7,433	304	8,950	263	149	119	17	46	9,514

NEW METERS SET.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.						TOTALS.	Quantity of water used. Gallons.
					5/8-inch.	1-inch.	1 1/2-inch.	2-inch.	3-inch.	4-inch.		
1	Delaware Sugar House.....	Swanson and Reed streets.....	Aug. 16, 1889	Crown					1	1	6,800	
1	Spreckles, Claus.....	Meadow and Reed streets.....	Dec. 27, 1889	Crown		1		1		2	86,654	
1	Spreckles, Claus.....	Meadow and Reed streets.....	Dec. 29, 1889	Crown.....					1	1		
5	Tatham Bros.....	224 to 228 South Fifth street.....	Aug. 13, 1889	Crown			1			1	723,180	
7	Philadelphia Rubber Works....	2117 to 2421 South street.....	Sept. 5, 1889	Crown					1	1	3,052,800	
8	Gilbert & Bacon.....	1630 Chestnut street.....	Mar. 12, 1889	Crown				1		1	478,912	
8	Kelsey Oriental Bath Co.....	1101 Walnut street.....	Apr. 27, 1889	Crown			1			1	1,242,195	
8	United States Express Co.....	622 Chestnut street.....	June 3, 1889	Crown					1	1	2,170,250	
9	Girard Life Ins. and Trust Co...	N. E. cor. Broad and Chestnut sts...	July 25, 1889	Crown				1		1	1,853,475	
9	Bradley, Thomas.....	N. W. cor. 21st and Market streets..	Aug. 26, 1889	Crown			1			1	2,213,047	
9	Bradley, Thomas.....	N. W. cor. 21st and Market streets..	Aug. 30, 1889	Crown		2				2		
10	United States Electric Light Co.	N. E. cor. Chester and Maple sts.....	July 25, 1889	Crown					1	1	4,026,975	
11	Carey, Thomas G.....	341 Dilwyn street.....	Aug. 5, 1889	Crown		2				2	69,750	
15	Peoples' Passenger R. W. Co...	2646 Callowhill street.....	Dec. 20, 1889	Crown			1			1	49,732	

NEW METERS SET—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	Size.						Quantity of water used.	
					7/8-inch.	1-inch.	1 1/2-inch.	2-inch.	3-inch.	4-inch.		
16	C. Schmidt Brewing Co.....	112 to 124 Edward street.....	Feb. 2, 1889	Crown		1					1	1,703,800
16	St. Peters Church.....	S. E. cor. Fifth st. and Girard ave.....	Oct. 8, 1889	Crown				2			2	1,303,868
19	Northern Electric Light Co.....	543 Diamond street.....	Aug. 5, 1889	Crown						1	1	4,269,150
22	Pearson, George T.....	4666 Green street.....	Dec. 5, 1889	Crown				1			1	21,982
24	Avil Printing Co.....	3941 Market street.....	Dec. 9, 1889	Thompson ...	1						1	13,025
26	Campbell, G. W.....	Thirty-first and Reed street.....	Dec. 21, 1889	Crown						1	1	797,775
26	Campbell, G. W.....	S. E. cor. 21st and Washington ave.....	Dec. 24, 1889	Crown					1		1	61,500
26	Ehret, M., Jr. & Co.....	Point Breeze Gas Works.....	Sept. 23, 1889	Crown				1			1	No water used.
26	Ehret, M., Jr. & Co.....	Thirty-sixth and Wharton streets.....	Dec. 13, 1889	Crown		1					1	9,187
26	Harrison Bros.....	35th street and Gray's Ferry road...	Nov. 5, 1889	Crown					1		1	128,250
26	Harrison Bros.....	35th street and Gray's Ferry road...	Nov. 19, 1889	Crown					2		2	
26	Harrison Bros.....	35th street and Gray's Ferry road...	Nov. 19, 1889	Thompson ...		1					1	
26	Wyeth, J. & Bros.....	S. W. cor. 11th st. & Washington av.....	Oct. 14, 1889	Crown					1		1	156,750
27	Croft & Allon.....	S. E. cor. 33d and Market streets.....	Aug. 31, 1889	Crown		1		1			2	1,416,915

TOTALS.

NEW METERS SET—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	Size.						TOTALS.	Quantity of water used. Gallons.
					5/8-inch.	1-inch.	1 1/2-inch.	2-inch.	3-inch.	4-inch.		
27	Equitable Brick Works.....	Walnut street, W. of 57th street.....	Nov. 4, 1889	Crown			1				1	32,812
27	Parrish Estate.....	3029 Chestnut street.....	Dec. 15, 1889	Crown				1			1	32,542
27	Schleicher, Schum & Co.....	N. E. cor. 33d and Walnut streets..	Dec. 9, 1889	Crown				1			1	15,915
28	Cresson, George V.....	N. W. cor. 18th st. & Allegheny av.	June 3, 1889	Crown				1			1	122,772
28	Peoples' Passenger R. W. Co....	S. E. cor. Eighth and Dauphin sts...	May 6, 1889	Crown	2	1					3	1,429,852
29	Bergner & Engle Brewing Co....	Thirty-second and Thompson sts....	July 14, 1889	Crown			2				2	539,220
29	Bergner & Engle Brewing Co....	Thirty-second and Thompson sts....	July 14, 1889	Frost.....		1					1	
29	Baltz, J. & P. Brewing Co.....	N. W. cor. 31st and Thompson sts...	Dec. 26, 1889	Crown			1				1	768,800
29	Ehle & Herter.....	N. E. cor. 33d and Thompson sts....	Dec. 13, 1889	Crown			1				1	108,795
				Totals.....	1	12	7	12	7	7	46	29,441,680

MISCELLANEOUS WORK.

MONTHS.	EXAMINATION.					MISCELLANEOUS.						METERS TESTED.				Statements taken.	
	Attachments.	Short supply.	Leaks.	Meters.	Total.	Boxes repaired.	Sidewalks re- paired.	New boxes put in.	Fish traps set.	New iron covers put on.	Service pipes re- paired.	Total.	Crown.	Frost.	Thompson.		Total.
January	28	3	6	23	60	3	1	5				9	1			1	1,151
February.....	6	1		16	23				2		6	8					788
March.....	12	1	6	34	51				1		6	7	3			3	320
April.....	9	4	1	13	27		2	2	3	1	58	66					173
May.....	68	2	2	12	84		2	1	4	3	47	57					
June.....	38	3	4	32	77	3		3	3	1	1	11	15	1		16	151
July.....	50	6	13	63	132			4	6		16	26	22			22	292
August.....	27	9		16	52	2		3	9	3	89	106					
September.....	34	4	2	5	45			1	2		12	15			2	2	274
October.....	105	4	6	70	185	2			3		56	61	20			20	279
November.....	110	7	4	25	146	2			5	3	64	74					240
December.....	78	6	11	51	146			7	9	7	36	59					157
Totals.....	565	50	55	360	1,030	12	5	26	47	18	391	499	61	1	2	64	3,825

APPENDIX E.

REPORT

ON THE

Operations of the Construction and Repair Shop

DURING 1889.

TWELFTH AND REED STREETS.

Philadelphia, January 18, 1890.

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, 1889.

Respectfully,

WILLIAM F. COURTNEY,
Superintendent.

	MERCHANDISE.	DR.
To Stock on hand January 1, 1889.....		\$ 9,037 44
Bolts and nuts.....		1,294 90
Hardware.....		483 22
Wrought iron.....		1,866 08
Steel.....		341 12
Iron castings.....		20,860 80
Brass castings.....		6,589 69
Lumber.....		1,676 77
Paints, brushes, etc.....		112 34
Oil and tallow.....		122 36
Chandlery.....		249 14
Machinery.....		4,713 99

Miscellaneous.....	1,499 31
Coal.....	1,893 06
Gum goods.....	4,972 25
Brass fittings.....	41 76
Lead coating.....	333 36
Wages.....	28,558 98
	<u>\$84,646 57</u>

MERCHANDISE.

CR.

By First District, supplies and repairs.....	\$10,162 17	
Second " " " "	13,328 28	
Third " " " "	11,165 48	
Fourth " " " "	18,261 47	
Fifth " " " "	4,393 35	
Sixth " " " "	8,550 23	
	<u> </u>	\$65,860 98

FAIRMOUNT PUMPING STATION.

By repairs to machinery.....	\$252 32	
" to buildings and grounds.....	186 94	
	<u> </u>	439 26

SPRING GARDEN PUMPING STATION.

By repairs to machinery.....	\$977 26	
" to boilers.....	420 35	
" to buildings and grounds.....	254 65	
	<u> </u>	1,652 27

BELMONT PUMPING STATION.

By repairs to machinery.....	\$879 43	
" to boilers.....	120 15	
" to buildings and grounds.....	11 85	
	<u> </u>	1,011 43

FRANKFORD PUMPING STATION.

By repairs to machinery.....	\$182 02	
" to boilers.....	16 09	
" to buildings and grounds.....	3 24	
	<u> </u>	201 35

ROXBOROUGH PUMPING STATION.

By repairs to machinery.....	\$302 87	
" to boilers.....	382 17	
" to buildings and grounds.....	3 98	
	<u> </u>	689 02

KENSINGTON PUMPING STATION.

By repairs to machinery.....	\$45 29	
" to boilers.....	1 85	
	<u> </u>	47 14

MOUNT AIRY PUMPING STATION.

By repairs to machinery.....	\$53 25	
" to boilers..	1 98	
" to buildings and grounds.....	6 66	
	<u> </u>	61 89

CHESTNUT HILL PUMPING STATION.

By repairs to machinery.....	\$26 98	26 98
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GENERAL BUILDINGS AND GROUNDS.

Lehigh avenue basin, supplies.....	\$23 71	
East Park Reservoir, supplies.....	110 69	
Repair shop, building.....	2,704 75	
	<u> </u>	2,839 15

MAIN OFFICE

By supplies.....	\$202 91	202 91
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METERS.

By supplies.....	\$509 96	509 96
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FERRULES.

By labor.....	\$37 25	37 25
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OLD METALS.

By sales.....	\$1,426 29	1,426 29
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FIXED PATTERNS.

By supplies and repairs.....	\$1,444 65	1,444 65
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CONSTRUCTION AND REPAIR SHOP.

By supplies.....	\$2,676 93	2,676 93
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MACHINERY.

By supplies and repairs.....	\$6,763 65	6,763 65
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DISTRIBUTION.

By supplies.....	\$34 87	
		<u>\$34 87</u>
Stock on hand January 1st, 1890.....		\$85,925 98
		<u>13,881 03</u>
Cr.....		\$99,807 01
Dr.....		<u>84,646 57</u>
Balance to Cr.....		\$15,160 44

INVENTORY JANUARY 1, 1890.

