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BUREAU OF WATER
—
ANNUAL REPORT
PHILADELPHIA.
—
1887

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(Revised June 16, 1915.)

SECTION DIVISION

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76

FIRST 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,
AND
EIGHTY-SIXTH ANNUAL REPORT
OF THE
BUREAU OF WATER

FOR THE
Year ending December 31, 1887.

ISSUED BY THE
CITY OF PHILADELPHIA, 1888.

ERRATA.

On p. 21, transpose figures in column "Gas made in 1886," \$8,051,000 and \$2,075,794,000.
On p. 26, column "Due January 1, 1889," should read Due January 1, 1899.

PHILADELPHIA:
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1888.

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HARVARD UNIVERSITY

VOL. I.

Mayor's First Annual Message and Reports of the
Departments of
Receiver of Taxes, City Treasurer,
City Controller and Sinking Fund Commission.

VOL. II.

Mayor's First Annual Message and Reports of the
Director of the Department of Public Safety
and his Chiefs of Bureaus.

VOL. III.

Mayor's First Annual Message and Reports of the
Director of the Department of Public Works
and his Chiefs of Bureaus.

VOL. IV.

Mayor's First Annual Message and Reports of the
Departments of Law, Education, and
Charities and Correction.

OFFICERS
OF THE
BUREAU OF WATER.

CHIEF ENGINEER,
JOHN L. OGDEN.

Assistant Engineers,

ALLEN J. FULLER,

WILLIAM WHITBY.

Draughtsmen.

John E. Codman,

Arthur Marichal.

James G. Davis

Chief Clerk—JOB T. HICKMAN.

Assistant Clerks—J. G. Dixon, Kennedy McNeal.

Correspondence Clerk—P. de Haven.

Search Clerk—Thomas Spence.

Assistant Search Clerk—William H. Shriver.

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,

Abram Stott, John L. McGinnis.

Telephone Operator—Fannie Shields.

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

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

MOUNT AIRY—*Engineers*, Lewis Culp, William Fletcher.

CHESTNUT HILL—*Engineer*, Henry W. Everly.

FRANKFORD—*Engineer*, Charles Douglass.

KENSINGTON—*Oilers*, Peter J. Tuttle, William Maxwell.

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. Lant.

Clerk, Jonathan Bonsall. *General Foreman*, Samuel Loeb.
Office, Town Hall, Germantown.

FIRST ANNUAL MESSAGE.

MAYOR'S OFFICE.

Philadelphia, April 2, 1888.

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

GENTLEMEN:—In accordance with the Act of Assembly, approved June 1, 1885, I herewith transmit to your Honorable Bodies my First Annual Message upon the finances and general condition of the city for the past year.

On the fourth day of April, 1887, I took the oath of office and assumed the executive power vested in me as Mayor under the said Act. In conformity with its provisions, I appointed William S. Stokley, Director of the Department of Public Safety, Louis Wagner, Director of the Department of Public Works, James W. White, M. D., President, and Richard A. Cleemann, M. D., Robert Laughlin, Richard C. McMurtrie, and James Stewart, Directors of the Department of Charities and Correction. Under Article 12 I appointed the following Civil Service Examiners, who were duly confirmed by the Heads of Executive Departments:

Schedules "B" and "G," B. F. Dennisson, Chairman, Stockton Bates, and James M. West.

Schedule "C," Francis W. Murphy, Chairman, John C. Kelley, and Horatio N. Fitzgerald.

Schedule "D," Class 1, William Sellers, Chairman, Joseph M. Wilson (C. E.), and Walter Wood.

Class 2, Galloway C. Morris, Chairman, Ellsworth H. Hults, and John Y. Huber.

Schedule "E," Class 1, James Tyson, M. D., Chairman, Charles K. Mills, M. D., and Francis X. Dercum, M. D.

Class 3, Charles Bullock, Chairman, Benj. H. Shoemaker, and George I. McKelway.

Class 4, John H. Long, Chairman, S. R. Knight, M. D., and Lucien Moss.

Examiners for Vaccine Physicians, etc., Board of Health, William H. Ford, M. D., J. Howard Taylor, M. D., and William M. Welsh, M. D.

Schedule "A," includes all persons exempt from examination under the above Act, and no Examiners have as yet been required for Schedule "F." B. F. Dennisson, Chairman, Schedules "B" and "G" having resigned, I appointed Theo. E. Wiedersheim to fill the vacancy.

FINANCES.

The financial affairs of the city are prosperous and in an improving condition. The Report of the City Controller shows a large amount of money expended for permanent improvements together with the regular payments of interest, the redemption of the loans, the appropriation to the Sinking Fund, and the payment of the current expenses of the Municipality. It is gratifying to report that notwithstanding all these large expenditures, we have been able to carry over a handsome balance which is available for the present year.

The debt of the city was decreased during the past year, \$1,402,225, and since 1879 the Funded Debt has been reduced as follows :

Funded Debt, January 1, 1880.....	\$70,970,041.70
Funded Debt, January 1, 1888.....	57,967,395.22
	<hr/>
Reduction in eight years.....	\$13,002,646.48

The Act of June 11, 1879, which compels Councils, under heavy penalties, to determine and fix the annual income of the city before making the appropriations, has been of the greatest importance to our citizens, as it effectually cures that widespread tendency of municipal bodies—to run into debt. Under its wholesome provisions our City Treasurer has paid within each year all the current liabilities of the city.

The Constitution of the Commonwealth, adopted in 1874, prohibits all cities whose funded debt then exceeded seven per cent. of the assessable value of the taxable property therein, from creating any further loan except that, by and with the consent of the Legislature, an additional three per cent. can be borrowed, making a total of ten per cent.

The debt of the city at this time amounts to \$57,967,395.22, and the assessed valuation is \$647,213,039, showing that, with the consent of the Legislature, there could be borrowed about \$6,000,000. It is held that the city loans owned by the Sinking Fund, not being cancelled, cannot be deducted from the indebtedness in making this calculation. The city therefore, cannot entertain any plan for enlarged permanent improvements, or for any other purpose that would exceed the above-named sum, unless Councils raise the balance by taxation.

The subject of making an open park around the new City Hall, by purchasing and tearing down four blocks of buildings has been suggested; and I deem it proper to state that if we have any surplus fund, it would be better to first finish the inside of the building, thus making it available for the officers and employes, who are now scattered all over the city, and who should be concentrated at that place for the convenience of the citizens. The cost of erecting the building—over sixteen million dollars—having all been paid by the present generation, the question of changing its surroundings can properly be left to posterity.

A year ago I asked your attention to the important question

of refunding the loans of the city at a lower rate of interest. I bring this matter again to your consideration.

Under the law the Commissioners of the Sinking Funds are restricted in their investments to United States, State, and our own Loans. The present high premiums which must be paid to obtain these securities not only impose a heavy annual burden upon our taxpayers, but also prevent the accumulation of a sufficient amount to redeem the outstanding loans at maturity. Under the authority conferred by the Act of June 11, 1879, it is certainly practicable to devise some plan whereby our loans may be refunded upon extended time and at a much less rate of interest, and an inducement offered the present holders of our six per cent. loans sufficient to tempt them to make the exchange. If this can be accomplished, over twenty-one million dollars of loans now in the Sinking Funds can be cancelled, and the debt of the city reduced that extent, effecting a saving of nearly one million five hundred thousand (1,500,000) dollars annually in interest and appropriations to the Sinking Fund.

The United States, State, and other securities now in the Sinking Fund can be retained, if necessary, to extinguish the loans maturing during the next few years.

I suggest that your Committee on Finance be instructed to consider what steps, if any, should be taken to bring about a reduction of the liabilities of the city for interest and Sinking Fund. Also the question of the sale of such securities and real estate as are not necessary for municipal purposes, and to submit to your Honorable Bodies the draft of such ordinances as may be necessary to promote the objects in view.

DEPARTMENTS.

DEPARTMENT OF PUBLIC SAFETY.

Bureau of Police.

The police force has been improved under the management of Director Stokley and Superintendent Lamon, and brought to a high standard of discipline. The addition to the force has increased its effectiveness and usefulness, but more men are still required to give in many districts of the city the protection to which the residents are entitled.

The Reports of the Director and Superintendent, transmitted herewith, clearly show the workings of this Bureau with its details and requirements.

Bureau of Fire.

The Report of Chief Cantlin to the Director of the Department of Public Safety calls attention to the fact that the selection of the employees of this Bureau, under the Rules and Regulations of the Civil Service Examinations, has resulted in a great improvement in the *morale* of the force, and an increased interest in, and attention to duty on the part of the men. The efficiency of this Bureau, however, has been seriously affected by the worn-out condition of the Fire-engines, to which your attention was called a month ago by a Report Director Stokley made to me, which I forwarded to your Honorable Bodies with my approval. This matter requires immediate attention, for with our present equipment and the erection of so many high buildings in the business portion of the city, we are unable to cope with any serious fire in such locality.

Bureau of Health.

The Report of this Bureau also accompanies that of the Director of the Department of Public Safety, and I commend it to your careful consideration. The subject is important, as

the health and sanitary condition of the city is a matter of vital interest to all.

Electrical Bureau.

This Bureau is well organized and efficient in all its appointments. Chief Walker in his Report to the Director of the Department of Public Safety, thoroughly explains and discusses its workings. I suggest that we continue as rapidly as possible, the extension of the City's Fire Telegraph, that appropriations for the extension of the City's Electric Underground Service be made, and that as quickly as possible, all wires be placed under the surface; or, if this last cannot be done, that the Tower System be carefully examined, as by this means the wires can be placed so far above ground as not to interfere in case of fire. I call special attention, however, to the system of Underground Arc Lighting introduced by this Bureau early in 1886, and extended in 1887, and which to-day is in successful operation.

To all matters of detail in connection with the office of Fire Marshal, and the Bureaus of Fire Escapes, Boiler Inspectors, and Building Inspectors, I refer you to their complete Reports, respectively, which accompany the Report of the Director of the Department of Public Safety, who has ably and fully treated upon all the Bureaus under his charge. I ask that his Report receive the careful consideration of your Honorable Bodies.

DEPARTMENT OF PUBLIC WORKS.

Bureau of Water.

The furnishing of an abundant supply of clean and pure water to our citizens is the most important subject which demands our consideration. While, as I write, we are suffering from its bad condition, I am happy to state that with the appropriation of \$100,000 made last year, the first section of the reservoir in the East Park has been completed, increasing our storage capacity 60,000,000 gallons.

An appropriation made this year of \$400,000, has enabled us to enter into contracts for finishing the second section, which will contain over 300,000,000 gallons. It is the intention of the Director of the Department of Public Works to press this to completion as rapidly as possible. During the year 1889, with the appropriation which we have every reason to expect your Honorable Bodies to make, the third and last section can be finished. The city will then have an additional storage capacity of 700,000,000 gallons, which, with our present basins, holding 200,000,000 gallons, will give us subsiding reservoirs sufficient at all times to furnish a clean supply of water, and allow our pumps to remain idle until the storm-water has passed out of the rivers.

Our pumping capacity is equal to our requirements for some years. The new Holly Engine is working to the entire satisfaction of the Department, and is developing a larger capacity than the contract calls for. Our other engines are in good serviceable condition.

The actual requirements of this branch of the public service are set forth in a condensed form in the Report of the Director of the Department of Public Works and in that of the Chief of the Bureau.

Bureau of Gas.

The city's works failed to satisfactorily meet the increased demand for gas during the past winter months. In order to make the whole plant economical and bring it up to a high standard of efficiency, it should be equipped with the latest improvements. All the bids made by the different parties who desired to buy or lease these Works last year contained provisions for the expenditure of a large amount of money for remodeling the plant, showing conclusively their opinion of the condition of the same. The Gas Ordinance just passed will, if an acceptable bid is made, give us an increased quantity, but for its storage and distribution we require new gas holders at the Works, and also in different sections of the city, as well

as mains through which to deliver it properly to the consumers. When all this is accomplished, and it will require time, we shall be able to give the citizens a full supply of good gas, silencing many of their just complaints.

Bureau of Highways.

Our highways are still in an unsatisfactory condition, and will continue to be so until we can replace the cobblestones with Belgian blocks or other improved pavement. Our great increase in population and trade throws upon them a volume and character of traffic beyond their enduring capacity, and it is impossible to keep them in good repair as now paved. The cobble stones should be removed as rapidly as our means will permit, and our best energies should be exerted in this direction. This character of pavement has been abandoned in all other first-class cities in this country and in Europe, whose experience, together with ours, proves conclusively that the day of usefulness of such material has passed.

The question of the responsibility of the city Passenger Railway Companies to comply with the orders of the authorities to relay with improved pavements, from curb to curb, the streets they occupy, is still pending in the Courts, and will not be fully and finally decided for some years to come. Meanwhile, our citizens are suffering and the annual expense of the repairs to the Railways, together with the wear and tear upon the horses and vehicles of the general public, will in a very few years amount to more than the entire cost of properly repaving all our great thoroughfares.

I purpose at an early day, to lay before your Honorable Bodies a plan which in my opinion will not only be equitable but also acceptable to both the city and the railway companies, and which will enable us if adopted, to improve all the highways occupied by these corporations.

The Reports of the Bureau of Surveys, Bureau of City Property, and of the City Ice Boats, which accompany that

of the Director of the Department of Public Works, are full and complete, and to them I respectfully refer you for details.

The Director of the Department of Public Works in his Report treats fully and at length upon all the Bureaus under his charge, and I ask that his suggestions and recommendations therein set forth be given the careful consideration of your Honorable Bodies.

DEPARTMENT OF CHARITIES AND CORRECTION.

The Report of the President and Directors of the Department of Charities and Correction, transmitted herewith, is well worthy of your careful study and consideration.

The gentlemen selected for the responsible duties of this Department have already shown that they fully merited the confidence which I placed in them. Dealing as they do with the sick, the insane and the unfortunate, their work is, of necessity, trying and often discouraging. They have however, thoroughly and intelligently investigated the problems arising in the complex institutions under their care, and their Report shows changes and contains recommendations which should have both warm approval and cordial support.

The most important suggestions are as follows: The withdrawal of the Almshouse from the Hospital proper, leaving the latter in its present suitable location, and erecting elsewhere new buildings for the reception and care of the distinctively pauper element. The urgent necessity for this change (which I recommended in my Inaugural Address) is made evident by the Report. The overcrowded condition of the Hospital alone demands it, as does also the injustice of surrounding our worthy sick poor with the atmosphere of pauperism. As a large amount of money has been specially set aside for this purpose, I earnestly urge upon your Honorable Bodies the need for prompt action in the matter.

The Report alludes to a portion of city property on the west bank of the Schuylkill, set apart by ordinance of Councils,

“to be improved for the health and public welfare of the citizens of Philadelphia,” and it is suggested that with your approval the labor of the Bureau of Correction could effect this desired change.

The work of this Board should appeal especially to the sympathy of the charitable public. While new Hospitals are being built and endowed, new Homes and Asylums founded, and various excellent charities fostered and encouraged by private benevolence, the care of vast numbers of the city poor, often deserving people, and usually the most helpless, and of thousands of the ignorant who have strayed into vice or petty crime, or have become the victims of alcoholic drink, is very properly left to those responsible for the conduct of the municipal administration; but the people of the city should by no means lose their interest in the work, or their appreciation of it when it is so performed as to reflect credit upon the city's reputation for far-reaching benevolence.

In addition to the foregoing Reports, I have the honor to herewith transmit for your consideration those of

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

which show in full detail their transactions for the past twelve months.

To-day closes the first year under the amended charter of the city. One year ago there were some twenty-five Departments directly connected with the government of the city, independent of each other and with responsibility only to Councils. The Mayor was powerless except as vested with the veto power, and as the acting head of the police force. Each Department deemed itself supreme, and many of them

acted in direct opposition to others, clashing and interfering with each other, and with the interests and convenience of the people, expending the money of the city by doing and undoing the public work ; one Department paving the streets only to have them torn up in a day or two by another, and it was to reform this mode of government that the Act of June 1, 1885, was passed, under which I was called to the position I now occupy. The task before me was great ; the responsibility placed upon me by the law was such as to cause me to hesitate, but as a matter of duty I assumed the office with the determination to execute the new law with all the energy I possessed.

The results of our first year's work are laid before you to-day, and you and the people must judge as to the measure of success.

The reconstruction of the management of the affairs of the city, whereby the Departments heretofore independent, have been placed under the control of the Mayor and his Directors, has been accomplished without embarrassment or friction, and the change from the old system of divided responsibility to the present one of executive control, has not only been wise but wholly in the interest of the better government of the city, and the benefit of the tax-payers.

The business of the several Departments has been thoroughly revised and formulated, and brought to a high standard of efficiency. All officers, clerks and employes hold their positions under the Civil Service Rules and Regulations, and they are beyond the power or control of any one except their superior officers, who report better results than were attained under the old system. If complaints are made the fault can be at once properly placed, and the remedy is applied without favor or fear of consequences.

Because of the increase of valuation of taxable property by the erection of new houses and the increased value of others, as well as by the increase of income from other sources, we

have at our command more money for permanent improvements without an increase in the tax rate.

Economy has been systematically introduced into every Department, and we show a surplus of receipts over expenditures during the year, of \$265,137.34, instead of the deficit estimated by the City Controller in August last, of \$328,024.93, a change in favor of the city of \$593,162.27.

By continuing this system and by a rigid adherence to business rules and principles, we will demonstrate the wisdom of the change made in the city government by the amended charter.

I am pleased to state that in the affairs of the city you have at all times given me the fullest assistance almost without question. To me this mark of your confidence is especially gratifying, and I ask your continued aid in this direction.

In conclusion, permit me to express my gratification at the very pleasant relations, official and personal, that exist between us, and to ask your future co-operation in my efforts to secure a faithful and honest administration of public affairs.

I am,

Respectfully,

EDWIN H. FITLER,

Mayor.

FIRST ANNUAL REPORT
OF THE
DEPARTMENT OF PUBLIC WORKS

LOUIS WAGNER, Director.

Philadelphia, January 2, 1888.

HON. EDWIN H. FITLER,
Mayor of Philadelphia.

SIR:—In accordance with law, I have the honor to present the Report of the Department of Public Works, for the year ending December 31, 1887.

The operations of this Department can be most readily appreciated by quoting from the Act of Assembly establishing it:

“Water works and gas works owned and controlled by the city, the supply and distribution of water and gas, the grading, paving, repairing, cleaning and lighting the streets, alleys and highways, the construction, protection and repair of public buildings, bridges and structures of every kind for public use, public squares, real estate (except such as now or hereafter may be used for educational or police purposes), surveys, engineering, sewerage, drainage and dredging, and all matters and things in any way relating to or affecting the highways, footways, wharves and docks of the city, shall be under the direction, control and administration of the Department of Public Works.”

“The operations of the City Ice Boats shall be under the direction of this department.”

When you honored me with the appointment of Director of this Department the work under its care was, by ordinances of Councils, subdivided into the following independent departments:

Department of Markets and City Property.

Department of Highways.

Department of Surveys.

Department of Water.

The Gas Works and the City Ice Boats were managed by Boards of Trustees.

The appropriations for the year 1887 had been made, and partially expended during the three months of the year preceding the first Monday in April, when the new Department went into operation, and by ordinance of Councils the Boards of Trustees referred to were abolished, and the heads of the Departments were continued in position for the unexpired term for which they had heretofore been elected by City Councils, being however designated as Chiefs of Bureaus, into which the Department was divided.

My first effort was to familiarize myself with the work already done, the expenditures made, and with the future requirements of the service.

The changes made in the administration of city affairs by the Act of Assembly and the Ordinances of Councils were so radical that some difficulty was expected in securing the harmonious co-operation of those who had heretofore exercised independent, and to some extent, conflicting power. The fear in this direction proved groundless, and with hardly an exception, all the officials were ready to aid in establishing efficient and economical management of public work.

What was done during the year is set out in full detail in the reports of the Chiefs of the Bureaus, of which this report is to some extent a synopsis.

Bureau of City Property.

The Bureau of City Property has charge of all the public buildings and offices; all the real estate owned by the city, except the new Public Buildings and that occupied for school and police purposes; all the public squares and parks, except

Hunting and Fairmount Parks; all docks and wharves and market-houses belonging to the city. The property is in good condition, and that not occupied for public purposes produced a revenue of over one hundred thousand dollars during the past year.

The public squares are 10 in number and nearly 50 acres in extent. Most of them have been improved within the last few years, by the removal of the iron railings, replacing them with dressed curb, and substituting either flagstone or artificial stone pavements for the gravel walks. These improvements have been of such a satisfactory character, that the squares not already improved should be, at as early a day as the finances of the city will justify.

The wharves and docks number forty, many of them, however, located at such points that the rentals received are not very large. They are leased for terms of either three or ten years, the lessees being required to keep the wharves in repair and to clean the docks when required by the Board of Port Wardens.

The number of market-houses belonging to the city, all of them located in the centre of the streets, is rapidly decreasing, and in a few years none of these old-fashioned structures will remain.

We have now :

On Moyamensing avenue.....	2
On Bainbridge street.....	2
On South Second street.....	2
On North Second street.....	2
On Callowhill street.....	5
On Spring Garden street.....	7
Total.....	<u>20</u>

During the past year the market-sheds on Girard avenue, from Frankford avenue to Twelfth street, and on Callowhill street, from Fourth street to Crown street, were removed.

The public bath-houses constitute one of the most important branches of this Bureau. Two of them are floating structures, located at Almond street and at Hanover street wharves. There are also three permanent buildings erected in different parts of the city.

The number of bathers during the year was :

Men.....	113,568
Women.....	2,942
Boys.....	620,137
Girls.....	11,577
Total.....	748,224
An increase over the previous year of.....	166,453

Under the appropriation made for the year 1888, an additional bath-house will be erected upon what is now known as Shackamaxon Square.

The city is the owner of a large amount of unimproved and unproductive real estate, for which there is no present and probably no future use for public purposes. This property should be sold as rapidly as surrounding improvements will make a market for it, and the city will be benefited not only by the money realized from such sales, but also by the increase of taxes, to be derived from the improvements made upon this ground, much of which is located in the best parts of Philadelphia, in the Twenty-seventh, Twenty-eighth and Twenty-ninth Wards.

The receipts of this Bureau were as follows :

From market-houses.....	\$29,323 00
From wharves and docks.....	45,676 75
From rent of real estate.....	7,963 67
From sales of real estate.....	2,529 67
From vendors' licenses.....	17,279 00

Total..... \$102,772 09

Total expenses were..... \$143,815 23

By the Act of June 1, 1885, the inspection of food was made one of the duties of the Department of Public Safety. The officers having charge of this inspection are called " Clerks of the Market," and have heretofore been, and continue to be, attached to this Bureau. Councils should pass some ordinance by which these officials, or others authorized to discharge their duties, may be transferred to the Department to which they properly belong.

Bureau of Gas.

Until the first Monday in April, the Gas Works of the City of Philadelphia were under the management and control of the Trustees of the Philadelphia Gas Works, and this report covers three months of their administration and nine months of the operations of the Department of Public Works.

The figures submitted have been examined by the President of said Board, and in so far as they refer to the financial transactions of his Board, have his approval. They are included here only for the purpose of giving the complete transactions for the full year, and the report is divided into two parts to cover the periods of time during which the Works were under different administration.

The operations of the Philadelphia Gas Works were larger than in any previous year. The amount of gas manufactured, and the coke, tar, and other residuals produced, was largely in excess of all previous years, whilst the cash receipts, notwithstanding the reduction in the price of gas from \$1.60 to \$1.50 per 1,000 cubic feet, were greater than at any time during the past ten years.

The amount of coal carbonized was 671,631,600 pounds, which, at 4.70 cubic feet to the pound, equals 3,154,842,000 cubic feet. This is accounted for as follows:

	Cubic feet.
Stock delivered and unpaid for, and on hand, January 1, 1887	430,413,600
Manufactured during the year.....	3,154,842,000
Total to be accounted for.....	<u>3,585,255,600</u>

	Cubic feet.	Per ct.
Delivered to private consumers, and paid for.....	2,163,156,100	= 60.36
Delivered to consumers, but not paid for, and in holders January 1, 1888.....	448,607,400	= 12.51

Public lighting, viz :

	Cubic feet.	Per ct.
Bureau of Police.....	8,762,600	= .0024
Bureau of Fire.....	5,843,500	= .0016
Bureau of Water.....	2,067,600	= .0006
Public Buildings.....	8,272,100	= .0023
Alms House.....	9,798,600	= .0027
City Property.....	6,356,200	= .0018
Public Squares.....	19,124,000	= .0053
Park Commission.....	200,100	= .0001
Schools.....	5,517,000	= .0015
	<hr/>	65,941,700 = 1.83
Street lamps.....	440,558,181	= 12.28
Used at Works, offices, stations, etc.....	25,651,800	= .71
Unaccounted for, leakage, etc.....	441,340,419	= 12.31
Total.....	<hr/>	3,585,255,600 = 100

	Cubic feet.
Largest production of gas in any 24 hours, on December 23.....	12,821,000
Largest consumption in 24 hours, December 24.....	13,415,000
	Bushels.
Quantity of coke on hand January 1, 1887.....	15,200
Made during the year.....	9,467,785
Total	9,482,985
Sold during the year.....	5,053,425
Sold (Breeze).....	480,370
Used under the retorts.....	3,450,971
Used under boilers and lime-kilns.....	416,594
In offices, yards, and in pipe-laying.....	78,925
On hand January 1, 1888.....	2,700
Total	9,482,985

The amount of coal carbonized, in tons of 2,000 pounds each, was as follows :

	Tons.	lbs.
From January 1 to March 31.....	102,856	900
From April 1 to December 31.....	232,959	700
Total	335,815	1,600
Production of gas per pound of coal.....	4.70	cubic feet.