32 No. 1 fire hydants, at \$29 25.....	\$936 00	
56 No. 2 " " " 37 00.....	2,072 00	
		<u>\$3,008 00</u>
22 4-inch stops at \$13 00.....	\$286 00	
12 8-inch " " 24 00.....	288 00	
16 10-inch " " 31 00.....	496 00	
28 12-inch " " 37 00.....	1,036 00	
4 16-inch " " 60 00.....	240 00	
8 Barton stop bonnet and screw, at \$8 00.....	64 00	
		<u>\$2,410 90</u>
6 4-inch O. S. stop screws, at \$1 50.....	\$9 00	
3 10-inch " " " 4 50.....	13 50	
2 12-inch " " " 5 00.....	10 00	
28 16-inch " " " 6 50.....	182 00	
9 20-inch " " " 8 25.....	74 25	
1 30-inch " " " 10 25.....	10 25	
3 36-inch " " " 12 00.....	36 00	
		<u>\$335 00</u>
1 4-inch N. S. stop screws, at \$1 50.....	\$1 50	
83 6-inch " " " 2 25.....	186 75	
6 8-inch " " " 3 25.....	19 50	
8 10-inch " " " 4 50.....	36 00	
3 12-inch " " " 5 00.....	15 00	
3 16-inch " " " 6 50.....	19 50	
3 20-inch " " " 8 25.....	24 75	
		<u>\$303 00</u>
2 30-inch N. S. stop screws, at \$10 25.....	\$20 50	
1 36-inch " " " 12 00.....	12 00	
5 Barton " " " 3 25.....	16 25	
25 Viney " " " 2 00.....	50 00	
7 Birkenbine " " " 2 50.....	17 50	
		<u>\$116 25</u>

32	3-inch socket screws, at \$1 50.....	\$48 00	
53	4-inch " " " 1 50.....	79 50	
36	6-inch " " " 1 75.....	63 00	
15	8-inch " " " 2 00.....	30 00	
71	10-inch " " " 2 25.....	159 75	
34	12-inch " " " 3 50.....	85 00	
			\$465 25
21	4-inch spindles, at \$1 50.....	\$31 50	
36	6-inch " " " 1 75.....	63 00	
15	8-inch " " " 2 00.....	30 00	
6	10-inch " " " 2 25.....	13 50	
3	12-inch " " " 2 50.....	7 50	
			\$145 50
7	4-inch iron bands, at \$2 00.....	\$14 00	
36	6-inch " " " 2 00.....	72 00	
5	10-inch " " " 5 00.....	25 00	
26	12-inch " " " 6 00.....	156 00	
17	16-inch " " " 7 50.....	127 50	
8	20-inch " " " 9 00.....	72 00	
20	30-inch " " " 15 00.....	300 00	
			\$766 50
46	pairs c. i. monkey legs, at \$1 50.....	\$69 00	
31	pairs w. i. monkey legs, at 3 25.....	100 75	
28	cross heads and nuts, at 1 50.....	42 00	
149	iron plugs, at 50 cents.....	74 50	
293	wood plugs, at 50 cents.....	146 50	
338	brass plugs, at 50 cents.....	169 00	
18	iron plug risers, at \$2 25.....	40 50	
			\$642 25
171	wood stop boxes, at \$2 50.....	\$427 50	
15	wood stop boxes, risers, at 35 cents.....	5 25	
			\$432 75
3	hydrant keys, at \$2 25.....	\$6 75	
5	stop keys, at \$5 25.....	26 25	
56	chisels, hand diamond points, at 35 cents.....	19 60	
22	chisels, hand gouge, at 50 cents.....	11 00	
13	chisels, handle gouge, at 60 cents.....	7 80	
1	pipe cutter.....	60	
33	flat chisels, at 35 cents.....	11 55	
32	drills, at 50 cents.....	16 00	
14	taper reamers, at \$3 50.....	49 00	
12	drill press mandrills, at 75 cents.....	9 00	
1	set handle caulking tools.....	4 00	
2	set hand caulking tools, at \$2 50.....	5 00	
17	gasket irons, at 60 cents.....	10 20	
12	dozen S. hooks, at 75 cents.....	9 00	
			\$185 75

15 dozen plug monkey keys, at 25 cents.....	\$3 75	
5½ dozen stop monkey keys, at 75 cents.....	4 13	
5 dozen clevises, at 75 cents.....	3 75	
9 medium lead pots, at \$2 50.....	22 50	
3 small lead pots, at \$1 35.....	4 05	
3 pressure caps, at \$1 75.....	5 25	
1 reducing cap, brass.....	2 25	
5 reducing cap, iron, at \$1 00.....	5 00	
2 cap nut wrenches, at \$2 00.....	4 00	
12 stub end straps, at \$8 00.....	96 00	
40 flushing nozzles, at \$1 70.....	68 00	
8 D. E. brass plug wrenches, at 50 cents.....	4 00	
20 pairs hook bolts, at 15 cents.....	3 00	
12 plug monkeys, at \$3 25.....	39 00	
3 crowheads, at \$4 50.....	13 50	
40 O. S. plug nuts, at 25 cents.....	10 00	
36 N. S. plug nuts, at 25 cents.....	9 00	
50 brass frost valves, at 50 cents.....	25 00	
46 iron hoe heads, at \$1 75.....	80 50	
5 street key heads, at \$1 50.....	7 50	
		<hr/>
		\$410 18
154 6-inch gum valves, at \$5 00.....	\$770 00	
14 4-inch gum valves, at \$2 25.....	31 50	
331 pounds gum joint rings, at 55 cents.....	182 05	
124 pounds sheet gum, at 40 cents per pound.....	49 60	
		<hr/>
		\$1,033 15
Finished parts stop cocks.....	\$52 00	
Finished parts fire hydrants.....	61 00	
50 lbs. rolled brass, at 22 cents.....	11 00	
30 lbs. rod brass, at 20 cents.....	6 00	
70 lbs. wire brass, at 17 cents.....	11 90	
3,157 lbs. unfinished brass castings, at 14 cents.....	441 98	
1,869 lbs. finished brass castings, at 20 cents.....	373 80	
28,961 lbs. wrought iron, at 3 cents.....	868 83	
3,588 lbs. steel cast, at 15 cents.....	538 20	
2,592 lbs. steel machinery, at 3 cents.....	87 76	
450 lbs. steel shear, at 8 cents.....	36 00	
142 lbs. steel spring, at 3¼ cents.....	4 97	
		<hr/>
		\$2,493 44
1,225 lbs. iron forgings, at 10 cents....	\$122 50	
6,672 lbs. iron castings, at 2½ cents.....	150 12	
5 pinions and spindles O. S. 36-inch stop, at \$6..	30 00	
3 gear wheels, at \$2 75.....	8 25	
Hardware	114 63	
Bolts and nuts	412 00	

Oil and tallow.....	22 78	
Chandlery.....	13 60	
Lumber.....	260 13	
		<u>\$1,134 01</u>
		<u>\$13,881 03</u>

ARTICLES MANUFACTURED DURING 1889.

300 No. 1 fire hydrants, at \$29 25.....	\$8,775 00	
669 No. 2 " " " 37 00.....	24,753 00	
		<u>\$33,528 00</u>
48 3-inch stop cocks, at \$13 00.....	\$624 00	
700 6-inch " " " 15 00.....	10,500 00	
25 10-inch " " " 31 00.....	775 00	
50 12-inch " " " 37 00.....	1,850 00	
4 16-inch " " " 60 00.....	240 00	
5 20-inch " " " 95 00.....	475 00	
6 30-inch " " " 190 00.....	1,140 00	
3 30-inch " " rotary 275 00.....	825 00	
3 48-inch " " " 425 00.....	1,275 00	
		<u>\$17,704 00</u>
100 6-inch stop screws, at \$2 25.....	\$225 00	
5 8-inch " " " 3 25.....	16 25	
28 10-inch " " " 4 50.....	126 00	
12 12-inch " " " 5 00.....	60 00	
30 16-inch " " " 6 50.....	195 00	
2 20-inch " " " 8 25.....	16 50	
3 30-inch " " " 10 25.....	30 75	
		<u>\$669 50</u>
35 4-inch socket screws, at \$1 50.....	\$52 50	
60 6-inch " " " 1 75.....	105 00	
15 10-inch " " " 2 25.....	33 75	
5 Barton stop screws, at 3 25.....	16 25	
25 Viney stop screws, at 2 00.....	50 00	
7 Birkenbine screws, at 2 50.....	17 50	
		<u>\$275 00</u>
		<u>\$52,176 50</u>
19 4-inch iron bands, at \$2 00.....	\$28 00	
197 6-inch " " " 2 15.....	413 55	
20 8-inch " " " 3 50.....	70 00	
31 12-inch " " " 6 00.....	186 00	
14 16-inch " " " 7 50.....	105 00	
8 20-inch " " " 9 50.....	76 00	
29 30-inch " " " 15 00.....	435 00	
13 48-inch " " " 20 00.....	260 00	
		<u>\$1,583 55</u>

61 pairs c. i. monkey legs, at \$1 50.....	\$91 50	
56 pairs w. i. monkey legs, at 3 25.....	182 00	
47 cross heads and nuts, at 2 25.....	105 75	
1129 wood plugs at 50 cents.....	564 50	
835 brass plugs, at 50 cents.....	417 50	
264 iron plugs, at 50 cents.....	132 00	
729 frames and covers, 151,794 lbs., \$1 65.....	2,504 06	
3 iron furnaces, at \$18 00.....	54 00	
		<u>\$4,051 31</u>
202 chisels, flat, at 35 cents.....	\$70 70	
19 " hand gouge, at 50 cents.....	9 50	
12 " handle gouge, at 60 cents.....	7 20	
117 " hand diamond points, at 35 cents.....	40 60	
48 " handle diamond points, at 90 cents.....	43 20	
62 pipe cutters, at 60 cents.....	37 20	
18 large lead pots, at \$4 00.....	72 00	
		<u>\$280 40</u>
23 medium lead pots, at \$2 50.....	\$57 50	
3 small lead pots, at \$1 35.....	4 05	
12 reducing caps, at \$1 00.....	12 00	
12 pressure caps, at \$1 75.....	21 00	
26 dozen S. hooks, at 75 cents.....	19 50	
18 dozen cleaves, at 75 cents.....	13 50	
16 pairs hook bolts, at 15 cents.....	2 40	
9 mandrils, at \$1 25.....	11 25	
5 street keys, at \$5 25.....	26 25	
1 hydrant key, at \$2 25.....	2 25	
21 dozen fire hydrant monkey keys, at 25 cents.....	5 25	
1955 wood stop boxes, at \$2 50.....	4,987 50	
623 wood stop boxes, risers, at 35 cents.....	218 05	
24 hammers, at \$1 00.....	24 00	
284 eye bolts, at 37½ cents.....	106 50	
117 tail clamps, at 75 cents.....	87 75	
19 reamers, at \$3 50.....	66 50	
19 plug wrenches, at 50 cents.....	9 50	
19 wedges, at 35 cents.....	6 65	
12 crowbars, at \$1 15.....	13 80	
12 plug risers, at \$2 00.....	24 00	
31 gasket irons, at 60 cents.....	18 60	
15 set caulking iron tools, at \$2 50.....	37 50	
15 " " " " " 4 50.....	67 50	
4 stub end straps, at \$8 00.....	32 00	
		<u>\$5,874 80</u>
		<u>\$63,966 56</u>

Stop Cocks, Frames and Covers, Fire Hydrants, etc., delivered from Department Construction and Repair Shop to Purveyors' Districts, Works, etc., during the year 1889.

Districts.	STOP COCKS.								STOP SCREWS.				STOP			
	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	30-inch R.	48-inch R.	6-inch.	10-inch.	12-inch.	16-inch.	30-inch.	Boxes.	Risers.
First	8	173	1	4									1		294	204
Second	13	123	3	2	5	1				1					374	168
Third	4	104	3	12	1					6	6	1			400	12
Fourth	3	145			12	2	3	4	3	6				2	369	48
Fifth	5	38		1			5	2	2						54	66
Sixth		117		2	14				1						293	110
	33	700	6	18	36	3	8	6	3	3	13	6	1	1	2,784	608

Stop Cocks, Frames, Covers, etc.—Continued.