Gas manufactured :

	Cubic feet.
From January 1 to March 31.....	941,415,000
From April 1 to December 31.....	2,213,427,000

Cash receipts :

	First 3 months.	Last 9 months.
Seventh Street Office.....	\$799,052 01	\$1,465,099 38
Spring Garden Office.....	308,516 32	578,785 14
Germantown Office.....	42,645 66	80,233 06
Manayunk Office.....	16,599 84	29,142 89
Frankford Office.....	22,735 65	41,019 18
Market Street Works.....	63,687 37	131,531 67
Point Breeze Works.....	29,334 26	64,202 29
Manayunk Works.....	1,999 25	2,622 48
Richmond Works.....	37,621 68	79,488 24
Rents	996 36	1,939 88
Sinking Funds.....	15,630 48	
Compromise with Shackamaxon Bank.....		1,206 95
Auction sale, carriages, and harness..		131 85
Moving street mains, etc.....		2,419 20
Total	\$1,338,818 88	\$2,477,822 21

Number of meters introduced during the year.....	4,263
Total in use.....	117,546
Services introduced.....	8,546
Total in use.....	129,788
Lights added.....	94,400
Total in use.....	1,980,999
Total number of consumers.....	118,644
Number of public lamps.....	16,473

for whose maintenance and repairs the Bureau of Gas has expended \$174,126.85, and to which it has supplied 440,558,181 cubic feet of gas, all without charge to the City Treasury.

Length of gas mains laid 121,593 feet, equal to 23 miles and 153 feet. Entire length of pipe laid and in use 878 miles.

The gross profits were \$684,356.90.

The statements of profit and loss appended to the report of the Chief of the Bureau, show balance profit for months of January, February and March, 1887, \$343,430.18. Balance profit for remaining nine months, \$340,926.72. Total, \$684,356.90.

These figures are ascertained in the usual manner by charging to the account for permanent improvements all moneys expended in the laying of mains, extension of the works, etc., and in this way handsome profits have been reported annually for many years past, when, as a matter of actual fact and figures, the total expenditures have been in excess of the total cash receipts.

This excess was in 1884.....	\$110,149 60
1885.....	143,590 74
1886.....	140,933 72
1887.....	108,528 02

The cash balance January 1, 1884, was \$618,771.57, and since 1874, when the last loan for the extension of the works was created, the total cash receipts have been \$53,361,103, and the total cash expenditures have been \$53,313,528.34.

This mode of keeping the accounts is strictly correct, and necessary to show the amounts expended annually for enlargements, so that the value of the plant can be known, but it is

very misleading when the attempt is made to ascertain the actual benefits derived by the city as owner of the works.

Having given a detailed statement of the receipts, and to prevent any possible misapprehension of the outcome of the past year, the following statement of the expenditures is also given :

	January 1 to March 31.	April 1 to December 31.
Gas manufactured.....	941,415,000 cubic ft.	2,213,427,000 cubic ft.
Expenditures :		
Works.....	\$65,925 00	\$27,250 00
Mains.....	7,644 81	76,669 80
Services	23,868 01	57,454 06
Gas.....	911,593 49	1,482,138 64
Repairs	98,160 00	225,872 63
Miscellaneous	165,605 45	318,367 87
Public Lighting.....	47,160 43	126,958 92
		<u>\$2,314,711 92</u>
One year's interest and sinking fund on Gas Loans.....		\$290,500 00
	<u>\$1,319,957 19</u>	<u>\$2,605,211 92</u>

Until the management of the Gas Works was transferred to the Department of Public Works it was always the custom to pay the bills for materials and supplies delivered in December, and the salaries and wages for the last half of the same month, in the succeeding month of January. Under the law merging all balances of appropriation on December 31, this can no longer be done, and as a result there was paid in 1887 thirteen months' bills and twelve and one-half months' salaries and wages, as follows :

Bills for December, 1886.....	\$215,187 45
Salaries and wages one-half December.....	87,912 47
Total	<u>\$303,099 92</u>

Deducting this sum from the expenditures for 1887, given above, we have a surplus of \$194,571.90, but even this amount would not justify the continued use of a plant as valuable as the Philadelphia Gas Works, unless it can be shown that with the continuance of the more economical administration of the past nine months better results can positively be realized.

Bearing in mind the fact that these nine months include the months of largest production and of smallest receipts (the bills for the months of October, November and December being paid the following year) the study of the following comparisons will aid in reaching correct conclusions.

	First three months. Cubic feet.	Remaining nine months. Cubic feet.
Gas made in 1886.....	2,075,794,000	870,613,000
Gas made in 1887.....	941,415,000	2,213,427,000
Increase.....	70,802,000	137,633,000
Per cent.....	.08.13	.06.63
Receipts, 1886.....	\$1,237,953 90	\$2,413,001 27
Receipts, 1887.....	1,338,818 88	2,477,822 21
Increase.....	\$100,864 98	\$64,820 94
Per cent.....	.08.14	*.02.68
Expenditures, 1886,	\$891,901 48	\$2,899,987 41
Expenditures, 1887, \$1,319,957 19		
Less bills of 1886, 303,090 92	1,016.857 27	2,605,211 92
	Increase, \$124,955 79	Decrease, \$294,775 49
	14.01 per cent.	10.16 per cent.

Applying these percentages to four millions of receipts and three and one-quarter of expenditures, the result would be nearly \$450,000 in favor of the City Treasury. It should be added that these economies were begun at a season of the year when the output of gas was the smallest, and that they are but just now showing complete and decisive results.

Again, if the expenses had been continued upon the basis of the last nine months of 1886, when it cost \$2,899,987.41 to make 2,075,794,000 cubic feet of gas, it would have cost in 1887 to make 2,213,427,000 cubic feet \$3,092,267.55. The actual cost was \$2,605,211.92, a reduction of \$487,055.63.

As proof that the claim of largest production and smallest receipts is well founded, a calculation shows that the proportion of gas produced during the first three months of 1887, and the consequent receipts and expenditures continued for the

* These receipts fell off \$109,986.17 because of the reduction of the price of gas from \$1.60 to \$1.50 per one thousand cubic feet. But for this reduction the increased receipts would have been 7.24 per cent.

year would have increased the former \$669,968.99, and the latter \$76,092.70.

The following is a statement of the cost of making, and the amount received, per one thousand feet of gas manufactured during the past two years :

Total gas made.	Cost per 1,000 ft.	Rec'd per 1,000 ft.
<i>First three months :</i>		
1886.....870,613,000.....	\$1 02.44.....	\$1 42
1887.....941,415,000.....	1 08	1 42
<hr/>	<hr/>	<hr/>
Increase, 70,802,000	Increase, 05.56	
 <i>Last nine months :</i>		
1886.....2,075,794,000.....	\$1 39.....	\$1 16
1887.....2,213,427,000.....	1 17.....	1 12
<hr/>	<hr/>	<hr/>
Increase, 137,633,000	Decrease, .22	Decrease, * 04

In considering the question of actual profit to the city, the 506,499,881 feet of gas supplied to the many public buildings and the street lamps must be taken into account. This gas could have been sold to private consumers (rendering an enlargement of the Works unnecessary at this time) for \$759,749.82.

To this sum should be added the increased value of the Works by reason of the money spent for enlargements and betterments

Among the many permanent improvements made during the year, the most important is the erection of the new purifying-house at the Ninth Ward Works. This building is equipped with all the modern appliances for purifying gas and has a capacity of one million feet per day. Previous to its erection the purifying pans were greatly overtaxed, to the detriment of the quality of gas passed through them, and the danger from back-pressure to the men employed at the Works. With the regenerative furnaces, heretofore erected, and this purifying-house, these Works have a manufacturing capacity in excess of the mains of distribution, and the question of larger mains applies to these Works to a greater degree than to either of the others.

Some of the old brick pavements have been replaced with granolithic, dispensing with the services of a number of men,

* Gas reduced ten cents per 1,000 feet.

and the use of the mules heretofore necessary to pull the coal and coke barrows. It is the intention to make similar improvements at each of the Works.

The necessary carrying of unusually high heats caused the pipes at the Ninth Ward Works to be seriously obstructed by naphthaline. To remove this, naphtha has been used to the extent of one gallon to four thousand pounds of coal carbonized, and has worked in a very satisfactory manner.

New boilers have been introduced at nearly all the Works, and all other necessary improvements have had prompt attention.

The 12-inch main, by which to secure a better supply of gas to Germantown and Chestnut Hill, which was commenced in 1886, was completed during the past year, greatly to the relief of the rapidly increasing number of consumers in that part of the city. Another 12-inch main was laid on Oxford street, west of Broad street, with a similar result.

The average candle-power of the gas was equal to 17.65 standard candles, each containing 120 grains, tested against a standard Argand burner consuming five cubic feet per hour. The average of tests in each month, as made by Professor Charles M. Cresson, at his laboratory on Walnut street, and by Professor Lemuel Stephens, at the Girard College, was as follows :

January.....	17.02	July.....	17.82
February.....	17.26	August.....	17.48
March.....	17.87	September.....	17.70
April.....	17.96	October.....	18.01
May.....	17.44	November.....	17.92
June.....	17.82	December.....	17.54

The needs of the Bureau of Gas are summarized as follows: Increased production of at least three million feet per day, increased holder capacity, and larger distributing mains.

The former difficulty would be met by the erection of additional retort and purifying houses, which should be built in connection with the Twenty-fifth Ward Works, as a point nearer the increased demand, and also because these Works were originally planned with a view to a much larger production than their present output. This subject is now under consideration by Councils, and favorable action will relieve us

of great anxiety as to our ability to fill the demand for gas next winter.

The second difficulty, so far as it exists in the northwestern part of the city, will be met, to some extent, by the erection, at the Fifteenth Ward Station, of a holder with a capacity of two hundred thousand cubic feet, now under contract, to take the place of the one torn down during the building of the Schuylkill River East Side Railroad tracks. In addition to this holder it is absolutely necessary that one, with a capacity of one million cubic feet, be erected at the Twenty-fifth Ward Works this year, and another in the southeastern part of the city, at Ninth and Mifflin streets, during the next year.

The third difficulty is one that must have prompt attention. When a large proportion of the mains now in use were laid, the average consumption of gas was four million cubic feet per day; it is now ten million cubic feet and increases nearly eight per cent. annually. From time to time mains of larger capacity than those originally put down, were laid in various parts of the city, but not sufficient in number or extent to meet the increased demand for gas.

Complaints of bad gas, a popular misnomer for insufficient gas, have been most numerous from the northwestern part of the city and from West Philadelphia. The former can be ascribed to the destruction of the Fifteenth Ward Gas Works and of one of the holders already referred to above, but the consumers will have relief through the mains, for which appropriation has already been made, and which are now upon the ground to be laid as soon as the weather permits. A 20-inch main will be laid on Girard avenue from Frankford avenue to Broad street, and on Broad street south, to connect with the 20-inch main already there; an 8-inch main on Spring Garden street west from Broad street, and an 8-inch main north on Twenty-first street to Girard avenue.

A 12-inch main will be laid at once on Tioga street from Richmond street to Frankford avenue, and on Venango street from Frankford avenue to Kensington avenue, but all these mains will be insufficient to supply the consumers with the gas required or to distribute all that can or should be made, and others should be laid at once in the central, the southeastern and the northwestern parts of the city.

These suggestions are not new, but will be found in the recommendations of the Chief of the Bureau, contained in the

reports made by him to the Board of Trustees for many years past, but a point has been reached when they must be met and have favorable consideration.

It is useless for the city to engage in a business that can be made profitable, and then to neglect improvements or enlargements necessary to meet the demands of its consumers, and of a character to insure good gas at the minimum cost of production.

Except in the Ninth Ward Works, where modern improvements have been to some extent introduced by the erection of the regenerative furnaces, gas is made after the most antiquated and expensive methods. Modern appliances have not been promptly nor systematically introduced. Machinery of all kinds, in connection with the making of gas from coal, is altogether unknown in the Works, and the result is that these rank lower in the output per man than any other Works in the country. If it is determined that in the future, as in the past, all the gas made shall be manufactured from coal, immediate steps should be taken to introduce machinery and appliances which in other places have increased more than fifty per cent the amount of gas made per man employed. Then, with the introduction of the regenerative furnaces, or with what are known as the "half-regenerative furnaces," a larger amount of gas per pound of coal carbonized can be had than with our present mode of manufacturing.

Should any of the Works be rebuilt in this way, the question of a construction upon a plan that would utilize in the production of power with which to run the machinery necessary for the electric lighting of the city, the intense heat now going to waste. The introduction of these lights crowds out gas at some points, but increases the consumption in other directions, and hence it would be a measure of wise economy to inquire into the practicability of the suggested mode of lighting the streets of the city with this new light.

In considering the first of the needs of the Gas Works: increased production of at least three million feet of gas per day, the question of introducing one of the several modern modes of making gas from material other than coal, now in successful operation in so many places, should have careful attention.