Districts.	IRON BANDS.								SOCKET SCREWS.				STOP						
	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	20-inch.	30-inch.	36-inch.	48-inch.	4-inch.	6-inch.	8-inch.	12-inch.	Cast Iron Monkey Legs.	Wrought Iron Monkey Legs.	Cross Heads.	Nuts.	Spindles.	Barren Bonnet & Screw.
First	22	6	1	2										9					8
Second	6	14		6					6	18	8			18	24		9	12	5
Third	30		2						36	52	7	5	6			21	89	18	5
Fourth	48					6	18	13	36	42			4	12	30		84		7
Fifth	12	24																	
Sixth	57			6	6														
	12	187	20	3	8	6	12	18	13	78	112	15	9	27	48	45	189	30	25

List of Articles delivered to the Purveyors' Districts, Works,
etc.—*Continued.*

Districts.	FIRE HYDRANTS.		KEYS.		CHISELS.				PLUGS.				Frames.	Covers.	Reducing Caps.	Pressure Caps.	Lead Pots.
	No. 1.	No. 2.	Steel.	Hydrants.	Fire Hydrant Monkey Keys.	Flat.	Hand Dia. Pts.	Handle Dia Pts.	Pipe Cutters.	Caps.	Wood.	Iron.						Brass.
First.....	53	81	2	36	51	24	24			180	24	166	150	125	3	2	2
Second.....	76	155	2		54	24				262	124	144	94	101	2	2	4
Third.....	32	139								229	96	174	150	159	2		1
Fourth.....	63	148	5				24	24		207		180	200	210	2		14
Fifth.....	4	23		24	12	12	24	29		36	6	6	50	50			9
Sixth.....	40	67	2	84						198	6	75	75	75			7
Works.....			3	1		54		10	12							1	2
Meters.....													10	20			
Total.....	268	613	14	1	144	174	60	72	63	12	1,112	256	645	729	731	10	8 37

List of Articles Delivered—*Continued.*

Districts.	S Hooks.	Clevises.	Hook Bolts.	Mandrels.	Hammers.	Eye Bolts.	Tail Clamps.	Reamers.	Wrenches.	Wedges.	Cross Bars.	Plug Risers.	Iron Furnaces.	Plug Monkey.	Gasket Irons.	Caulking Tools.
First.....	144		4					6	5	6	12	1				
Second.....	72	72	1	3	7	12			2			6		4	6	30
Third.....				2		6	6									68
Fourth.....		144	7	7		48	12							4		
Fifth.....	48	24			12	24	12			12			1		7	51
Sixth.....	48	48			10	194	87		6	12			2		12	45
Works.....									5	13						
Total.....	312	288	12	12	29	284	117	6	18	43	12	7	3	8	25	194

APPENDIX F.

REPORT OF JOHN E. CODMAN,

In Charge of Hydrographic Work.

BUREAU OF WATER,

Philadelphia, January 23, 1890.

JOHN L. OGDEN, ESQ.,

Chief, Bureau of Water.

SIR:—The following report of progress during the year 1889 of the hydrographic work, in connection with the investigations of the sources for a future water supply, is respectfully submitted.

Rain-fall observations have been continued at all the stations established by the Bureau during the entire year. These observations extend now over a period of seven years, and are of greater value every year; the records are continued.

The stream flow is governed by the distribution of the rain-fall throughout the year; heavy and long-continued rains occurring during the summer and fall months will give greater stream flows than heavy rains and snows during the winter months. The records so far show that the year 1885 was a minimum year in rain-fall and stream flow, the heaviest rain storm occurring during the winter months, and that the year 1889 was a maximum in rain-fall and stream flow, the heaviest rain storms occurring during the summer and fall months, with a deficiency during the winter and spring months.

The rain-fall for the months of January, February, March, and April, 1889, at all the stations is much below the average,

while for the remainder of the year it is greatly above the average. A comparison of Table 11 with preceding years shows that the percentage of rain-fall reaching the streams is less for the months of January, February, March and April, 1889, than for the same months in the preceding six years, and the percentage for the remaining eight months is greater than for the same period of time in the preceding six years.

The total rain-fall for the year 1889 for the eastern counties of Pennsylvania is nearly 25 per cent. above the average, and 17 per cent. above that of 1888. Only 90 per cent. of the average rain-fall for the first four months of the year had been recorded up to and including part of the month of May. On May 20 a heavy southeast storm set in, lasting eighteen hours, during which the automatic rain gauge at Philadelphia registered 2.21 inches of rain, and at one part of the storm, one inch of rain fell in twenty minutes, or at the rate of three inches per hour. This storm extended over all the stations at which observations are taken by the Bureau. The storm of May 31, which caused so much damage and loss of life in the middle and western counties of the State did not reach any of the Bureau Stations.

The snow which fell during the winter months did not exceed two (2) inches in depth, and melted about as soon as it fell.

The total amount of rain-fall registered by the gauge a Thirty-second and Spruce streets, Philadelphia, for the year 1889, is 50.62 inches, or 6.66 inches more than in 1888. The elevation of this gauge is sixty-six feet above the sea level.

The rain-falls at the stations Ottsville and Quakertown are nearly equal, amounting to 71.09 inches for the former, and 68.96 inches for the latter, and are greater in amount than at any other Stations in Bucks or Berks County, due no doubt to the close proximity of the Haycock Mountain, which rises to the height of 960 feet, with Ottsville on the eastern, and Quakertown on the western, slope, both near the head-waters

of the Tohickon creek. During the month of April, the observer at Ottsville moved to another part of the county, and as it is very important that the observations, to be of value, should be continued at the same place, another observer, a short distance from the former position of the gauge was selected to continue the record. All the rain-fall records are completed for the year 1889, both those maintained by the Bureau and those furnished by volunteer observers.

E. F. Smith, Superintendent of Canals at Reading, has furnished monthly reports from three stations in the Schuylkill Valley, Reading, Browsers, and Hamburg. Observations at Hamburg were begun in 1888, and are intended to take the place of those discontinued at Schuylkill Haven during 1887. The observations on rain-fall in the Schuylkill Valley for the year 1889 show 33 per cent. above the average, and a corresponding increase in flow of the Schuylkill and its tributaries.

Mr. Thomas I. Beans, of Moorestown, N. J., furnished complete reports for each month of the year from that section. In his report he says:—"The average rain-fall here for the past twenty-five years has been 43.62 inches. The year 1873 furnished 52.72 inches. The excess of rain-fall in 1889 over that of 1873 is not sufficient to have caused such disaster to agricultural interests. During the summer of 1889 it sometimes quit raining, but seldom cleared off, and the harmful cause may perhaps be found in the excessive atmospheric humidity near the earth, and clouds above, preventing performance of efficient duties of sunshine and evaporation. On 153 days of the year 0.01 inch or more of rain and snow fell. Of snow for the year, there fell in January 2.25 inches, in February 6.25 inches, March 4.02 inches. Total of rain and snow for the year, 53.655 inches."

Professor J. W. Moore furnished a complete daily report from Easton, Pa. The total rain-fall at that station was, for 1889, 63.89 inches; for 1888, 57.85 inches. In his report he says:—"July and November exceeded all the other months of this year; Also, that the increase in precipitation is not

“ limited to July and November, but is distributed throughout the months of May, June, August, September, and October, while January, February, March, and December show deficiencies. The number of rainy days amounted to 181.”

The automatic rain-gauge at Thirty-second and Spruce streets has been in operation now for eighteen months, and has given very good results. The amount of rain-fall, together with the rate per hour, is accurately recorded. The collector of this gauge is $22\frac{3}{8}$ inches in diameter, and for purposes of comparison, two more collectors, one of 2 inches diameter, and one of $7\frac{1}{4}$ inches, were placed at the same height and in like position. Records have been carefully made on each gauge at 8.30 A. M., every day that rain fell. The results show that although differences are found in some storms, yet the total amounts for the year are very close together, as will be seen from the following table :

Total for the year, $22\frac{3}{8}$ inches diameter collector, 50.626 inches.

Total for the year, $7\frac{1}{4}$ inches diameter collector, 51.008 inches.

Total for the year, 2 inches diameter collector, 50.003 inches.

The United States Signal Service use a collector 8 inches in diameter. The total as recorded at that Station, Ninth and Chestnut streets, was 50.60 inches. These amounts are remarkably close, and there can be no doubt that they represent a correct amount of rain-fall at Philadelphia.

It is about $2\frac{1}{4}$ miles from Thirty-second and Spruce streets to Ninth and Chestnut streets. The distance apart causes slight variations to be observed in different storms. The elevation of the gauge at Thirty-second and Spruce streets above the ground is 17 feet, and that at Ninth and Chestnut streets 175 feet above the pavement. Observations taken at the Pennsylvania Hospital, one-quarter of a mile from the Signal Station, for the year 1889, give 60.58 inches, or 17 per cent. more than any of the four preceding gauges.

Observations taken at Germantown, by Thomas Meehan, give 59.40 inches, or 16 per cent. more than the Bureau gauges.

The automatic records by the gauge at Thirty-second and Spruce streets, show that at eight different times the rain-fall has reached the rate of one inch per hour and over. On August 14 and 15 a series of showers occurred, during which 2.46 inches of rain fell in about five hours. At one part of the storm one inch of rain fell in 20 minutes, or at the rate of three inches per hour. At another time during the same storm 1.03 inches fell in 42 minutes, or at the rate of 1.47 inches per hour.

The rain-fall at Philadelphia is from 14 to 40 per cent. less than at the stations in the Schuylkill Valley, varying according to locality. As an illustration of this, the storm of July 14 to 16, extended over the entire Schuylkill Valley, but the rainfall at Seisholtzville, near the head-waters of the Perkiomen creek, was 2.09 inches; at Frederick, 17 miles down the Perkiomen, it was 2.91 inches, while at Philadelphia, it was only a little more than one-half inch. This storm produced very sudden and heavy freshets in all the streams flowing into the Schuylkill, and causing that river to rise, until over six feet of water were registered as flowing over Fairmount Dam.

The greatest amount of rain-fall for the year, from any of the stations is reported from West Chester, where 73.00 inches are recorded. The next highest are reported from Pottstown and Ottsville, with 71.22 inches and 71.09 inches, respectively. By the Pennsylvania Hospital reports the rain-fall of 1889 has been exceeded by one year only, since the records were begun in 1825. A rain-fall of 61.187 is recorded for the year 1867, or 0.63 inch more than that of 1889. On 159 days of the year 0.01 inch or more of rain fell.

The automatic rain gauges at the forks of the Neshaminy and Frederick have both been altered to correspond with the new design. A small frame shelter house has been built for each, six feet square in plan, and the collectors placed on the roof, about 11 feet above the surface of the ground, the recording machinery being directly under the collector. Observations are also made on the ordinary field gauges at the same time with the automatic, and a record made of both.

They are now found to agree very closely, whereas, before these improvements were made, the differences were often as great as 25 per cent.

To illustrate the workings of the automatic recording apparatus, used in connection with the rain-fall and stream flow, a series of diagrams is attached to this report.

The storm of July 14 to 15, before mentioned, has been selected as a fair sample. The vertical lines in all the diagrams represent the hours of the day; the heavy vertical lines, mid-night of each day; the lines occupy the same time in each diagram, so that the sequence of rain-fall, stream flow and volume, can be easily seen. The first diagram at the top of the sheet shows the amount of rain-fall, with time when it began and when it ceased. Horizontal lines represent inches of rain. The second diagram shows the record made by the automatic stream gauge; when the stream began to rise; the time it reached the highest point, and continuance of flow at the highest point. Horizontal lines represent feet in height. The third diagram shows the volume of flow in cubic feet per second for each hour. Horizontal lines represent one thousand cubic feet per second. The fourth diagram shows a cross section of the stream at the automatic recording gauge.

Profiles and cross sections of each of the three streams on which observations are taken have been prepared from notes and maps on file in the Bureau.

The profiles of the Neshaminy and Perkiomen are made on the main stream, and also on the two principal branches. Cross sections are made of the valleys at points near the gauging stations, and at elevations of each 50 feet above these points, as nearly at right angles to the general course of the valley as possible. The profile of the Tohickon is on the main stream from its junction with the Delaware to its sources. The cross sections are taken at elevations of about 50 feet apart. An examination of profile and cross sections will show at once why the Tohickon yields so much more than the other two per square mile of drainage area.



180

8

9

1

0

2

2

7

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5

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8

2

TABLE 1.
 MONTHLY PRECIPITATION ON SUNDRY WATER SHEDS,
 COMPARED WITH U. S. SIGNAL SERVICE OBSERVATIONS AT PHILADELPHIA, 1889.
 ELEVATION IN FEET ABOVE SEA LEVEL.

DATE, 1889.	PHILADELPHIA SERIES.					SCHUYLKILL SERIES.					PERKIOMEN SERIES.					DELAWARE SERIES.					TOHICKON AND NESHAMINY SERIES.																					
	U. S. Sig. Service.	PHILADELPHIA BUREAU OF WATER	PENNSYLVANIA HOSPITAL.	GERMANTOWN.	LEBANON.	READING.	POTTSTOWN.	BROWERS.	HAMBURG.	SIESHOLTZVILLE.	FREDERICK.	EASTON.	MOORESTOWN.	WEST CHESTER.	OTTSVILLE.	QUAKERTOWN.	SMITH'S CORNER.	POINT PLEASANT.	LANSDALE.	FORKS OF NESHAMINY.	DOYLESTOWN.																					
	Ele. 195	66	25	368	480	207.6	150	86.4	365.1	870	299.7	340	65	455	390	536	480	119.5	350	143	405																					
	Precipitation, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.							
January.....	3.75	3.41	-0.34	4.86	+1.11	3.82	+0.07	2.83	-0.92	4.24	+0.49	4.12	+0.37	3.79	+0.04	2.73	-0.02	4.28	+0.53	3.43	-0.32	5.31	+1.56	4.07	+0.32	4.78	+1.03	4.30	+0.55	4.58	+0.83	4.19	+0.44	4.64	+0.89	2.95	-0.80	3.55	-0.20	4.32	+0.57	
February.....	2.00	1.84	-0.16	2.61	+0.61	2.19	+0.19	1.85	-0.15	1.10	-0.90	1.92	-0.08	1.91	-0.09	1.58	-0.42	2.13	+0.13	1.84	-0.16	2.26	+0.26	2.27	+0.27	2.46	+0.46	2.67	+0.67	2.38	+0.38	2.22	+0.22	2.20	+0.20	1.63	-0.37	2.03	+0.03	2.05	+0.05	
March.....	2.58	2.56	+0.24	4.17	+1.59	3.34	+0.76	3.45	+0.87	2.98	+0.40	3.73	+1.15	3.50	+0.92	1.62	-0.96	3.59	+1.01	2.75	+0.17	3.61	+1.03	3.85	+1.27	5.44	+2.86	4.42	+1.84	3.47	+0.89	3.35	+0.77	3.45	+0.87	2.98	+0.40	3.35	+0.77	3.77	+1.19	
April.....	3.17	3.08	-0.09	4.40	+1.23	3.20	+0.03	5.47	+2.30	5.63	+2.46	6.15	+2.98	3.72	+0.55	2.52	-0.65	6.23	+3.06	3.86	+0.69	5.21	+2.04	3.84	+0.67	5.46	+2.29	4.64	+1.47	4.83	+1.66	5.02	+2.85	5.11	+1.94	4.90	+1.73	4.68	+1.51	4.90	+1.73	
May.....	4.32	5.20	+0.88	4.68	+0.36	5.73	+1.41	5.47	+1.15	3.58	-0.74	7.37	+3.05	6.42	+2.10	1.70	-2.62	4.55	+0.23	4.55	+0.23	6.08	+1.76	4.59	+0.27	5.78	+1.46	5.85	+1.53	5.45	+1.13	4.75	+0.43	5.59	+1.27	4.17	-0.15	5.70	+1.38	4.82	+0.50	
June.....	3.39	2.91	-0.48	3.49	+0.10	3.36	-0.03	8.66	+5.27	7.99	+4.60	6.20	+2.81	3.87	+0.48	2.60	-0.79	7.91	+4.52	6.42	+3.03	3.77	+0.38	3.44	+0.05	5.38	+1.99	7.58	+4.19	7.31	+3.92	7.54	+4.15	5.33	+1.94	5.45	+2.06	4.49	+1.10	5.82	+2.43	
July.....	8.29	8.24	-0.05	8.15	-0.14	10.50	+2.21	9.37	+1.08	9.27	+0.88	12.50	+4.21	11.93	+3.64	5.43	-2.86	11.77	+3.48	12.69	+4.40	10.48	+2.19	7.94	-0.35	12.49	+4.20	13.19	+4.90	11.54	+3.25	12.30	+4.01	12.30	+4.01	15.02	+6.73	10.37	+2.08	11.87	+3.58	
August.....	7.07	6.22	-0.85	8.14	+1.07	6.60	-0.47	3.07	-4.00	3.01	-4.06	5.05	-2.02	5.47	-1.60	2.55	-4.52	4.15	-2.92	3.84	-3.23	5.27	-1.80	5.50	-1.57	4.43	-2.64	5.13	-1.90	4.76	-2.31	4.88	-2.19	3.75	-3.32	4.66	-2.41	5.30	-1.77	4.28	-2.79	
September.....	4.66	5.55	+0.62	6.65	+1.99	5.56	+0.90	3.45	-1.21	5.32	+0.66	8.44	+3.78	6.80	+2.14	3.27	-1.34	7.32	+2.66	6.68	+2.02	6.40	+1.74	6.10	+1.44	9.95	+5.29	7.38	+2.72	8.06	+3.40	8.07	+3.41	8.15	+3.49	8.32	+3.66	8.76	+4.10	8.61	+3.95	
October.....	3.76	4.00	+0.24	4.72	+0.96	5.41	+1.65	4.47	-0.71	3.67	-0.09	4.56	+0.80	5.10	+1.34	4.43	+0.67	5.15	+1.39	4.61	+0.85	4.51	+0.75	4.03	+0.27	4.97	+1.21	5.09	+1.33	5.23	+1.47	4.99	+1.23	5.06	+1.30	5.02	+1.26	4.43	+0.67	4.27	+0.51	
November.....	6.76	6.84	+0.08	8.00	+1.24	8.78	+2.02	9.99	+3.23	8.15	+1.39	9.15	+2.39	7.00	+0.24	6.15	-0.61	9.70	+2.94	7.63	+0.87	9.90	+3.14	7.02	+0.26	9.91	+3.15	8.87	+2.11	8.88	+2.12	9.06	+2.30	8.63	+1.87	8.11	+1.35	7.44	+0.68	10.05	+3.29	
December.....	0.85	0.78	-0.07	0.68	-0.17	0.91	+0.06	2.20	+1.35	1.88	+1.03	2.03	+1.18	1.55	+0.70	1.76	+0.91	1.53	+0.68	1.87	+1.02	1.12	+0.27	1.01	+0.16	1.95	+1.10	1.97	+1.12	2.43	+1.58	1.86	+1.01	1.69	+0.84	1.71	+0.86	1.64	+0.79	2.30	+1.45	
Total.....	50.60	50.62	+0.02	60.55	+9.95	59.40	+8.80	60.28	+9.78	56.82	+6.22	71.22	+20.62	61.06	+10.46	36.34	-14.26	68.31	+17.71	60.17	+9.57	63.92	+13.32	53.66	+3.06	73.00	+22.40	71.09	+20.49	68.92	+18.32	68.23	+18.63	65.90	+15.30	64.92	+14.32	61.74	+10.14	67.06	+16.46	
Percentages.....	100	100	117	116	119	114	123	120	61	135	118	126	106	144	140	136	135	130	128	122	132	
7 years yearly averages.	inches..... percentages	40.84 100	41.39 101	+0.55	47.66 117	+6.82	47.44 116	+6.60	46.65 112	+6.81	44.98 110	+4.14	50.63 124	+9.79	45.88 112	36.34 90	-4.50	53.02 130	+12.18	48.00 117	+7.16	51.33 126	+10.49	45.86 112	+5.02	55.95 136	+15.11	53.36 136	+12.52	49.70 121	+8.86	55.02 134	+14.18	57.08 142	+16.24	48.92 120	+8.08	50.44 123	+9.60	50.66 124	+9.82

TABLE 2.

AREA OF WATERSHED, 152.0 SQUARE MILES.

Rain Storms Exceeding in Rate 0.25 Inches per Hour, as Recorded by the Automatic Rain Gauge at Frederick, for the Year 1889, and the Effects on the Perkiomen, as Recorded by the Automatic Stream Gauge.

DATE OF OBSERVATIONS.	AUTOMATIC RAIN GAUGE.					AUTOMATIC STREAM GAUGE.						REMARKS.
	TOTAL FALL.		MAXIMUM FALL.			Recorded rise of stream in feet.	Hours to reach highest point of flow. Hrs. Min.	Duration of flow at highest point. Hrs. Min.	Number of hours of storm flow. Hrs. Min.	Stream flow in cubic feet per second at highest point.	Average yield in cubic feet per second per square mile of drainage area for hours of storm flow.	
	Amount in inches.	Duration. Hrs. Min.	Amount in inches.	Duration in minutes.	Rate per hour during maximum fall.							
January 20th and 21st, rain and snow storm.....	0.960	14-55	0.50	120	0.25	2,380	31-00	2-00	32-00	792	3,565	
March 3d and 4th, rain storm.....	1.670	35-55				8,110	38-00	1-30	48-00	6,155	18,800	
April 25th to 29th, northeast storm.....	2.165	86-40	0.15	10	0.90	5,290	26-00	2-00	96-00	2,333	6,929	
May 10th, shower.....	0.255	2-40	0.10	6	1.00							No effect on stream.
May 19th, rain storm.....	0.475	9-00	0.15	30	0.30							
May 20th and 21st, rain storm.....	1.375	28-15	0.30	15	1.20	3,560	26-00	2-00	72-00	1,152	3,130	Rain of 19th, 20th, and 21st.
May 21st, shower.....	0.600	2-15	0.50	40	0.75							
May 25th and 26th, rain.....	0.505	8-00	0.15	24	0.375							
May 27th, rain.....	0.900	12-35	0.15	8	1.130	4,000	33-00	2-00	48-00	1,649	8,901	Rain of 25th, 26th, and 27th.
May 31st and June 1st, rain storm.....	1.579	25-00	0.32	20	0.975	6,420	27-00	1-30	48-00	4,272	9,590	
June 5th, shower.....	0.270	4-45	0.15	8	1.130							No effect on stream.
June 11th, showers.....	0.505	4-40	0.200	30	0.400	1,400						
June 15th, rain storm.....	1.705	7-15	0.905	16	3.594	3,450	10-00	1-00	33-00	1,350		
June 17th, heavy shower.....	0.745	1-55	0.395	12	1.975	3,930	8-30	1-00	26-30	1,637		
June 25th and 26th, rain storm.....	1.365	17-15	0.430	16	1.610	5,130	11-00	2-00	48-00	2,180	4,960	
July 1st, rain storm.....	1.250	13-10	0.800	35	1.360	2,840	12-00			1,105		
July 2d, rain storm.....	0.950	20-40	0.350	15	1.400	3,480	10-00		96-00	2,138	6,503	Rain of 1st, 2d, and 4th.
July 4th, shower.....	0.385	2-45	0.200	30	0.400	2,450	8-00	3-00		1,703		
July 11th, showers.....	1.550	17-30	0.500	12	2.500	1,530	14-00	3-00				
July 13th, showers.....	0.525	7-50	0.150	12	0.750	2,680	3-00	0-30				Rain of 13th, 14th, and 15th.
July 14th and 15th, rain storm.....	2.590	10-36	1.440	28	3.090	9,950	4-30	4-00	96-00	8,570	8,826	
July 28th, showers.....	0.220	15-45	0.200	36	0.330							No effect on stream.
July 30th and 31st, heavy rains.....	4.900	46-45	2.350	116	1.220	10,400	22-00	4-00	120-00	8,570	11,751	
August 14th, rain storm.....	1.050	7-05	0.600	20	1.800							
August 15th, rain storm.....	1.520	12-05	1.120	30	2.240	6,770	24-00	2-00	72-00	4,501	7,015	
September 11th to 14th, rain storm.....	0.970	69-30	0.150	10	0.900	0,980						
September 15th, rain storm.....	0.500	18-20	0.200	20	0.600							
September 16th, rain storm.....	1.330	4-20	0.880	48	1.100							
September 17th, rain storm.....	2.000	23-00	0.300	20	0.900	10,700	21-00	2-00	72-00	9,375	14,880	
October 26th to 28th, rain storm.....	2.003	49-00	0.300	45	0.400	8,100	10-00	2-00	48-00	5,825	14,991	
November 8th and 9th, rain storm.....	2.490	50-40	0.300	20	0.900	11,080	10-15	0-45	48-00	10,525	21,500	
November 8th and 9th, rain storm.....			0.700	72	0.600							
November 13th, rain storm.....	0.970	7-20	0.450	36	0.750	6,400	6-00	2-00	48-00	5,319	10,566	
November 17th to 19th, rain storm.....	1.290	42-15	0.120	20	0.360	6,050	21-00	1-30	72-00	4,780	8,820	
November 27th, rain storm.....	0.960	20-15	0.130	15	0.500	5,650	17-00	5-00	48-00	4,500	11,506	

TABLE 3.