These processes have passed beyond the region of experi-

ment, our larger cities being supplied by them, either in whole or in part, with gas claimed to be superior in illuminating power to the best made from coal. When, in addition to this claim of superior light, the difference in cost of manufacture enters into the account, we can not longer postpone inquiry into their merits.

It is a fact established beyond question that by these processes a fixed gas of good candle-power is made at a cost so low when compared with our own figures, that it is believed that by a combination of our present modes of manufacture with the best of these new ways financial results will be attained commensurate with the value of the city's Gas Works.

This will be the last report of this Bureau dealing separately with the sinking funds established for the payment of the loans created for the extension of the Gas Works, they having been transferred to the immediate care of the Commissioners of the Sinking Funds.

The loans are as follows :

Due January 1, 1889.....	\$1,000,000	Sinking fund..	\$631,888 03
Due January 1, 1900.....	1,000,000	Sinking fund.....	545,992 50
Due January 1, 1902.....	500,000	Sinking fund.....	228,643 50
Due January 1, 1905.....	1,000,000	Sinking fund.....	446,618 75
	<u>\$3,500,000</u>		<u>\$1,853,142 78</u>

With compound interest at six per cent., upon which these sinking funds are predicated, the amounts now on hand and invested, either for the separate loans or for all of them combined, would more than equal the sum to be paid at the dates named, and it will be good management to see to what extent the two per cent. invested annually for these funds can be reduced and yet meet the loans at maturity, notwithstanding the fact that the interest received does not compound at the rate above named.

Bureau of Highways.

The appropriations to this Bureau for the year 1887	
were.....	\$1,218,397 49
Expenditures for all purposes.....	1,011,061 94
Balances not merging.....	<u>\$167,928 39</u>

The receipts were as follows :

Passenger railway licenses, 832 two-horse and 103 one-horse cars,	\$46,425 00
Breaking of street pavements.....	2,264 00
Dray, cart, wagon, and barrow permits.....	2,230 00
Vault permits.....	1,967 00
Building permits.....	1,157 25
From other sources.....	2,429 57
Total.....	<u>\$56,472 82</u>

Whilst the building of new bridges is under the supervision of the Bureau of Surveys, this Bureau has charge of the maintenance and repairs of the bridges, when once erected.

The total number is 181, distributed by wards as follows :

First Ward.....	16	Twenty-fourth Ward.....	12
Eighth Ward.....	1	Twenty-fifth Ward.....	28
Ninth Ward.....	1	Twenty-sixth Ward.....	3
Fifteenth Ward.....	1	Twenty-seventh Ward.....	6
Eighteenth Ward.....	5	Twenty-eighth Ward.....	8
Twenty-first Ward.....	3	Twenty-ninth Ward.....	3
Twenty-second Ward.....	35	Thirtieth Ward.....	1
Twenty-third Ward.....	42	On county lines.....	16
Total.....			<u>181</u>

Amount expended for repairs.....	\$41,123 88
Estimated repairs for the year 1888.....	\$32,900 00

This does not include the estimated cost of repairing the bridge over the Philadelphia & Reading Railroad on the line of Girard avenue, which is reported by the Railroad Company as in a dangerous condition, and which, according to their report, should be rebuilt.

The subject of iron bridges crossing railroad tracks requires serious consideration, past experience showing that unless the iron girders supporting the bridge floor are sheathed with some material capable of resisting the action of the acids and gases from the locomotives, to which they are subjected, it is but the question of a few years when all these iron bridges must have repairs equivalent to rebuilding.

The amount of work done by this Bureau in connection with the paving and repaving of streets is classified as follows :

New paving :

Granite block.....	54,398.08 sq. yds., or 18,683 lin. feet.
Asphalt block.....	1,587.00 sq. yds., or 1,054 lin. feet.
Vitrified brick.....	8,041.00 sq. yds., or 2,881 lin. feet.
Macadamizing.....	22,666.00 sq. yds., or 8,669 lin. feet.
Total new paving.....	<u>86,692.08 sq. yds., or 31,287 lin. feet.</u>

Replacing cobble-stone with improved pavement :

Granite block.....	29,396.86 sq. yds., or 10,536.00 lin. feet.
Sheet asphaltum.....	33,813.72 sq. yds., or 10,971.83 lin. feet.
Vitrified brick.....	4,000.00 sq. yds., or 1,044.30 lin. feet.
Total.....	<u>67,210.58 sq. yds., or 22,552.13 lin. feet.</u>

Total amount of new paving, 153,902.66 square yards or 53,839.13 linear feet, equal to 9 miles and 3,401 feet.

Repairs made to paved streets.....	535,703.13 square yards.
Footway breaks repaved.....	3,557.42 square yards.
Grading.....	139,450.00 cubic yards.
Connections : Gas and water.....	9,120
Gutter stone laid.....	11,860.00 feet.
Crossing stone laid.....	20,919.78 feet.
Tramway stone laid.....	2,880.56 feet.
Curbstone reset.....	7,501.00 feet.
Brick and stone drains built.....	578.5 feet.
Wooden trunks built.....	1,981.00 feet.
Gutters paved.....	7,809.00 feet.
Broken stone used.....	8,114.64 cubic yards.

One of the most important questions during the past year has been the subject of the repairs and repaving of the streets of the City. Under existing ordinances, no new paving with cobble or rubble stone is permitted, and therefore the territory of badly-paved streets, difficult of repair and impossible to keep clean, is circumscribed by the streets heretofore paved. Those in the new districts, will, under existing ordinances, be paved originally with material better calculated for street pavements than that used heretofore.

With continued appropriations for replacing the present cobble and rubble stone pavements with pavements of an improved character, the time will come, and its coming will be

hastened or delayed by the amount of the appropriations annually made, when the City will be relieved of the reasonably just charge of having the worst paved streets in the country.

Experience here and elsewhere has demonstrated the fact that for narrow streets, or for streets where for any cause, wagon travel is confined to a single track, the Belgian block paving is best adapted, making a reasonably smooth pavement and one that will wear longer than any of the other materials used under the title of improved pavements. For wider streets, and more especially for those used for light driving, sheet asphalt, properly laid with good material, has given the best satisfaction; it is the pavement above all others easily kept clean, and its wearing capacity, when properly, laid is established.

The rapidity with which the streets of this City can be converted from their present unsightly and uncomfortable condition by reason of the rough pavements now covering them, is one entirely of appropriation.

During the past year but a little over four miles of streets were repaved with improved pavement, and it will require very much larger appropriations than those heretofore made, to repave, within a reasonable period of time, the 600.34 miles of streets now open, most of them paved with rubble and cobble stones.

In connection with this subject, it will be well to consider the costliness and generally unsatisfactory mode of doing this work, a square or two in one street and at any one time.

Whilst it is true that the streets in all parts of the city are in such bad condition that they should all be promptly repaved, and that some portion of the appropriation is demanded in each of the several wards, it is a readily appreciated fact that it will cost more per square yard to do a given amount of work scattered all over the city than it would cost if the work were confined to a smaller number of streets. In addition to this increased cost, there is the result that no one street is ever completed, and that thoroughfares which should be covered with a good pavement throughout their entire length, have small patches put upon them.

Unless the opposite of this plan and want of system is adopted in the expenditure of the sums appropriated and to be appropriated, those portions of any street laid with improved pavement will be worn out before the adjoining squares are reached. In other words, it is better to finish work within

given limits than to spread and scatter it in such a way that the results will be apparent neither to the eye nor in the daily use of the streets.

The cost of improved pavement per running square or block of five hundred feet, in streets fifty feet between house lines, is \$3,600; on Broad street per square, \$12,500. A calculation, very easily made, will show to what extent the appropriation now available will continue the good work.

The question of repaving with improved pavement is complicated by the fact that all the principal streets of the city, between the Delaware and Schuylkill rivers, and all but six of the principal streets between Jackson street on the south and Lehigh avenue on the north, a distance of five miles, have either in their entire length or in some portions, passenger railway tracks upon them. Many of the streets not included in these limits are also thus occupied, and it is estimated that 271.29 miles of street are used for this purpose.

Under the opinion of the City Solicitor, that the companies occupying these streets are entirely liable, not only for their maintenance and repair, but also for their improvement with better pavement, it is impossible for the Department to expend any of the moneys appropriated for improved pavements upon these thoroughfares.

Practically all the streets in the business parts of the city are occupied by these tracks, and it is the contention of the companies using them that they cannot be required under their charters, to do more than repair the streets with the character of pavement now on them.

The whole subject is pending in a suit brought by the City against the Union and Ridge Avenue Passenger Railway Companies, but with the proverbial delay in law suits, it is not possible to name any definite time at which this case will be finally decided.

Under a resolution of Councils, the Department made arrangements to stop the cars of another company, for the purpose of causing another suit more promising of immediate decision. The company interested agreed with the City Solicitor to submit for the consideration of the proper court, a "case stated," and we are again brought to a halt until this case can be argued and decided. No matter what the decision, it is to be expected that the losing side will carry the case to the Supreme Court, and thus the matter of the improvement

of the streets in the part of the city most in need of the same, is postponed for practically an indefinite period.

It is impossible to suggest any way by which these difficulties can be removed, and this very vexed question be definitely decided, and it is feared that for yet several years the business streets of the City of Philadelphia will continue in their present condition.

The several passenger railway companies have been reasonably prompt in the repairs of the streets occupied by them, and one of them, the Traction Company, has expended considerable money in repaving with Belgian blocks.

It is useless to argue for the advantages of a pavement of this kind; the railway companies would be saved large sums annually in the repairs of the streets which are continually demanding new repairs, and in the wear and tear of their stock, and the people generally would be benefited in ways without number.

The subject of street cleaning was one of the most troublesome questions engaging the attention of this Department. With the paving of the city in its present condition it is a matter of great difficulty to keep the streets clean, and until they are repaved with a better class of pavement, the complaint of dirty streets, well-founded, will continue.

The streets of a large city should be cleaned daily and with machinery; manual labor should be employed only in connection with the cleaning of inlets and in looking after the machinery in operation. If cleaned by machinery they would necessarily be cleaned at night, when the streets would be, to a very large extent, clear of business traffic, and with the modern appliances there is no reason why this work should not be done in this way and at that time.

The contracts for the cleaning of streets, inlets, and market houses, the removal of garbage, ashes, and dead animals, had been awarded before this Department was established. Considerable difficulty was experienced in compelling the contractors to comply with the provisions of their contracts. The specifications of these contracts were ample to secure clean streets and the removal of offensive waste and material of all kinds, but the feeling on the part of the contractors seemed to be, that the enforcement of these specifications was to them a hardship to which they ought not to be subjected.

Pushed on all sides by the Inspectors of the Department, and stirred to greater activity by the imposition of fines and penalties provided for in the contracts, reasonably good service was had, except during the months of August and September, when the complaints of the non-removal of garbage became very numerous.

It was deemed best not to annul any of the contracts, but to continue pushing the contractors to increased work and effort, and considering all the circumstances of the case, the year closed and the contracts expired with perhaps but little profit to the contractors, but with the streets of the city much cleaner than for many years past, when the street cleaning season closed.

Advertisements for this work during the ensuing year were made early in the winter, and the contracts were awarded at figures nearly one-third higher than during the previous year, with contractors who will be compelled to do the work for which they have contracted, and for which they expect to be paid.

The city has been divided into five districts, and in the Second and Third Districts, comprising that part of the city between South and Poplar streets and including West Philadelphia, will be cleaned by machinery, and, under the ordinance of Councils, the ashes in the district between South and Vine streets and the two rivers, will be removed between 10 P. M. and 6 A. M.

By ordinance of Councils, this whole branch of the city service has been organized into a separate bureau called "The Bureau of Street Cleaning," and it is expected and believed that with this separation of duties and concentration of responsibilities, we shall have clean streets and a prompt removal of ashes and garbage.

The Board of Highway Supervisors

is composed of the Chiefs of the Bureaus of Highways, Water, Gas, City Property, Surveys, and the Electrical Bureau, with the Director of the Department as President. It is not strictly connected with the Bureau of Highways or the Department of Public Works, but as all of its members, except one, are at the head of bureaus in this department, and as its object, as recited in the ordinance of Councils originally creating this Board, was to prevent all unnecessary openings in street pavements, and to promote system and economy of repaving over breaks made

over underground work, it may be well to make, in connection with this part of my report, a short statement of its operations during the past year.

Numerous applications for opening streets in connection with the laying of conduits for wires of all kinds, have been received during the year and all of them were granted, subject to the restrictions of the ordinance of Councils as to the use of the streets by particular companies, and the general regulations established for this purpose. Other applications for railroad turnouts, vaults under the sidewalks, and other matters of minor importance were received and the privileges granted.

The Board has now under consideration the expediency of charging, either of its own motion or by an ordinance of Councils, some annual fee for these privileges. A large sum could be realized to the city from this source.

The subject of opening streets for the purpose of laying underground conduits, is one of serious and immediate moment. Under the privileges already granted by Councils, permission has been given by this Board for the opening of streets, which will amount practically to a tearing up of all the streets in the business parts of the city, some of them for the second, the third, and even the fourth time. The inconvenience of this is readily appreciated, and its interference with the transaction of business is one of serious extent.