AREA OF WATERSHED, 139.3 SQUARE MILES.

Rain Storms Exceeding in Rate 0.25 Inch per Hour, as Recorded by Automatic Rain Gauge at the Forks of the Neshaminy, for the Year 1889, and the Effect on the Neshaminy, as Recorded by Automatic Stream Gauge.

DATE OF OBSERVATIONS.	AUTOMATIC RAIN GAUGE.					AUTOMATIC STREAM GAUGE.						REMARKS.
	TOTAL FALL.		MAXIMUM FALL.			Recorded rise of stream in feet.	Hours to reach highest point of flow. Hrs. Min.	Duration of flow at highest point. Hrs. Min.	Number of hours of storm flow. Hrs. Min.	Stream flow in cubic feet per second at highest point.	Average yield in cubic feet per second per square mile of drainage area for hours of storm flow.	
	Amount in inches.	Duration in Hrs. Min.	Amount in inches.	Duration in minutes	Rate per hour during maximum fall.							
January 16th and 17th, rain and snow storm.....	1.290	11-10	0.72	190	0.28	3.02	14-50	6-00	48-00	1,564	4.483	
March 3d and 4th, rain storm.....	1.830	31-40				6.72	18-00	2-00	48-00	4,975	16.370	
April 25th to 28th, northeast storm.....	3.420	45-30	0.40	80	0.30	5.48	6-00	2-00	72-00	4,558	9.732	
May 10th, shower.....	0.380	5-10	0.15	10	0.90							No effect on stream.
May 14th, shower.....	0.600	3-45	0.55	30	1.10	0.45	0-20	2-00	12-00	242	1.170	
May 20th, southeast storm.....	1.910	11-30	0.45	20	1.35	5.09	7-00	4-00	24-00	3,080	6.754	
May 20th, southeast storm.....			0.30	15	1.20							
May 26th, rain.....	0.870	8-20	0.25	60	0.25	0.84	12-00	2-00	24-00	289	1.540	
May 27th, rain.....	1.000	12-30	0.35	60	0.35	3.04	5-30	1-00	48-00	1,610	4.578	
June 8th to 12th, rain.....	1.400	106-10	0.53	35	0.92	0.34	1-45					No effect on stream.
June 17th, heavy shower.....	0.160	2-15				1.82	0-30	1-00	24-00	684	2.087	Heavy shower in valley.
June 25th and 26th, rain.....	1.210	17-20	0.35	52	0.42	4.04	1-30	2-00	30-00	2,399	10.647	
June 29th, shower.....	0.450	1-15	0.40	40	0.60							No effect on stream.
July 1st to 4th, showers and light rains.....	1.700	70-00	0.25	20	0.75	4.33	91-00	1-30	96-00	2,550	4.481	
July 15th, heavy rain.....	2.260	8-00	0.55	80	0.41	9.82	8-00	1-00	24-00	8,460	24.308	
July 29th to 31st, heavy showers.....	3.790	42-25	1.68	66	1.53	10.91	26-00	4-00	168-00	9,520	10.721	} Rain of July 29, 30, and 31 and Aug. 3.
August 3d,	1.805	7-10	1.52	45	1.90	3.10	1-00	0-20				
August 14th, rain storm.....	0.540	7-25										
August 15th, rain storm.....	0.920	10-25	0.35	20	1.05	7.58	7-00	2-30	48-00	6,224	9.186	
September 11th to 14th, rain storm.....	3.180	84-15	0.20	20	0.60	3.27	36-00	3-00	48-00	1,339	4.157	
September 15th, rain storm.....	1.860	10-30	1.56	48	1.95	6.05	2-00	0-20	8-00	4,662	15.141	
September 17th to 18th, rain storm.....	2.090	39-00	0.35	24	0.87	9.71	4-00	1-00	48-00	10,520	19.763	
September 26th, rain storm.....	1.110	41-00	0.20	16	0.75	2.84	12-00	6-00	48-00	1,564	5.576	
October 26th to 27th, rain storm.....	2.010	24-45	1.26	90	0.84	7.76	12-00	2-00	48-00	6,039	16.930	
November 8th to 10th, rain storm.....	1.950	52-00	0.25	28	0.54	7.44	8-00	5-00	48-00	5,450	14.080	
November 13th, rain storm.....	0.870	9-25			0.28	5.57	7-00	1-30	48-00	4,558	9.336	
November 17th to 19th, rain storm.....	1.330	38-00	} Less than .25	inches per	hour. }	5.98	19-00	2-00	48-00	4,486	13.757	
November 27th, rain storm.....	1.900	22-30				6.40	13-00	6-00	48-00	5,554	16.865	

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TABLE 4.

AREA OF WATERSHED, 102.2 SQUARE MILES.

Rain Storms Recorded by the Field Rain Gauge, and the Effect on the Tohickon as Recorded by the Automatic Stream Gauge, for the Year 1889.

DATE OF OBSERVATIONS.	FIELD RAIN GAUGE.				AUTOMATIC STREAM GAUGE.						REMARKS.
	TOTAL FALL.				Recorded rise of stream in feet.	Hours to reach highest point of flow. Hrs. Min.	Duration of flow at highest point. Hrs. Min.	Number of hours of storm flow. Hrs. Min.	Stream flow in cubic feet per second at highest point.	Average yield in cubic feet per second per square mile of drainage area for hours of storm flow.	
	Amount in inches.	Duration. Hrs. Min.									
January 16th and 17th, rain and snow storm.....	0.900	19—50			3.35	15—00	4—00	48—00	2,661	10.156	
January 20th and 21st, rain, storm.....	1.650	36—00			1.35	17—00	5—00				
March 3d, 4th, and 5th, rain storm.....	1.890	59—15			4.15	38—00	3—00	96—00	3,490	14.571	
March 20th to 22d, rain storm.....	1.400	37—00			1.82	24—00	3—00	48—00	1,230	7.700	
April 25th to 23th, northeast storm.....	3.512	63—30			3.90	26—00	12—00	96—00	2,582	11.216	
May 10th, shower.....	0.625	2—00									No effect on stream.
May 14th, shower.....	0.210	3—15									No effect on stream.
May 19th to 21st, showers.....	2.845	47—25			2.89	9—00	12—00	96—00	1,187	4.682	
May 25th to 28th, showers.....	1.400	56—00			1.81	18—00	12—00	72—00	955	3.974	
June 11th and 12th, rain storm.....	0.900	22—30			1.25						
June 15th to 17th, rain storm.....	1.590	60—00			1.64	5—00	1—00	72—00	735	3.956	
June 25th to 26th, rain storm.....	1.750	29—15			3.22	4—00	3—00	48—00	1,856	6.932	
June 29th, shower.....	1.920	1—00			1.70	0—12	3—00				
July 1st to 4th, rain.....	1.900	74—00			2.63	28—00	3—00	96—00	1,973	10.209	
July 15th, rain.....	1.400	12—45			3.95	4—00	1—00	48—00	3,546	14.383	
July 19th and 20th, rain.....	3.950	10—00			7.29	4—00	0—30	24—00	7,143	19.323	
July 30th and 31st, rain.....	3.215	33—30			6.850	21—00	1—30	48—00	6,681	35.790	
August 1st, rain.....	0.700	22—50									
August 13th and 14th, rain.....	2.535	30—00			5.47	17—00	2—00	48—00	5,240	21.000	
September 11th to 13th.....	2.110	72—00									
September 15th and 16th.....	1.830	18—00			6.69	120—00	2—00	48—00	5,774	24.690	
September 17th to 18th.....	1.640	21—30									
September 26th.....	1.010	4—00			1.35	18—00	36—00	72—00	663	4.053	
October 26th to 28th.....	2.595	29—15			4.42	3—30	13—00	48—00	4,288	22.534	
November 8th.....	2.400	16—00			5.91	5—00	1—30	48—00	5,934	27.891	
November 18th.....	0.960	23—45			3.32	18—00	4—00	48—00	2,809	13.030	
November 27th and 28th.....	2.160	22—00			4.00	17—00	4—00	24—00	4,059	27.088	

TABLE 5.

RAIN STORMS EXCEEDING IN RATE 0.25 INCH PER HOUR
AS RECORDED BY THE AUTOMATIC RAIN GAUGE AT PHILADELPHIA, PA., FOR THE YEAR 1889.

Date of Observation.	TOTAL FALL.		MAXIMUM FALL.				
	Amount in inches.	Duration Hrs. Min.	Amount in inches.	Duration in min'ts.	Rate per hour during max. fall.		
March 4th and 5th, N. E. storm.....	1.47	37—50					
April 26th to 29th, N. E. storm.....	2.17	47—10	0.30	60	0.30		
May 20th to 22d, S. E. storm.....	2.21	17—30	1.00	20	3.00		
May 20th to 22d, S. E. storm.....	2.21	17—30	0.25	20	0.75		
May 25th to 26th, S. E. storm.....	1.325	6—56	0.35	60	0.35		
May 27th, S. E. storm.....	1.015	9—40	0.40	60	0.40		
June 12th, shower.....	0.440	16—30	0.09	15	0.36		
June 15th, shower.....	0.380	5—40	0.20	15	0.80		
June 26th, rain storm.....	1.230	16—30	0.25	12	1.25		
July 1st to 4th, showers.....	0.510	5—20	0.315	20	0.94		
July 10th to 11th, showers.....	0.867	13—30	0.717	60	0.72		
July 15th, showers.....	0.560	8—40	0.45	35	0.77		
July 19th, showers.....	0.855	14—30	0.50	48	0.57		
July 26th to August 2d	} rain in succession...	27th.....	0.860	10—30	0.35	60	0.35
showers and light		28th.....	0.340	4—45	0.15	12	0.75
		31st.....	2.965	24—00	1.17	36	1.95
		Aug. 1st...	0.610	20—00	0.15	15	0.60
August 5th, shower.....	0.750	5—40	0.42	30	0.84		
August 14th, shower.....	1.100	3—20	1.03	42	1.47		
August 14th, shower.....	1.360	1—40	1.00	20	3.00		
August 23d to 24th.....	1.660	17—45	0.956	55	1.04		
September 16th, rain storm.....	0.905	3—50	0.20	15	0.80		
September 17th, rain storm.....	0.900	11—50	0.22	14	0.95		
September 24th to 25th, rain storm.	0.900	35—25	0.15	15	0.60		
November 19th.....	1.540	37—50	0.20	28	0.43		
November 27th.....	1.870	23—35	0.20	25	0.78		

The total fall of the Tohickon, from the head-waters to the Delaware river, is 650 feet in a distance of 28 miles, and for a portion near the junction with the Delaware its fall is 100 feet in about two miles. The section shows the valley to be deep and almost precipitous.

Tables Nos. 2, 3, and 4 are given to show the rate of rain-fall as registered by the automatic rain-gauges and the subsequent effect on the stream-flow as registered by the automatic stream-gauges. The table gives the amount and duration of the rain-fall: the maximum rate and duration; the rise in feet of the stream; time to reach the highest point; continuance of flow at highest point; volume of flow at the highest point in cubic feet per second, and cubic feet per second per square mile of drainage area for the hours of storm-flow; that is, for such a period of time as will cover about the whole of the flood flow. It is understood that the stream will be affected by the storm for several days, but the flood flow will pass away in 48 hours, or more as given in the table; the amount flowing off is given for this portion of the flow.

Table No. 6 shows the average percentage of rain-fall reaching the streams for each month of the year for the past six years. The average maximum is attained in the month of March, and the minimum in October. The last two years have increased the minimum percentage for the Perkiomen from 10 per cent. to 19 per cent.; for Neshaminy, from 2 per cent. to 12 per cent., and for the Tohickon, from 8 per cent. to 20 per cent. During 1889, the largest percentage occurred in the month of March for the three streams, and the minimum in May for the Perkiomen and Tohickon, and in June for the Neshaminy. The table of maximum and minimum percentages reaching the streams for each month in a period of six years, shows that the year 1889 gave for June, July, August, September, October, November, and December, a maximum for those months, and January, February, and March, a minimum. The Perkiomen for the summer months of June, July, and August, and for the two fall months of September and October,

gives an average maximum percentage of 47, an increase of 7 per cent. over 1888, and a minimum of 13, or a total average of 30 per cent. The Neshaminy for the same months has an average maximum of 46, an increase of 19 per cent. over 1888, and a minimum of 4, or a total average of 25 per cent. The Tohickon for the same months has an average maximum of 61, or an increase of 14 per cent. over 1888, and a minimum of $4\frac{1}{2}$, or a total average of 33 per cent.