The continuance of overhead wires, whether for telegraph, telephone or lighting purposes, is a nuisance of such magnitude and danger, that the people demand their early removal into structures underground, and yet, judging by the past and realizing the magnitude of the contemplated work in this direction in the immediate future, it seems almost as if the remedy were worse than the disease. With the street paving continually disturbed and a solid foundation undermined and torn to pieces by the digging of trenches of a greater or less depth and width, and filling the same with boxes of perishable material, the prospects of well-paved streets are very unpromising, especially when in connection with the first laying of the conduits, the subsequent tearing up of the streets for the purpose of making house connections wherever these wires are to be introduced along the line of the street, is taken into consideration.

The only remedy for the present condition of our streets, because of this work, seems to be the construction of extensive

brick or stone subways, within which pipes, whether for gas, water, or for wires, can be placed. These structures are costly, but when once completed, with proper house connections carried to the curb-line, there would be no further excuse for the digging up of pavements, except such as may be required to repair any possible break in the subway itself. Whether it would be proper, were it possible financially, for the city to build these structures and to lease them to such companies as desire to occupy them for the purposes of their business, reserving space for the use of her own pipe lines and wires, or whether they should be constructed by companies specially organized for this purpose, paying for the privilege of occupying the highways a reasonable annual charge to the city, are subjects that have already had attention from City Councils, but the magnitude of the question and its importance to the condition of our highways, should induce further consideration, and, if possible, prompt action.

In connection with the laying of underground conduits, there have been filed with the Board of Highway Supervisors, nearly three hundred plans showing all underground structures on a scale of twenty feet to the inch; these records have been thus far of comparatively little use in the administration of city affairs, but will no doubt become very valuable in the early future.

Ice Boats.

The three ice boats are in good condition and repair, and they have successfully kept the harbor of Philadelphia, and the river below the City to the Capes, free from obstruction by ice.

Boat No. 1 made her trial trip on January 23, 1838, nearly fifty years ago. She has been rebuilt twice, but the original engines and shafts are still in service, and are in good condition.

Boats Nos. 2 and 3 are more powerful vessels, and the three combined are amply able to prevent the closing of our harbor by ice.

During the winter of 1886-'87 the boats towed

Thirteen vessels outward bound, of.....	15,724 tons
Twelve vessels inward bound, of.....	9,697 tons
One vessel assisted, of.....	240 tons
Total.....	25,661 tons

Amount received for towage and assistance rendered.....	\$7,311 48
For sundries.....	154 84
Total paid into the City Treasury.....	<u>\$7,466 32</u>
Expenses:	
Repairs.....	\$10,200 00
Fuel.....	7,809 20
Salaries and wages.....	13,672 29
Provisions.....	1,697 63
Wharfage.....	2,400 00
Stationery and advertisements, &c.....	1,250 00
Total.....	<u>\$37,029 12</u>

The boats went out of commission on February 16 and 26, 1887, and were again put into commission on December 29, 1887—a later date than for many previous years.

Arrangements are under consideration by which a dock, for the boats when not in commission, will be constructed at the grounds belonging to the House of Correction, thereby saving the annual charge of \$1,200 for wharfage, at a cost of perhaps \$2,500 and the labor of the inmates of the institution in building the dock.

This branch of the City Service has not been organized into a separate Bureau, the boats being under the care of a superintendent and a clerk, under the immediate direction of the Director of the Department.

Lighting the City.

The city is fairly well lighted by electric arc lights, gasoline lamps, and gas lamps, classified as follows:

Electric arc lights.....	354	
At a cost during the year 1887 of.....		\$87,974 53
Gasoline lamps.....	5,297	
At a cost during the year 1887 of.....		116,586 09
Gas lamps, in that part of the City formerly known as the Northern Liberties, supplied by the Northern Liberties Gas Company.....	472	
At a cost of.....		10,701 45
Under charge of the Bureau of Gas.....	16,473	
(1,062 of these are not lighted, because of their proximity to electric lights.)		
Total number of lamps.....	<u>22,596</u>	<u>\$215,262 07</u>

The Bureau of Gas paid for maintenance, etc., of the lamps under its care.....	\$174,126 85
If the City had paid for them the same rate paid the Northern Liberties Gas Co., the cost would have been increased....	175,280 02
Or, if the City were charged the same as private consumers for the 440,358,181 cubic feet of gas burned, the cost would be increased.....	486,711 42

No general ordinance or regulation seems to fix the location of the nearly two thousand lamps ordered by Councils to be erected annually, but for the purpose of preventing the crowding of lamps into particular localities, to the deprivation of light at other places, it would be well if such general rules were established. Permit me to suggest the following as the basis: no lamp should be located within, say, one hundred and fifty feet of a lamp already erected, except at the corners of streets and opposite alleys or courts, and that the department be authorized to re-locate any lamps now erected which come within these restrictions.

In this way, portions of the city now unable to secure proper public lighting, would be served without increasing the general cost. Whilst it is true that by far the larger number of lamps are maintained without any direct appropriation from the City Treasury, it is also true that it costs the city a very large sum to manufacture the nearly five hundred million feet of gas burned, and this sum should not be extravagantly increased, as is now done by the indiscriminate location of public lamps.

The lighting by gasoline lamps is confined to those portions of the city where gas-mains are not yet laid, but as rapidly as these are introduced, the lamps are changed from gasoline to gas lights.

The lighting by electricity is still in its infancy, but it is rapidly growing in magnitude and importance. Most of the lights are supplied by overhead wires with all the attendant inconvenience and danger to life and property.

Lighting by underground wire, on Broad street from Fairmount avenue north to Tioga street, and (by the Directors of City Trusts) on Delaware avenue and on Front street, from Vine street to South street, has been in successful operation for a long time with the most gratifying results.

Conduits for underground wires have been laid on Diamond street from Broad street to Ridge avenue, and on Broad street from Fairmount avenue to Market street, and money is appro-

riated for the laying of similar conduits on Broad street south from Market street to Passyunk avenue.

The subject of placing all lighting wires underground, and also the more important question of establishing electric light plants to be owned and operated by the city, should have early consideration by City Councils.

This branch of the city service is not organized into a separate bureau, the care of the electric lights being with the chief of the Electrical Bureau, attached to the Department of Public Safety; the gasoline lighting and the District of the Northern Liberties under the immediate supervision of the Director's office, and the remainder of the lighting under the care of the Bureau of Gas.

Bureau of Surveys.

This Bureau has charge of all work pertaining to the surveys, drainage, sewerage, and general engineering of the city. All new bridges, sewers, and culverts are constructed under its supervision, and all plans governing the laying out of streets and of lines and grades are under its control, through the Board of District Surveyors, of which the Chief of the Bureau is *ex officio* President. Its duties and responsibilities, in a city covering 129 square miles and of such varied topography as Philadelphia, are large in number and important in extent and detail.

The very difficult question of adjusting the local and limited systems of drainage adopted in years gone by by the municipalities then existing in the territory now known as the City of Philadelphia, is a matter of very serious concern; and with the limited appropriations made for the construction of main sewers (of such moment to the health and comfort of the citizens), the work is not progressing with the rapidity that its importance demands. With the determination of the representatives from the various parts of the city to secure some portion of these appropriations for the particular locality represented by them, it is found impossible to carry to continuous completion any one of the several main sewers in process of construction, and the result of the year's work, distributed in small sections all over the city, whilst representing many hundreds of thousands of dollars, makes but little impression upon the total work to be accomplished. This mode of operation should, if possible, be remedied, and some one of the main

sewers should be completed before others are commenced ; in brief, the present mode of patchwork should give way to more general and comprehensive plans.

The intercepting sewer will be completed through its entire length early in the ensuing year, but the general system of house-drainage into this sewer is yet to be arranged. The other main sewers upon which work has been done during the past year are Mill Creek sewer, in West Philadelphia ; the extension of Cohocksink sewer, on Twenty-fourth street, and the Wingohocking sewer, in Germantown. Important repairs have also been made to that part of the Mill Creek sewer, West Philadelphia, built in former years, and to the eastern end of the Cohocksink sewer.

Ten bridges have been under construction during the year 1887. The most important of these, Market street bridge, has been delayed beyond the time named in the contract, but it is hoped that it will be completed within a short time.

The following bridges were completed during the year :

Spencer street, over Norristown Railroad...	Twenty-first Ward.
Ontario street, over Germantown Railroad.....	Twenty-eighth Ward.
Fifty-second street, over Mill Creek.....	Twenty-fourth Ward.
Chester avenue, over West Chester Rail- road.....	Twenty-seventh Ward..
Forty-seventh street, over West Chester Railroad	Twenty-seventh Ward.
Poplar street, over P. & R. Railroad, a wooden foot-bridge, ten feet wide, as a communication to Fairmount Park ; Glen- wood avenue, over Germantown Railroad..	Twenty-eighth ward.
Somerset street, over Richmond branch of the P. & R. Railroad.....	Twenty-fifth Ward.

The bridge over the Wissahickon, on the line of Ridge avenue, is in process of construction. The time of completion was early in December, but it will be several months before the work will be finished.

A detailed statement of the construction of these bridges will be found in the report of the Chief of the Bureau, hereto appended.

As soon as the new bridge over the Schuylkill river, at Market street, is finished, the question of other bridges over said river should have consideration, and probably none will

commend itself to your judgment more than the proposed bridge at Walnut street.

The receipts of the Bureau were as follows:

For sewer permits.....	\$15,058 50
For searches.....	2,803 25
For copies of plans and certificates.....	1,150 10
For sewer bills and balance of accounts.....	3,796 88
Total.....	\$22,808 73
The total expenditures were.....	\$633,132 16
The balance of appropriation not merging is.....	\$328,493 77

The following is the length of sewers built:

Main sewers.....	17,213.62 feet
Branch sewers.....	84,709.00 feet
Length of branch sewers at private expense.....	17,290.00 feet
Total.....	119,212.62 feet

equal to 22.578 miles.

The appended report of this Bureau refers in detail to very interesting and important branches of the City Service.

Bureau of Water.

The collection of all moneys due the city having been transferred by Act of Assembly to the Department of Receiver of Taxes, the registrar's office of the department for supplying the city with water ceased to be a branch of this Bureau on the first Monday of April last, and the receipts from water-rents and other sources will no doubt be reported to you by the Receiver of Taxes, but for the purpose of completing the records of this important branch of the City Service, the following figures are submitted:

Receipts from water-rents.....	\$1,721,488 83
“ “ fractional rents.....	115,939 21
“ “ water-pipes.....	106,602 48
“ “ City Solicitor's Office.....	29,504 04
“ “ penalties.....	24,453 03
“ “ delinquent rents.....	19,040 87
“ “ Chief Engineer's Office.....	7,287 61
“ “ searches.....	3,412 75
“ “ delinquent penalties.....	2,705 79
Total..	\$2,030,434 61

An increase over the previous year of \$97,106.27.

The quantity of water pumped is largely in excess, and the cost of pumping the same materially less than in any previous year.

Pumped to reservoirs, 32,426,779,765 gallons; equal to 51,289,948,331 gallons pumped 100 feet high.

Cost per 1,000,000 gallons pumped 100 feet high, 3.99 cents.

Average gallons per capita per day, estimating the population at 995,000, 89 gallons. This is an actual increase of 3,767,813,196 gallons, an increase per capita of 9 gallons per day, and a reduction in the cost of pumpage of 14 cents per 1,000,000 gallons.

Pumped by water-power, 10,105,736,633 gallons; pumped by steam-power, 22,321,043,132 gallons.

One reason for the reduction in the cost of pumpage is the fact that the quantity pumped by water-power increased nearly 40 per cent. over similar pumpage in the previous year.

The largest quantity pumped in 24 hours was 118,604,079 gallons; the smallest quantity pumped in 24 hours was 61,232,735 gallons.

The pumping machinery in the Department is all in excellent condition, with a capacity of 183,000,000 gallons per day.

The storage capacity is 263,000,000 gallons, an increase over the previous year of 60,000,000 gallons, by reason of the completion of the smaller basin of the East Park Reservoir.

Arrangements are being made to continue work upon this reservoir for the purpose of completing the next larger section, having a storage capacity of 310,000,000 gallons. When the remaining section, with a capacity of 320,000,000 gallons, is completed, water sufficient in quantity, and of a superior quality, can be furnished for many years without any material increase either of pumping machinery or of storage reservoirs.

The question of a new reservoir at Cambria and Thirtieth streets has had serious attention. When the land upon which this basin is to be built was purchased it was for the purpose of giving the higher districts in the northwestern part of the city a better supply of water than that furnished them by direct pumpage from the river. A more careful examination of the subject has convinced the Department that the great expense attached to the construction of this reservoir will not be justified by the resulting benefits. By reason of the topog-

raphy of the land, and the peculiarity of the street lines, this reservoir would cost more per 1,000,000 gallons than any one heretofore built, and when the advantages of pure water can be had at once and at a very much less cost than by the building of this basin, it is a matter of economy to abandon, for the present at least, any expenditures in that direction.