The average daily yield of the Perkiomen at Frederick, for the past six years, the year ending September 30 (see Table 7), was 183,440,586 gallons. The yield of the same stream for the year 1889, was 223,129,479 gallons per day, or 22 per cent. over the six years average, with a rain-fall on the water shed of 23 per cent. above the seven years average of rain-fall observations.

The average daily yield on the Neshaminy for the past six years was 162,098,384 gallons. The yield of the same stream for the year 1889 was 207,590,285 gallons per day, or 28 per cent. in excess of the average for six years, with a rain-fall on the water shed of 23 per cent. above the average for seven years.

The average daily yield of the Tohickon for the past six years was 154,083,427 gallons. The yield of the same stream for 1889 was 184,367,062 gallons per day, an increase of 20 per cent. over the six years average, with a rain-fall on the water shed of 24 per cent. above the average.

Table No. 7 gives the total annual yield in gallons, together with the daily yield, and the yield in cubic feet per second per square mile of drainage area, and the cubic feet per second per inch of rain-fall area, as compared with the Croton and Sudbury rivers for the same period of years.

The table shows the Tohickon to give larger results than either of the other two for years preceding 1889. The year 1889, with an increase of rain-fall of 21 per cent. over 1888, yielded a smaller average increase of stream flow and a less amount per inch of rain-fall. Observations should be continued on this stream for a longer period of years to get a fair average flow.

TABLE 6.

Comparative Statistics of Sundry Watersheds.

WATERSHEDS.	Area in miles	STATISTICS OF WATER- SHEDS IN PERCENTAGES OF TOTAL AREA.				PERCENTAGE OF RAINFALL REACHING THE STREAM.												
		Woodland.	Cultivatd.	Flats.	Roads.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Annual.
Perkiomen at Frederick, six years.....	152.0	25	71	2	2	81	82	112	84	35	26	20	40	27	19	48	63	49
Neshaminy, below Forks, six years.....	139.3	6	92	$\frac{1}{4}$	2	94	100	104	79	28	15	17	14	17	14	36	78	48
Tohickon, six years.....	102.2	24	72	2	2	114	122	124	95	29	26	23	29	24	20	56	64	59
Average.																		
Perkiomen, at Frederick.....	{ Maximum in six years.....					98	111	191	114	40	37	40	62	50	49	77	75	
	{ Minimum in six years.....					72	49	65	41	29	13	8	19	17	9	25	32	
Neshaminy, below Forks.....	{ Maximum in six years.....					103	138	177	122	36	23	44	71	41	50	74	100	
	{ Minimum in six years.....					85	74	62	48	18	5	2	9	3	2	14	47	
Tohickon.....	{ Maximum in six years.....					138	191	190	148	48	53	52	81	66	51	90	97	
	{ Minimum in six years.....					99	64	90	42	17	9	2	7	2	2	18	49	

TABLE 7.

AVERAGE ANNUAL YIELD OF SUNDRY STREAMS, OCTOBER 1ST TO
SEPTEMBER 30TH.

WATERSHEDS.	Area in miles.		Average annual yield in galls.	Average daily yield in galls.	Average yield in cubic feet per second per sq. mile of drainage area.	Average yield in cubic ft. per second per sq. mile of drainage area for each inch of rainfall.
		Rainfall.				
Perkiomen, at Frederick, 6 yrs.	152.0	49.137	66,954,871,497	183,440,586	1.870	0.0381
Neshaminy, below Forks, 6 yrs.	139.3	49.762	59,158,108,980	162,098,384	1.806	0.0370
Tohickon, 6 years	102.2	51.898	56,240,266,509	154,083,427	2.333	0.0450
Sudbury, Mass., 6 years.....	70.0	46.10	29,606,810,000	81,040,500	1.615	0.035
Croton, N. Y., 6 years.....	361.0	46.50	106,600,000,000	440,000,000	1.890	0.041

TABLE 8.

OBSERVED MINIMUM STREAM FLOW AND MINIMUM FLOW, 1889.

STREAM.	PREVIOUS OBSERVED MINIMUM FLOW.	DATE.	MINIMUM FLOW, 1889.	DATE.
	Cubic ft. per 24 hours.		Cubic ft. per 24 hours.	
Perkiomen, at Frederick....	653,184	.....	5,788,800	August 31.
Neshaminy, below Forks....	108,864	.....	3,240,000	Sept. 6.
Tohickon	17,280	.....	734,400	Sept. 7.

TABLE 9.

OBSERVED MAXIMUM STREAM FLOW AND MAXIMUM FLOW, 1889.

STREAM.	Cubic ft. per 24 hours.	DATE.	Cubic ft. per 24 hours.	DATE.
Perkiomen, at Frederick....	458,352,000	Sept. 18, '88	480,802,400	July 31, '89.
Neshaminy, below Forks....	498,268,800	Feb. 11, '86	477,878,400	July 31, '89.
Tohickon	479,174,400	Sept. 18, '88	407,289,600	July 31, '89.

The automatic stream gauges in use at the different stations have, with care and attention, given satisfaction. The winter of 1888-1889 was mild and warm; very little ice formed in the creeks, and no injury was sustained from that cause. The gauges are all placed so high that the highest water flow, so far, has failed to injure them. The gauges are all in good order and will last for some time longer.

All the instruments at Stover's dam, on the Tohickon, are kept in a small room prepared for them last year in the loft of the saw-mill. Observations begun last year on the high flows of the Tohickon were continued during the past year, and will be compared with observations during the coming year. The crest of the weir swept away by the ice in January, 1888, was partially replaced in September while the stream was low, but the long storm of rain beginning the tenth of the month, and continuing to the twenty-third, prevented any further operations or observations being made.

The following named persons have been engaged as observers and rodmen, during the entire year :

John G. Hilsman, rodman, Rush Valley P. O.
 George W. Wood, rodman, Spring Mount, Pa.
 R. C. Stover, rodman, Point Pleasant, Pa.
 Dr. George M. Grim, gauge observer, Ottsville.
 George Lowder, gauge observer, Smith Corner.
 Dr. J. A. Roth, gauge observer, Seisholtzville.
 Alfred W. Walton, gauge observer, Doylestown.
 H. L. Shull, gauge observer, Lansdale.

The Bureau is indebted to the following named persons, who have kindly furnished rain-fall records :

Mr. Thomas Meehan, Germantown, Philadelphia.
 Mr. J. L. Heacock, Quakertown, Pa.
 Sergeant L. M. Dey, U. S. Signal Service.
 Sergeant T. F. Townsend, State Weather Service, Philadelphia.
 Mr. Benjamin Shoemaker, Pennsylvania Hospital, Philadelphia.

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.

In order to secure uniformity in observations on rain-fall the following notice was sent to the observers at the beginning of the year 1890: "To facilitate the work of the Hydrographic Corps, and maintain a uniform system of observations with the State Service, it is requested that you hereafter take rain-fall observations, at least once every day, as near 8 P. M. as possible, recording the amount under that date as the rain-fall of the preceding twenty-four hours."

Respectfully,

JOHN E. CODMAN,

In charge of Hydrographic Work.

TABLE 10.—YIELD ON SUNDRY STREAMS FOR THE YEAR 1889.

1889.	PERKIOMEN 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.....	1,166,477,760	37,628,315	281,479,326	952,931,520	30,739,727	229,949,112	1,041,534,720	33,597,894	251,329,684
February.....	522,434,880	13,658,388	139,574,427	504,187,200	18,006,687	134,699,364	361,437,120	12,908,470	96,562,056
March.....	1,057,224,960	34,104,031	255,115,852	931,582,080	30,051,035	224,797,338	912,936,960	29,449,579	220,298,136
April.....	737,095,680	24,569,856	183,795,275	665,910,720	22,197,024	166,045,260	684,426,240	22,814,208	170,662,117
May.....	557,616,960	17,987,644	134,557,913	573,557,760	18,501,863	138,403,538	404,792,640	13,057,827	97,679,323
June.....	936,273,600	31,209,120	233,460,415	376,211,520	12,540,384	93,809,582	409,622,400	16,354,080	122,337,007
July.....	1,713,415,680	55,271,474	413,459,311	1,761,315,848	56,816,640	425,017,956	1,526,532,480	49,242,983	368,363,070
August.....	873,367,120	28,172,810	210,747,240	1,098,394,660	35,432,083	265,050,369	894,369,600	28,850,632	215,069,650
September.....	991,543,680	33,051,456	247,242,052	1,147,150,080	38,383,336	287,127,274	820,903,680	27,363,456	204,692,853
October.....	833,924,160	26,900,779	201,231,789	813,948,480	26,256,402	196,411,514	554,541,120	17,888,423	133,814,688
November.....	2,385,262,080	79,508,736	594,766,611	2,030,659,200	67,688,640	506,346,190	1,900,264,320	63,342,144	473,832,141
December.....	799,191,360	25,780,367	192,850,623	610,649,280	19,698,304	147,353,575	460,261,440	14,847,143	111,010,906
Total.....	12,573,816,920	34,448,814	257,695,020	11,466,498,248	31,415,064	235,000,995	9,971,622,720	27,319,514	204,364,144

TABLE 11.

PRECIPITATION AND STREAM FLOW IN SUNDRY STREAMS.

DATE.	PERKIOMEN, AT FREDERICK.						NESHAMINY, BELOW FORKS.						TOHICKON.					
	AREA OF WATERSHED, 152.0 SQUARE MILES.						AREA OF WATERSHED, 139.3 SQUARE MILES.						AREA OF WATERSHED, 102.2 SQUARE MILES.					
	Rainfall in inches.	Percentage flowing off.	Inches collectible.	Monthly yield of stream. Cubic feet.	Average daily yield of stream. Cubic feet.	Average yield in cubic feet per second per square mile of drainage area.	Rainfall in inches.	Percentage flowing off.	Inches collectible.	Monthly yield of stream. Cubic feet.	Average daily yield of stream. Cubic feet.	Average yield in cubic feet per second per square mile of drainage area.	Rainfall in inches.	Percentage flowing off.	Inches collectible.	Monthly yield of stream. Cubic feet.	Average daily yield of stream. Cubic feet.	Average yield in cubic feet per second per square mile of drainage area.
1888.																		
October	3.414	37	1.263	442,117,440	14,261,859	1.032	3.763	28	1.054	344,995,200	11,128,877	0.923	4.060	38	1.543	368,591,040	11,890,034	1.347
November	3.421	72	2.463	876,795,840	29,226,528	2.217	3.486	67	2.336	754,643,520	25,154,784	2.149	3.657	85	3.108	740,033,280	23,872,041	2.703
December	4.371	66	2.885	1,012,893,120	32,673,972	2.478	3.716	85	3.159	1,018,859,760	32,866,444	2.730	4.346	80	3.477	831,340,800	26,817,445	3.037
1889.																		
January	3.856	85	3.273	1,166,477,760	37,623,315	2.854	3.606	81	2.921	952,931,520	30,739,727	2.553	4.427	99	4.381	1,041,534,720	33,597,894	3.805
February	1.986	74	1.470	522,434,880	18,658,388	1.415	1.903	82	0.896	504,187,200	18,006,687	1.496	2.368	64	1.515	361,437,120	12,908,470	1.462
March	3.167	95	3.009	1,057,224,960	34,104,031	2.587	3.366	86	2.895	931,582,080	30,051,035	2.496	3.672	105	3.856	912,936,960	29,449,579	3.334
April	5.045	41	2.069	737,095,680	24,569,856	1.863	4.826	43	2.074	665,910,720	22,197,024	1.844	4.900	58	2.882	684,426,240	22,814,208	2.583
May	4.548	35	1.578	557,616,960	17,987,644	1.369	4.895	30	1.492	573,537,760	18,501,863	1.537	5.410	31	1.704	404,792,640	13,057,827	1.478
June	7.163	37	2.650	936,273,600	31,209,120	2.376	5.254	22	1.162	376,211,520	12,540,384	1.041	6.939	33	2.289	409,622,400	16,354,080	1.852
July	12.230	40	4.892	1,713,415,680	55,271,474	4.208	12.420	44	5.465	1,761,315,840	56,816,640	4.725	12.332	52	6.413	1,526,532,480	49,242,938	5.576
August	3.795	62	2.477	873,337,120	28,172,810	2.145	4.746	71	3.370	1,098,394,560	35,432,083	2.944	4.630	81	3.750	894,369,600	28,850,632	3.267
September	7.000	40	2.800	991,543,680	33,051,456	2.517	8.563	41	3.511	1,147,150, 80	38,383,336	3.177	7.915	43	3.404	820,903,680	27,363,456	3.099
Total	60.196	51	30.700	10,887,246,720	29,828,073	2.273	60.544	52	31.483	10,129,739,760	27,752,712	2.305	64.656	58	37.501	8,996,520,960	24,648,003	2.791

APPENDIX G.