It is the immediate intention of the Department to lay two large mains, which will eventually be required to fill the East Park Reservoir when it is completed, and to connect them with one of the engines at the Spring Garden Pumping Station, then use one of the mains for the purpose of supply, and the other for the purpose of distribution to the residents in the north-western part of the city, taking the water from the small section already completed. This section has a larger capacity than any one of the reservoirs now in use, and will hold water sufficient for supplying the district referred to, the water having first been permitted to remain in the basin four or five days for purposes of subsidence. If this plan prove feasible by actual trial, it will no doubt be enlarged upon when the other sections of this reservoir are completed, and instead of pumping into a basin at higher elevation and there permitting the water to subside, we will first permit the water to subside in the reservoirs already constructed, and pump it thence to the higher elevation required. This second pumpage will be but little, if any, greater in expense than a direct pumpage from the river into the contemplated reservoir at Cambria and Thirtieth streets.

The work on the section of the East Park Reservoir now finished was completed in a very satisfactory manner. The bank was finished by days' work, and the lining with concrete and brick laid in Portland cement was done under contract awarded after advertisement. The contractors finished their work ahead of time, and all was done within the original estimates. The basin had been gradually filling with water, and there is no leak perceptible anywhere.

With the experience gained in building this smaller section it is expected that the work on the larger, which will be commenced as soon as the weather permits, will be done equally well, with the same expedition and regard to economy as well as to good work.

For the purpose of a better supply of water than is now furnished by the Kensington Pumping Station to the northeastern

part of the city a 30-inch main was laid from the Wentz Farm Reservoir to the Lehigh Reservoir, at Sixth street and Lehigh avenue, a distance of nearly five miles, at a cost of \$142,272.77. The excavation was done by contract, and the pipe was laid by the employés of the Bureau. The work was done in a satisfactory manner, and when the water is turned on in the spring it is hoped that the Kensington Pumping Station can be finally abandoned. This improvement will be one of great benefit to the general health of the district supplied from this basin.

The other reservoirs are in excellent condition, except the one on Wentz Farm, which needs some repairs to stop a leak, which it has not yet been possible to locate definitely.

Next to the finishing of the section of the East Park Reservoir, the most important event in this Bureau was the completion of the 20,000,000 gallon pumping engine, contracted for with the Holly Manufacturing Company. The details of the trial, as found in the report of the Chief of the Bureau, show that the work is satisfactory in every respect, and that it has a capacity greatly in excess of the requirements of the contract.

A 48-inch pumping main, from the Spring Garden Station to Twenty-fourth and Parrish streets, a 20-inch main on Girard avenue from Otis street to Front street, and a 20-inch supply main on South Broad street, on which work was begun in 1886, were completed during the past year, and a 48-inch supply main was laid from the East Park Reservoir to near the Spring Garden stand-pipe. Including the above, there were added to the distribution, 122,790 feet of pipe, equal to 23 miles and 1,350 feet, making a total of pipe now in use of over 876 miles.

6,171 feet of small pipe were taken up and replaced with 6-inch mains.

Complaints of a short supply of water were received from but two sections of the City; one, from Sixth and Tioga streets, was relieved by the use of the 30-inch main connecting the Wentz Farm and Lehigh Reservoirs; the other, from the Falls of Schuylkill, has had temporary relief, but will require for permanent relief, the laying of a 12-inch main on Ridge avenue from Rodman street to Hermit lane, a distance of 7,000 feet.

420 new style fire-hydrants were placed in position, and 150

new and 72 old style have been substituted for defective ones. There are now 6,919 fire-hydrants in use.

8,532 water attachments were made, an increase of 523 over the previous year.

The appropriations to this Bureau were.....	\$1,061,324	42
Expenditures	1,026,941	59
Balances not merging.....	17,129	27
Amount expended for extensions and permanent improve- ments.....	295,440	09

The operations of the Bureau are set out in detail in the very interesting report of the Chief, which is hereto appended.

When the collection of water rents and other moneys due the City was transferred to the Department of the Receiver of Taxes, it was found impracticable to move the officers having charge of this work from the quarters theretofore occupied by them to the office of the Receiver of Taxes in the new Public Buildings, and this work was continued in the same manner as before the transfer of officials was made. In this transfer were included all the inspectors of the Department of Water, and when these officers are removed to the new Public Buildings at an early day in the spring, the Bureau of Water will be left without an official to examine into the many questions arising in connection with the introduction and use of water in all parts of the City. These officials should be reassigned to this Department, or others must be appointed to take their places.

Whilst under the law, the Department of the Receiver of Taxes is required to collect all moneys due, it is the duty of the Department of Public Works to furnish and to distribute the water to the consumers, and under the ordinance of Councils, it is the duty of the inspectors to examine and report upon the fraudulent use of water, the abuse of permits, the proper attachments to be made, and also other duties not having any relation to the collection of moneys, but appertaining to the operations of the Bureau having charge of the water supply of the City.

The following is a recapitulation of the suggestions and recommendations contained in the foregoing report :

Bureau of City Property :

First—Improvement of the squares from which the iron railings have not yet been removed.

Second—Sale of the City's unimproved property not required for public purposes.

Third—Transfer of the "Clerks of the Market" to the Department of Public Safety.

Bureau of Gas :

First—Additional appliances for the manufacture of three million feet of gas per day.

Second—Construction of additional holders.

Third—Laying of larger mains

Fourth—Utilizing waste heat for supplying power for electric lighting.

Fifth—Modification of the sinking funds from which to pay the outstanding loans.

Bureau of Highways :

Repaving streets with improved pavement throughout their entire length, instead of a square or two at one time.

Board of Highway Supervisors :

Charge for permits granted for the opening of streets and the construction of vaults.

Lighting the City :

A general ordinance for the location of public lamps.

Bureau of Surveys :

Completion of main sewers instead of building them as now, in short sections.

Bureau of Water :

The re-transfer of the water inspectors from the Department of the Receiver of Taxes to the Department of Public Works.

APPROPRIATIONS FOR THE YEAR 1888.

BUREAU.	Annual Appropriation for the year 1888.	Balance available from previous years.	Total.
Director's Office.....	\$13,620 00	.....	\$13,620 00
City Property.	143,863 00	.....	143,863 00
Gas.....	3,249,156 79	\$75,000 00	3,324,156 79
Highways.....	821,350 00	161,328 56	982,678 56
City Ice Boats.....	39,500 00	.....	39,500 00
Lighting the City.....	270,801 82	.....	270,801 82
Street Cleaning.....	428,000 00	*28,614 62	456,614 62
Surveys.....	450,858 00	328,493 77	779,351 77
Water.....	1,131,588 00	17,129 27	1,148,717 27
Total.....	\$6,548,737 61	\$610,566 22	\$7,159,303 83

* This is an additional appropriation, not an available balance.

The principal points of the work actually done during the year 1887 are set forth in my report, and in full detail in the reports of the Chiefs of the Bureaus, hereto attached, for which careful consideration is asked.

Whilst this work falls far short of the hopes of the oversanguine citizen, who overlooked the fact that changes so extensive and far-reaching as those made in the management of affairs by the Act of Assembly creating this department could only be made with the expenditure of much time and money, and the exercise of great patience, all has been accomplished that could have been reasonably expected by those familiar with the difficulties in the way and with the means for their removal.

With the increased appropriations made for the year 1888, the experience gained by the successes and the failures of the year just closed, the knowledge that my subordinates are in thorough accord with my determination to secure for the city the best possible results with the means at hand, and the

assurance that my efforts in this direction shall have your continued approval and endorsement, I enter upon the work of the new year in the belief that the citizens and tax-payers of Philadelphia will not be disappointed in their hopes and expectations of the benefits to result from the operations of the law creating the Department of Public Works.

Very truly yours.

LOUIS WAGNER,

Director.

ANNUAL REPORT
OF THE
BUREAU OF WATER,
DEPARTMENT OF PUBLIC WORKS,
For the year 1887.

Philadelphia, January 2, 1888.

GEN. LOUIS WAGNER,

Director of the Department of Public Works.

SIR:—The following report of the operations of this Bureau during the year 1887 is respectfully presented:

In accordance with the provisions of the new city charter which went into effect on April 4, 1887, the Water Department, with the exception of the Registrar's office, became a branch of the newly organized Department of Public Works, under the title of Bureau of Water.

The office of the Registrar, which had charge of the receipt of water rents and other moneys, was transferred to the Department of the Receiver of Taxes.

Mr. A. N. Keithler, the Registrar, died on March 2. The vacancy occasioned by his death was not filled, as it was understood that the office would be abolished. Mr. E. S. Higbee, Chief Clerk to the Registrar, who managed the office during the illness of the latter, continued in the performance of such duties until the Receiver of Taxes assumed control.

RECEIPTS.

In order that this may be uniform with previous Annual Reports, the collections for the entire year are given as follows :

Water rents.....	\$1,721,488 83
Fractional rents.....	115,939 21
Water-pipes.....	106,602 48
City Solicitor's Office.....	29,504 04
Penalties.....	24,453 03
Delinquent rents.....	19,040 87
Chief Engineer's Office.....	7,287 61
Searches.....	3,412 75
Delinquent Penalties.....	2,705 79
Total.....	<u>\$2,030,434 61</u>

The increase over 1886 is \$97,106 27.

The receipts at the City Solicitor's office for pipe frontage claims have been included in the above given total.

The unpaid water-pipe charges referred to the Law Department for collection amounted to \$33,900.28.

The number of properties delinquent on September 1 was 10,117. Orders were issued to deprive these premises of water, which resulted in the payment of \$93,331.88 on 8,809, leaving 1,106 turned off for non-payment of water rents.

For a full account of receipts, see report of Mr. E. S. Higbee, Appendix A.

Revenues for ten years, 1878 to 1887, inclusive.

YEAR.	Delinquent Water Rents.	Delinquent Penalties.	Water Rents.	Penalties.	Fractional Rent.	Water-Pipe.	Searches.	Chief Engineer's Office.	City Solicitor's Office.	Totals.
1878	\$136,123 93	\$19,759 24	\$1,085,838 41	\$25,915 19	49,391 90	55,631 89	.....	3,871 49	40,113 80	1,416,645 85
1879	118,234 15	17,439 36	1,186,001 69	22,931 31	40,516 70	31,235 92	.....	2,819 94	46,445 94	1,465,625 01
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 89	97,219 62	122,743 91	2,960 00	10,121 36	24,594 95	1,933,328 34
1887	19,040 87	2,705 79	1,721,488 83	24,453 03	115,939 21	106,602 48	3,412 75	7,287 61	29,504 04	2,030,434 61

The following comparisons may be of interest :

There is a marked decrease since 1878 in the receipts from delinquent rents and penalties, owing to the execution of the law requiring delinquent properties to be deprived of water.

The increase in the receipts from water rents has been \$635,650.42.

The increase in fractional rents which represent permits issued for new buildings, from \$49,391.90 in 1878, to \$115,939.21 in 1887, will give a good idea of the advance in building operations.

The corresponding increase in the collection from water-pipes laid is also due to the same cause—the erection of new houses.

Appropriations and Expenditures.

Appropriation December 31, 1886.	Amount appropri'd.	Amount expended.	Amount merging.	Amount not merging
Items.				
1. Salaries:				
Office—Chief Engineer.....	\$57,268 00	\$57,051 74		
Office—Registrar.....	37,210 00	9,088 68		
Fairmount Pumping Station...	5,630 00	5,583 87		
Spring Garden Pumping Station	32,797 50	31,412 75		
Belmont Pumping Station.....	9,800 00	9,657 65		
Roxborough Pumping Station..	7,507 50	7,095 98		
Mount Airy Pumping Station..	2,370 00	2,370 00		
Chestnut Hill Pumping Station	1,500 00	1,500 00		
Frankford Pumping Station....	3,325 00	3,887 31		
Kensington Pumping Station..	1,620 00	1,620 00		
Works, general.....	21,550 00	21,460 34		
	\$181,748 00			
Transferred—				
To Receiver of Taxes.....	\$28,657 50			
To Item 2, W. D.....	600 00			
To Item 3, W. D.....	600 00			
To Item 4, W. D.....	300 00			
	\$30,157 50			
	\$151,590 50	151,308 30	\$282 20.	
2. Regular supplies, including fuel, oil, and small stores.....				
Transferred from Item 1.....	\$100,000 00			
	600 00			
	100,600 00	100,479 95	120 05	
2¾. For coal. Transferred from Gas Surplus, Nov. 12, 1887.....	2,000 00	2,000 00		
2½. For coal. Transferred from Bureau of Highways, Nov. 12, 1887.....	23,000 00	23,000 00		
3. Repairs to machinery and conveyance of workmen incident thereto.....				
Transferred from Item 1.....	\$50,000 00			
	600 00			
	50,600 00	50,595 59	4 41	

Appropriations and Expenditures—(Continued).

Appropriation December 31, 1886.	Amount appropia'd.	Amount expended.	Amount merging.	Amount not merging
Items.				
4. Maintenance and repairs to buildings, grounds, and reservoirs..... \$40,000 00 Transferred from Item 1..... 300 00	\$40,300 00	\$36,949 C2	\$47 98	\$17,129 27
4½. Maintenance and repairs to buildings, grounds, and reservoirs. Transferred from Gas Surplus, November 12, 1887.....	3,000 00	2,986 30		
5. Maintenance and improvement of the dis- tribution, including purchase of material and cost of labor connected therewith, which shall include paving over water- pipe..... \$135,000 00 Transferred from Bureau of Highways, Nov. 12, 1887..... 6,000 00	141,000 00	140,940 64	59 36	
6. Supplies and labor at City Repair Shop. \$50,000 00 Transferred from Bureau of Highways, Nov. 12, 1887..... 1,000 00	51,000 00	50,998 94	1 06	
6½. Transferred from surplus, Nov. 12, 1887....	5,000 00	5,000 00		
7. General, incidental, and contingent ex- penses, including \$650 for keep of horse for Chief Engineer, and \$750 for keep of horse for General Superintendent and Assistant Engineer..... \$15,000 00 Transferred from Bureau of Highways, Nov. 12, 1887..... 1,000 00	16,000 00	15,933 86	66 14	
8. For extensions..... \$300,000 00 Transferred from Sur- veys, June 21, 1887... \$30,000 00 Transferred from the Bureau of Highways Dec. 24, 1887..... 1,800 00	31,800 00			
	\$331,800 00			
Deficiency of 1886..... 36,314 08	295,485 92	295,440 09	45 83	
Totals.....	\$1,061,324 42	\$1,026,941 59	\$627 03	\$17,129 27

The item for extensions was subdivided by the Water Committee as follows:

For the completion of one section of the East
Park Reservoir \$100,000 00
For a 30-inch main from Wentz Farm Reservoir
to the reservoir at Sixth and Lehigh avenue 163,000 00
and the balance for deficiency bills.

The expenditures are given in detail in the report of Mr. J. T. Hickman, Chief Clerk, Appendix B.

PUMPING STATIONS.

The performance of the pumps at the several stations for each month is shown in the following tables:

Total Gallons Pumped during 1887.

Months.	Water-power.	Steam Pumpage.	Totals.	Gallons per day, Average.
January.....	998,924,100	1,348,247,939	2,347,172,039	75,715,227
February.....	963,277,739	1,157,363,200	2,120,640,939	75,737,176
March.....	1,051,042,927	1,256,424,484	2,307,467,411	74,434,432
April.....	1,001,952,833	1,389,000,751	2,390,953,584	79,698,452
May.....	1,056,653,009	1,769,512,312	2,826,165,411	91,166,626
June.....	941,042,152	2,015,208,292	2,956,250,444	98,541,681
July.....	839,626,962	2,479,918,499	3,310,545,461	106,791,789
August.....	889,848,959	2,380,690,782	3,270,539,741	105,501,281
September.....	666,169,120	2,341,724,826	3,007,893,946	100,263,131
October.....	530,763,389	2,427,796,005	2,958,559,394	95,437,399
November.....	440,229,920	2,097,891,846	2,538,121,766	84,604,058
December.....	735,205,433	1,657,264,196	2,392,469,629	77,176,439
	10,105,736,633	22,321,043,132	32,426,779,765	88,840,492

Total number of gallons pumped in excess of that of preceding year, 3,767,813,196.

Daily average in excess of preceding year, 10,407,203 gallons, or over 12 per cent.

Maximum quantity pumped in one day, 118,604,079 gals.

Minimum quantity pumped in one day, 61,232,735 gals.

No trouble was experienced in keeping up the supply, notwithstanding the increased demand.

At Fairmount the increase was 2,823,182,838 gallons, or nearly 40 per cent.

At Spring Garden there was a decrease of 257,110,363 gallons.

The former being pumped by water power, and the latter by steam, a great saving in the cost was effected.

The flow of the Schuylkill river was less than during 1886. There were one hundred and seven days only during which water was wasted over the dam, while in the preceding year there were one hundred and forty-five. This is, however, partly accounted for by the increased pumpage at Fairmount. Of the total pumpage, 30 per cent. was by water power and 70 per cent. by steam. During 1886 the per centage was 25 by water and 75 by steam. The cost of pumpage, as shown by the following table, is less than during any previous year since 1878.

Pumpage Table for the Years 1878 to 1887, 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.
1878	19,101,664,332	27,668,619,658	\$6.56	64	813,000
1879	19,894,101,515	29,787,829,909	5.07	65	830,000
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	5.51	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

REPAIRS AND CONDITION OF WORKS.

In Appendix C, the report of Mr. F. L. Hand, General Superintendent, will be found, in detail, an account of the work performed and the repairs made at each station.

The repairs were generally of a minor character and consisted principally of the thorough overhauling of each wheel and engine, the renovation of the buildings, and the replacing of walks and reservoir lining injured by frosts.

No serious accident occurred to the machinery, great care having been taken to keep it in thorough order so that it could always be relied upon for service.

EAST PARK RESERVOIR.

One section of this reservoir has been completed. The bottom was brought to grade and the banks trimmed to the proper lines by men employed by this Bureau. The contract for the lining thereof was awarded to Mr. Lewis Grant, of Pottsville, for the sum or price of \$1.29 per square yard.

The bottom lining consists of a layer of concrete five inches in thickness, composed of four parts of broken stone, two parts of sharp sand, and one part of the best Portland cement. The concrete was joined together so as to form one continuous sheet over the entire bottom, and the upper surface was finished smooth with concrete, composed of one part cement and two parts sand.

The sides were lined with hard paving bricks set on edge and imbedded in two inches of concrete, composed of one part cement and two parts sand.

The contractor began work on August 3, and finished November 19, eleven days less than his contract stipulated.

The work was carefully inspected during its progress, the cement frequently tested, and in both quality and workmanship the lining is in all respects equal to the standard required by the specifications.

Water was first pumped into this section on November 19. For fear of an accident the filling was discontinued until after the completion of the fence around the top.

The outlet chamber was thoroughly repaired, the gates and screws put in, coping set, and iron girders to support gratings placed in position.

LEHIGH AVENUE RESERVOIR.

The grading of Somerset street north of the Lehigh Avenue Reservoir, necessitated the building of a wall between Sixth and Eighth streets for the purpose of supporting the embankment. The contract for the entire work of excavation, grading of sidewalk and building of the wall, was awarded to Mr. John McParland under date of July 13. He agreed to complete it in ninety days, but for several reasons the work, which was begun on August 4, was not finished until December 26.

The wall, with the exception of the coping and pointing, was completed on November 4. The facing stone is of good quality, and was obtained from the Perkiomen Stone Company.

The total cost was \$6,598.86. The sidewalk is not yet paved.

GASKILL ENGINE.

The twenty million (20,000,000) gallon engine contracted for by the Holly Manufacturing Company was completed, ready for steam, on September 14. It was started on September 28, and tested November 29 and 30. The report of the experts is attached as Appendix II.

The coal used during the trial was not of the best quality; it was wet, and contained about 25 per cent. of ash.

The amount of dry coal consumed was, pounds,	41,373
Amount of combustible, pounds,	31,285
Duty from the dry coal, foot pounds,	83,686,208
Duty from the combustible, foot pounds,	110,670,660
Duty on the basis of 1,000 pounds of dry steam, foot pounds,	125,022,730

The following are the principal dimensions of the engine :

STEAM CYLINDERS.

H. P. cylinders (2), diam., inches.....	33.
L. P. cylinders (2), diam., inches.....	66.
H. P. piston rods (single), diam., inches.....	4.5
L. P. piston rods (double), diam., inches.....	5.
Stroke H. P. and L. P. pistons.....	48.
Steam cylinders (4) jacketed.	
Steam cylinders, heads (8) jacketed.	
Clearance H. P. and L. P. cylinders.....	0.025

STEAM VALVES AND PORTS.

Cut-off valves, style, double-beat puppet.	
Cut-off valves, diam. upper seat, inches.....	9.125
Cut-off valves, diam. lower seat, inches.....	7.875
Cut-off valves, lift, inches.....	0.75
Cut-off valves, area of opening, sq. inches.....	40.055
Intermediate valves, style, gridiron slides.	
Intermediate valves, 5 openings in seat.....	1' x 13''
Intermediate valves, area of openings square inches.....	65.
Exhaust valves, style, gridiron slides.	
Exhaust valves, 10 openings in seat.....	1' x 13''
Exhaust valves, area of openings, sq. inches.....	130.
Steam ports H. P. cylinders.....	3' x 11''
Steam ports H. P. cylinders, area, sq. inches.....	33.
Intermediate ports, from H. P. to L. P. cylinders.....	3.5' x 20''
Intermediate ports, area, sq. inches.....	70.
Exhaust ports L. P. cylinders.....	3.5' x 37.5''
Exhaust ports L. P. cylinders, area, sq. inches.....	131.25

CONDENSERS AND AIR PUMPS.

Condensers, style "jet."	
Condensers, number.....	2.
Condensers, diam., inches.....	54.
Condensers, height, inches.....	30.
Air pumps, style, single-acting.	
Air pumps, number.....	4.
Air pumps, diam., inches.....	24.
Air pumps, stroke, inches.....	27.
Exhaust pipe to condenser, diam., inches.....	14.
Injection pipe to condenser, diam., inches.....	6.

STEAM PIPES.

Main steam pipe, diam., inches.....	10.
Branch steam pipe [2], diam, inches.....	8.

CRANKS, SHAFT, AND FLY-WHEEL.

Crank pins [2].....	8.5' x 10.5''
Crank shaft, diam., at fly-wheel, inches.....	16.5
Crank shaft, diam., at bearings, inches.....	15.0
Fly-wheel, diam, feet.....	20.0
Fly-wheel, weight, tons.....	25.
Total weight of engine, pounds.....	700,000.

FEED PUMPS.

Feed pumps, style, single-acting plunger.	
Feed pumps, number	4.
Feed pumps, diam., inches.....	6.
Feed pumps, stroke, inches.....	11.

PUMPS.

Pumps, style, double-acting plunger with central packed gland.	
Pumps, number	2.
Pumps, diam., plunger, inches.....	36.
Pumps, diam., plunger-rods [2], inches.....	6.
Pumps, stroke plunger, inches.....	48.
Pump valves, sets to each pump.....	4.
Pump valves, number in each set.....	306.
	288.
Pump valves, diam. of opening in seat, inches.....	1.3125
Pump valves, diam. of rubber disk, inches.....	1.75
Pump valves, thickness of rubber disk, inches.....	0.5
Pump valves, lift, inches.....	0.3125
Pump valves, area through seats, one set, sq. inches.....	413.
	389.
Pump valves, area through waterway at $\frac{5}{16}$ inch lift, sq. inches.....	525.7
	494.8

SUCTION AND DISCHARGE PIPES.

Principal suction pipe, diam., inches.....	36.
Branch suction pipe [2], diam., inches.....	30.
Principal discharge pipe, diam., inches.....	36.
Branch discharge pipe [2], diam., inches.....	30.
Stop valves in both branches of suction and discharge pipes.	

The five furnace flue tubular boilers, contracted for in 1886 with I. P. Morris & Co., were delivered and set up at the Spring Garden pumping-station. They were ready for firing on April 13, and were inspected on May 11 by the chief boiler inspector. The foundations and flues to stack were built by employes of the Bureau. The boilers are intended for the running of the Gaskill engine, and were used during the trial thereof. Some trouble is experienced when the fires are first started, on account of the want of circulation. The water in the bottom of the boilers below the fires remains

much cooler than that above. The difference in the temperature causes an unequal expansion in the outside boiler plates, in consequence of which some of the joints leak. This trouble can be overcome by the use of hydrokineters, which produce a circulation in the water and keep the plates at a uniform temperature. Steam can also be generated in much less time. The cost of this attachment will be about sixty (60) dollars for each boiler. In all other respects the boilers work very satisfactorily.

On December 30th a curious formation of ice took place on the face of Fairmount dam. The water above was backed up thereby to a height of six feet above the top of the dam, causing considerable trouble at both Spring Garden and Fairmount. At the latter place the wheels were stopped until the ice wall was broken through to allow the water to escape.

The following is some of the most important work requiring attention in this branch of the Bureau :

- Renewal of the apron on the crib work in front of the dam, and a cap log along its entire length ; a new pavement over the wheel-house of Nos. 7, 8, and 9 ; new pavement on Twenty-fifth street along the reservoir wall, and relining of the inside slope of the large section of the reservoir.

At Spring Garden the cartway around the forebay should be paved with Belgian Blocks, and a granolithic pavement laid in front of the new engine house.

At Roxborough a ventilator is needed in the fire-room roof, and the coal sheds repaired.

The Spring Garden reservoir requires cleaning and the property fenced in.

At Corinthian avenue an iron fence is to be placed on the south side and the leak in the west bank stopped, if possible.

At the Lehigh avenue basin, a new fence is required on three sides, two sections cleaned and a brick pavement laid on the north side.