REPORT OF JOHN E. CODMAN, CHIEF DRAUGHTSMAN.

BUREAU OF WATER.

January 22, 1890.

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

SIR:—The following report of work under my charge in the Draughting room, for the year 1889, is respectfully submitted:

The work has been of the usual character, consisting of drawings of new work, repairs to machinery, surveys, plans and estimates.

One large Pumpage Diagram on the scale of that made in 1888 was prepared, making it possible to show the maximum pumpage on one sheet of the same size as that of the preceding years. Three stream-flow diagrams, and three profile and cross sections of streams, and one diagram, showing records of automatic recording instruments in use by the Hydrographic Corps were made. One complete set of detail drawings and tracings and accompanying blue prints of a 20-inch rotary stop-valve were made for the machine shop of the Bureau.

Ten drawings of special pipe, castings, etc., were made for the East Park Reservoir pumping main and connections.

Two plans of Roxborough property, one of Chestnut Hill, and two of Cambria, three drawings of machine repairs for Spring Garden, two for Belmont, and four for Fairmount, some of them involving much labor, were made and placed on file. A complete set of twenty-three (23) drawings of the new Belmont boilers were prepared, including general arrangement of

boilers in the boiler house, general plan, and full details of construction. The boilers were built by the I. P. Morris Co. from drawings furnished, under the supervision of the draughtsman appointed by the Chief of the Bureau.

The steel plates used in the construction of the boilers were made by Park Bros., Black Diamond Steel Works, Pittsburgh, Pa. A coupon from each sheet was tested by the Fairbanks Co., and the elongation in decimals of inches for each increment of applied force in pounds per square inch noted, so that a graphical diagram of the results could be made.

The diagram attached to this report shows the elastic limit in pounds per square inch, and the elongation at that point, the total breaking stress, and the total elongation.

There are three lines on the diagram. One shows the highest tensile strength obtained, one the least, and one the average for fifty-five coupons tested.

Before being cut off each coupon was carefully marked to correspond with the sheet it was taken from, and a record made of the position the sheet occupied in the boiler. There were thirty sheets, five-eighths of an inch thick, used in the shells: twenty, nine-sixteenths of an inch thick in the combustion chambers and tube sheets, and five sheets, three-eighths of an inch thick used in the domes.

All the blue print paper used in the Bureau was prepared by the draughtsmen, and about four hundred blue prints taken.

Over four hundred and fifty boiler and engine forms were calculated for horse power from the data furnished by the inspectors.

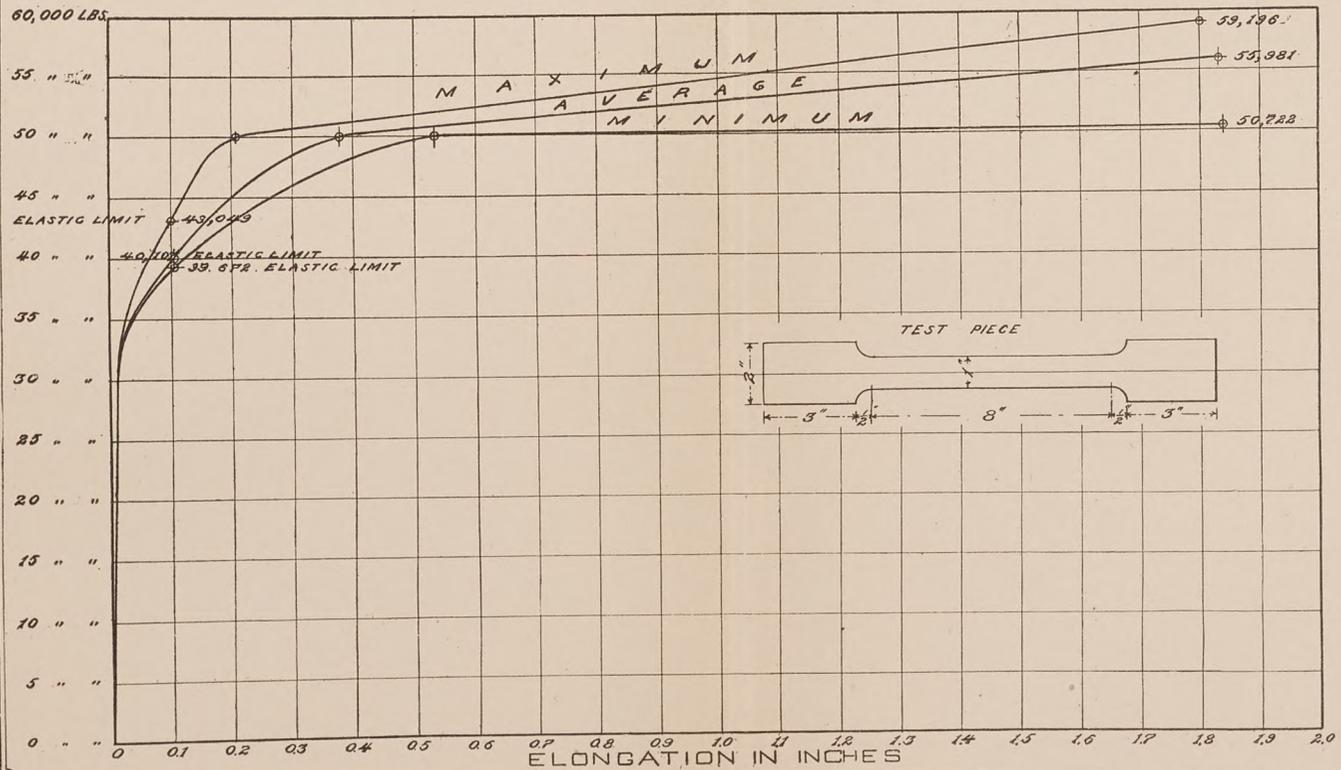
One man has been employed since April 1 lettering pipe plans.

Several indicator cards have been taken from No. 11 engine at Spring Garden while working on the distribution from the East Park Reservoir.

Respectfully,

JOHN E. CODMAN,
Chief Draughtsman.

STRAIN DIAGRAM
OF STEEL PLATES USED IN CONSTRUCTING
BELMONT BOILERS
PHILADELPHIA

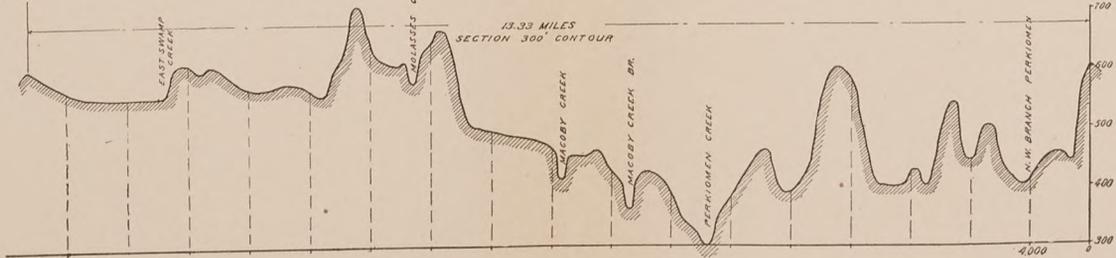
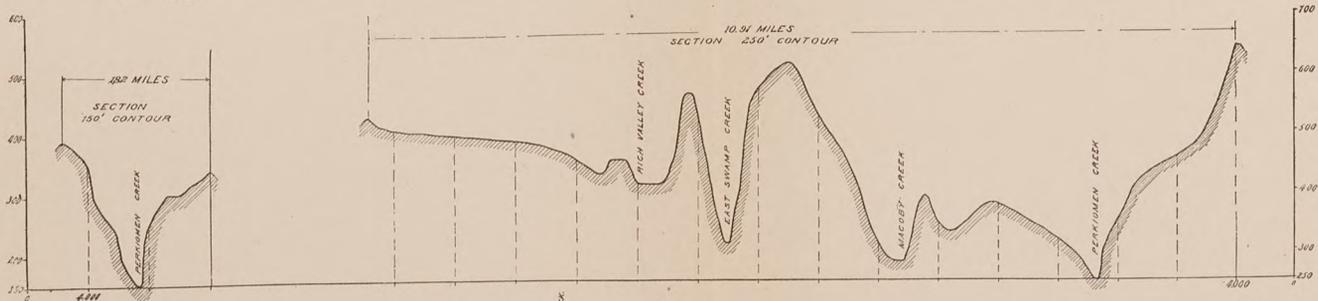
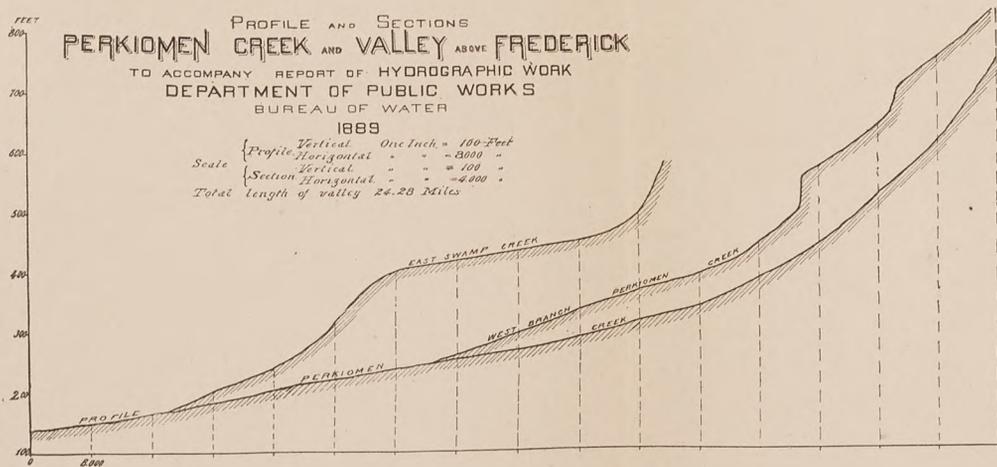


PROFILE AND SECTIONS
PERKIOMEN CREEK AND VALLEY ABOVE FREDERICK

TO ACCOMPANY REPORT OF HYDROGRAPHIC WORK
 DEPARTMENT OF PUBLIC WORKS
 BUREAU OF WATER

1889

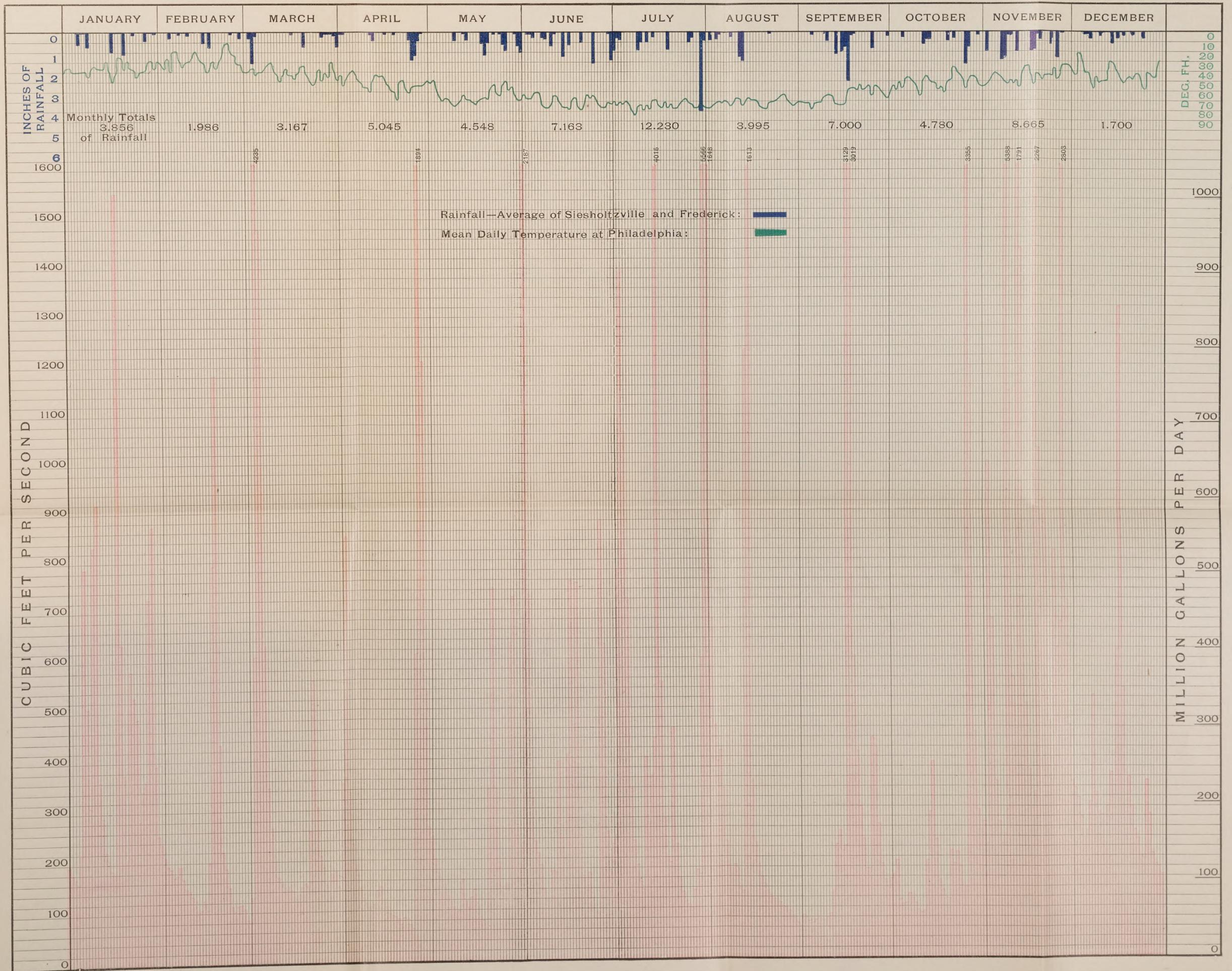
Scale { Profile Vertical One inch = 100 Feet
 Profile Horizontal " " = 3000 "
 Section Vertical " " = 100 "
 Section Horizontal " " = 4,000 "
 Total length of valley 26.20 Miles



STREAM FLOW

1889

PERKIOMEN CREEK AT FREDERICK.



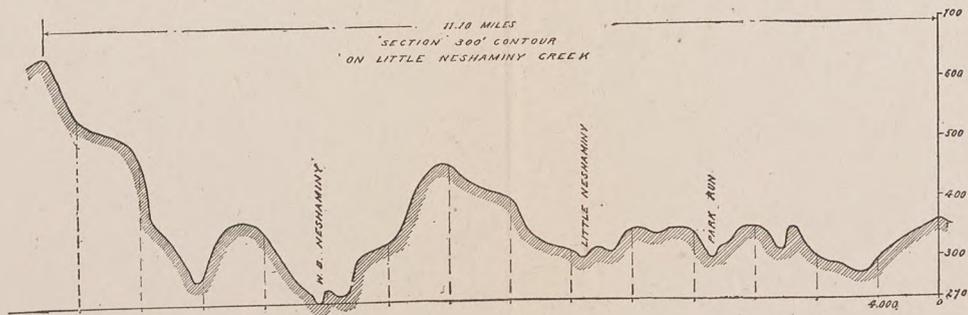
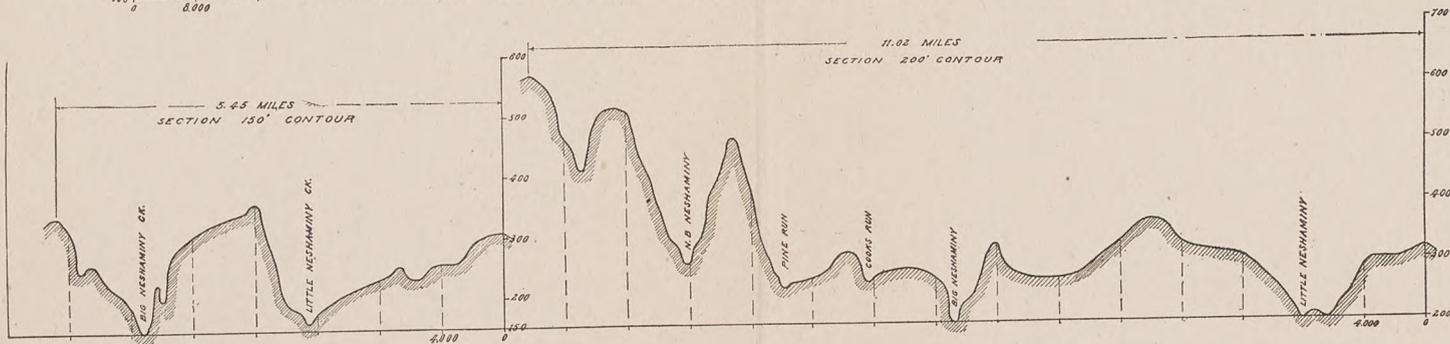
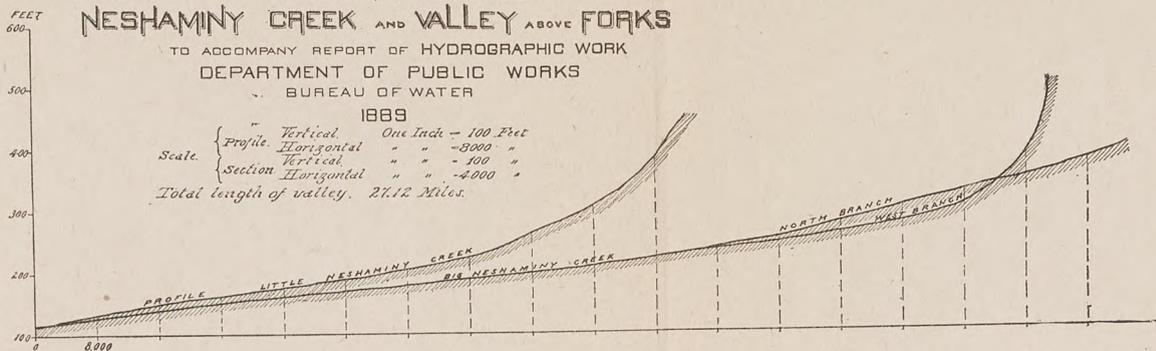
PROFILE AND SECTIONS NESHAMINY CREEK AND VALLEY ABOVE FORKS

TO ACCOMPANY REPORT OF HYDROGRAPHIC WORK
DEPARTMENT OF PUBLIC WORKS
BUREAU OF WATER

1889

Scale. $\left\{ \begin{array}{l} \text{Profile Vertical} \quad \text{One Inch} = 100 \text{ Feet} \\ \text{Profile Horizontal} \quad \text{"} = 2,000 \text{ "} \\ \text{Section Vertical} \quad \text{"} = 100 \text{ "} \\ \text{Section Horizontal} \quad \text{"} = 2,000 \text{ "} \end{array} \right.$

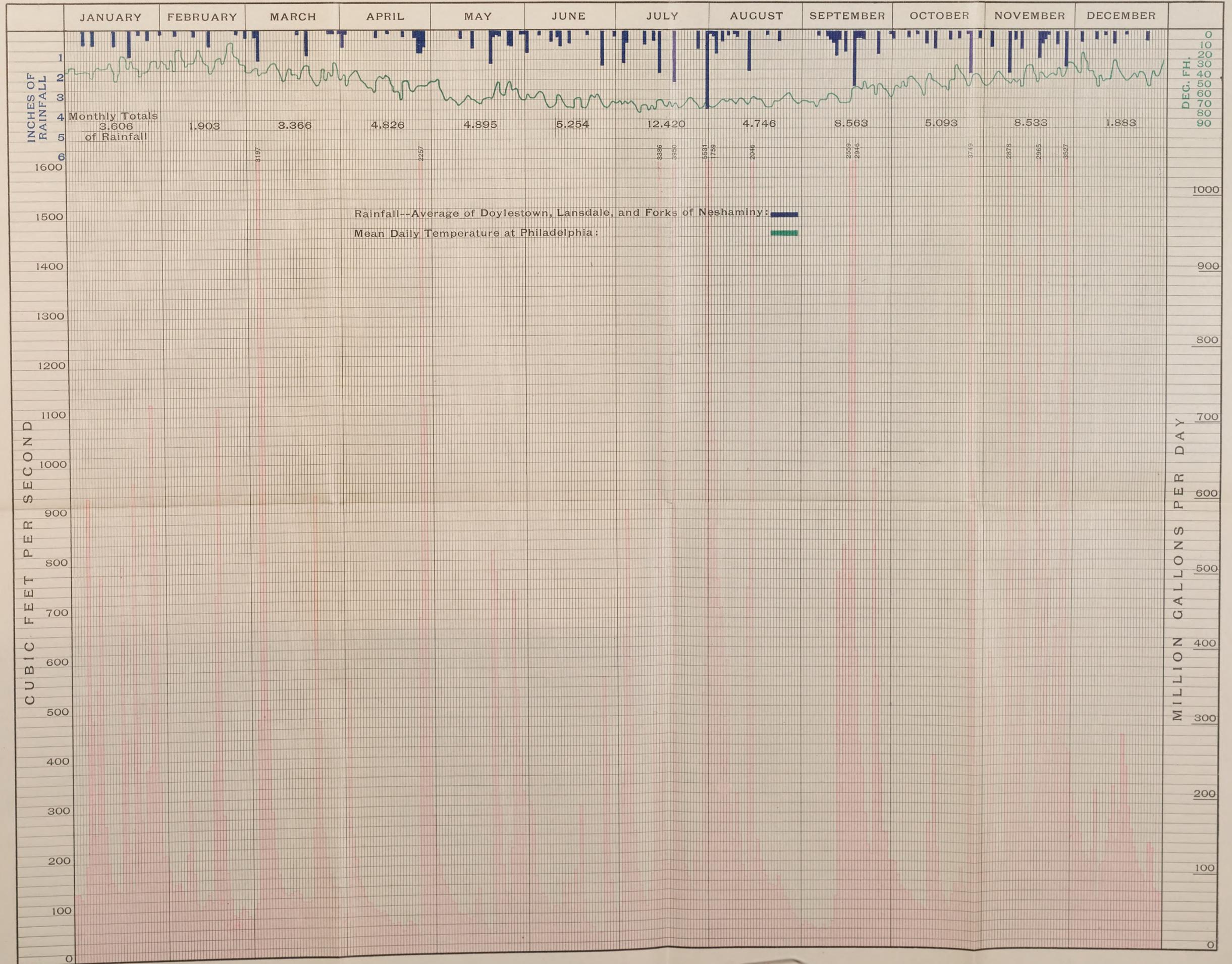
Total length of valley, 27.12 Miles.



STREAM FLOW

1889

NESHAMINY CREEK BELOW FORKS.



10
R
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STREAM FLOW

1889

TOHICKON CREEK.