The Roxborough basin should be cleaned and the grounds put in better condition.

The Mt. Airy basin needs cleaning, and the grounds filled and graded.

The leak in the Wentz Farm reservoir should be found and repaired.

REPAIRS TO MACHINERY.

The pump valves of Nos. 7, 8, and 9 require altering, and boilers Nos. 7 to 11, inclusive, at Spring Garden, need resetting.

At Roxborough, boilers Nos. 1 to 4 should be moved closer to the wall and a new stack built. Boilers Nos. 5 to 7 require resetting.

At Mt. Airy, engine No. 1 should have a condenser attached.

At Frankford station, boilers require re-covering and a new piston put into the Wetherill engine.

DISTRIBUTION.

Several large mains that were begun in 1886 were finished early in 1887. Among these are the following:

A 48-inch pumping main from the Spring Garden pumping station to Twenty-fourth and Parrish streets was completed (with the exception of connecting it to the new engine) on May 28; a 20-inch main on Girard avenue, from Otis to Front streets, April 26; a 20-inch supply main on South Broad street, March 25. The following were commenced and completed during the year: A 48-inch supply main from the East Park reservoir to near the Spring Garden standpipe, connecting with the main already in use; a 30-inch supply main from the Wentz Farm reservoir to Sixth street and Lehigh avenue.

The distance was 24,986 feet, and the total cost, \$142,272.77, or \$5.69 per lineal foot.

The excavation was done by contract, and the pipe laid by day's work.

Including the above, there have been added to the distribution 122,790 feet, or 23 miles 1,350 feet, making a total of pipe in use of over 876 miles.

Number of feet of small pipe taken up and replaced with 6-inch, 6,171.

The total pipe handled for all purposes amounted to 16,109,165 pounds.

During the year complaints of a short supply of water have been received from two sections of the city, viz: The Falls of

Schuylkill, and in the vicinity of Sixth and Tioga streets. The former was due to the mills drawing heavily upon the mains, and was temporarily relieved by a change in the distribution. In order to give permanent relief, a 12-inch pipe must be laid in Ridge avenue, from Rodman street to Hermit lane, a distance of 7,000 feet. The Sixth and Tioga district was relieved by the use of the new 30-inch main from Wentz Farm reservoir.

FIRE-HYDRANTS.

There were 420 new style fire-hydrants placed during the year in new locations, and 150 new and 72 old style plugs have been substituted for defective ones. The total number of fire-hydrants in use is 6,919.

DRILLS.

There were 8,532 attachments made—an increase of 523 over last year.

The work done in the Distribution branch of the Bureau is given in detail in the report of Mr. A. J. Fuller, the assistant engineer in charge (Appendix D).

MACHINE SHOP.

The following table shows the principal work of the year, and a comparison for ten years :

Year.	Fire Hydrants.	Stop Valves.	Frames and Covers.	Ferrules.
1878.....	332	281	393	3,425
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	7,115
1886.....	626	953	927	8,480
1887.....	606	549	466	8,041

Owing to the advance in the price of castings and other material, the operations of the shop do not appear to as good advantage as in the preceding year. The price of iron castings in 1886 was \$1.66 per pound, while in 1887 the price was \$3.50, or more than double.

The fitting up of the Armory building was completed early in the year, and the Bureau now has a large and convenient shop.

For work in detail, see report of Mr. W. F. Courtney, Appendix E.

DRAUGHTING ROOM.

In addition to the usual work, the draughtsmen have been employed in making careful experiments with the several engines, with a view of ascertaining the most economical method of running them. Boiler tests were also made for the purpose of determining their efficiency.

The evaporative qualities of the coal used were also noted. The results, in detail, are given in the report of Mr. John E. Codman, Chief draughtman, Appendix F.

HYDROGRAPHIC WORK.

This work is necessary in order to procure correct data, upon which estimates and plans for a future water supply may be made.

The work, in detail, is contained in the report of Mr. Amasa Ely, who is in charge thereof, Appendix G.

RECOMMENDATION FOR EXTENSION AND IMPROVEMENT OF PRESENT SUPPLY.

New boilers, Belmont Station.....	\$22,600
East Park Reservoir, northeast section.....	400,000
12-inch pipe on Christian street, from Broad to Tenth street, and 10-inch from Fifth to Eighth street.....	8,000
20-inch main on Dickinson street, from Moyamensing avenue to Twenty-second street.....	30,000

12-inch pipe on Fortieth street, from Pine to Woodland avenue, and on the latter street to Forty-ninth street.....	10,800
30-inch main on Lehigh avenue, from American to Sixth street...	10,200
12-inch pipe on Foulkrod street, from Frankford avenue to Bridge street.....	1,180
12-inch pipe on Bridge street, from Foulkrod to Tacony street.....	6,325
30-inch pumping main, from Frankford Station to Frankford Reservoir.....	110,500
48-inch pumping mains, from Nos. 7 and 11 engines to East Park Reservoir.....	60,000
Supply main from East Park Reservoir.....	30,000
Connection from the 30-inch Belmont main, on Pennsylvania ave- nue, from Connecting Railroad bridge to Thirty-third street...	4,800
7,000 feet of 12-inch pipe for Fifth District.....	17,500
10-inch supply main on Germantown avenue, between Broad and Eighteenth streets.....	9,000
30-inch pumping main, from Roxborough Reservoir to Mt. Airy Reservoir.....	128,000
Replacing small pipes with larger sizes.....	100,000
20-inch main at Roxborough Reservoir, from 20-inch pumping main to 30-inch main to Germantown.....	1,500

Respectfully,

JOHN L. OGDEN,

Chief of Bureau.

APPENDIX A.

REPORT OF E. S. HIGBEE.

DEPARTMENT OF RECEIVER OF TAXES,
BUREAU OF WATER,

January 9, 1888.

JOHN L. OGDEN,
Chief Engineer.

SIR:—I respectfully transmit herewith a report of the business of this Office for the year 1887:

On and after April 4, the Office for the Collection of Water Rents, etc., being transferred to the Department of the Receiver of Taxes, you will find report for different periods.

The total receipts from all sources for the year 1887 (and paid daily into the City Treasury)

were	-	-	-	-	-	-	\$2,030,434	61
Increase over year 1886,	-	-	-	-	-	-	97,106	27
Amount received through Water Department from January 1, to April 4,	-	-	-	-	-	-	646,826	08
Increase over year 1886,	-	-	-	-	-	-	24,399	42
Amount received through Bureau of Water, Department of Receiver of Taxes, from April 4 to December 31, inclusive,	-	-	-	-	-	-	1,354,104	49
Increase over year 1886,	-	-	-	-	-	-	67,797	76
Amount collected, through the City Solicitor's Office, for pipe frontage, and certified to the Bureau of Water	-	-	-	-	-	-	29,504	04
Increase over year 1886,	-	-	-	-	-	-	4,909	09
Receipts of the Department in full for the year 1887, as previously estimated by the Chief Engineer to the City Controller,	-	-	-	-	-	-	1,900,000	00
Actual receipts for the year 1887,	-	-	-	-	-	-	2,030,434	61
Increase over estimate	-	-	-	-	-	-	130,434	61

The annexed itemized tables contain full information of the detailed work of this office.

Respectfully,

E. S. HIGBEE,
Chief Clerk.

Total Receipts Bureau of Water for the Year 1887.

MONTHS.	Searches.	Delinquent Rents.	Delinquent Penalties.	Rents, 1887.	Penalties, 1887.	Fractional Rents.	Water Pipe.	Bureau of Water, Department Public Works.	Totals.
January.....	\$223 00	\$1,129 00	\$146 46	.....	.....	\$3,459 86	\$5,295 35	\$644 57	\$10,898 24
February.....	251 00	1,499 50	145 84	\$213,114 88	.....	8,214 22	5,704 24	79 20	229,008 88
March.....	330 25	2,608 08	388 28	354,963 02	.....	13,510 61	16,665 09	174 98	388,640 31
April.....	359 00	3,491 49	519 85	919,100 11	.....	9,608 78	6,351 86	1,721 31	941,152 40
May.....	335 75	1,515 50	226 61	43,898 16	\$2,192 77	10,829 86	9,940 89	759 29	69,698 83
June.....	323 50	974 80	107 88	60,921 73	3,034 68	13,365 81	8,561 96	815 27	18,108 13
July.....	229 50	638 50	95 79	13,325 50	1,898 35	8,016 44	11,000 16	794 61	35,998 85
August.....	196 75	962 00	143 07	22,833 55	3,424 27	12,888 41	13,424 15	551 35	54,423 55
September.....	245 25	1,240 50	186 11	56,399 31	8,414 13	5,128 26	6,743 43	47 90	78,405 69
October.....	313 25	2,621 51	393 30	26,394 80	3,922 71	7,578 33	6,308 95	187 41	47,720 25
November.....	305 00	1,512 00	226 11	7,928 50	1,180 64	18,146 44	12,318 06	526 04	42,142 19
December.....	300 50	848 00	126 99	2,609 27	385 28	5,192 19	4,285 34	985 68	14,733 25
Totals.....	\$3,412 75	\$19,040 87	\$2,705 79	\$1,721,488 83	\$24,453 03	\$115,939 21	\$106,602 48	\$7,287 61	\$2,000,930 57
Total receipts through the office of the City Solicitor for year 1887.....									29,504 04
Total receipts of the Bureau of Water for the year 1887.....									\$2,030,434 61
Receipts as previously estimated by the Chief Engineer.....									1,900,000 00

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Items of Receipts under Head of "Fractional Rents."

YEAR.	Rents.	Meter rents.	Ferrules.	Repairs.	Totals.
1887.....	\$56,642 41	\$40,444 30	\$17,588 00	\$1,264 50	\$115,939 21
1886.....	52,961 81	26,540 06	16,624 00	1,093 75	97,219 62
Increase...	\$3,680 60	\$13,904 24	\$964 00	\$170 75	\$18,719 59

Total Receipts, Water Department, from January 1 to April 2, inclusive, Year 1887.

MONTHS.	Searches.	Delinquent Rents.	Delinquent Penalties.	Rents, 1887.	Fractional Rents.	Water Pipe.	Chief Engineer's Office.	Totals. •
January.....	\$223 00	\$1,129 00	\$146 46	.....	\$3,459,86	\$5,295 35	\$644 57	\$10,898 24
February.....	251 00	1,499 50	145 84	\$213,114 88	8,214 22	5,704 24	79 20	229,008 88
March.....	330 25	2,608 08	388 28	354,963 02	13,510 61	16,665 09	174 98	388,640 31
April 1st and 2d.....	27 50	62 00	9 30	17,056 18	415 10	578 02	130 55	18,278 65
Totals.....	\$831 75	\$5,298 58	\$689 88	\$585,134 08	\$25,599 79	\$23,242 70	\$1,029 30	\$646,826 08

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1887.*

January 8	Warrants.....	Overdrawn.....	\$19 75
10	Alfred M Harkness & Co.....	Horse.....	29 70
25	Edward Hobbs.....	Old rope.....	38 40
31	William McCoach.....	Supply connection.....	106 72
31	Henry Snyder.....	Rent at Fairmount.....	450 00
February 12	Joseph Ladley.....	Stone.....	29 20
25	Wm. G. Bedford.....	Penalty.....	50 00
March 10	St. Agnes Hospital.....	Supply connection.....	74 98
14	Patrick Farley & Williams.....	Stone.....	10 00
29	Alfred M. Harkness & Co.....	Horse.....	90 00
April 1	M. Dolan & Bro.....	Old material.....	130 55
4	Bussenius, Cunliff & Co.....	" ".....	515 02
6	Beswick & Kay.....	Fire connection.....	39 14
7	Samuel W. Evans & Son.....	" ".....	112 15
9	Watson & Peale.....	Supply connection.....	74 67
9	Manuf. Fire Equipment Co.....	Fire connection.....	68 63
11	E. Bradford Clarke.....	Supply connection.....	75 34
11	John F. Betz & Son.....	" ".....	55 53
11	Quaker City Croquet Club.....	Rent 22d and Brown streets...	10 00
13	Wm. P. Oglesby.....	Repairing main.....	26 22
14	Robert Shaw.....	Old barrels.....	37 80
16	Girard Estate.....	Inspection for leak.....	12 38
21	John C. Graham.....	Fire connection.....	52 82
23	Richard McGarigle.....	Repairing pipe.....	255 47
25	B. & O. R. R. Co.....	Fire connection.....	255 59
May 2	James Long, Bro. & Co.....	" ".....	59 95
9	Real Estate Trust Co.....	Penalty.....	50 00
10	George I. Bodine.....	Stone.....	14 00
10	F. P. Murray.....	Repairing pipe.....	60 78
10	Baltimore & Ohio R. R. Co.....	Fire connection.....	49 28
11	Henry Grant.....	" ".....	68 88
13	Baltimore & Ohio R. R. Co.....	Supply ".....	67 87
17	Richard Hey & Son.....	Fire ".....	89 15
17	Pennsylvania R. R. Co.....	Supply ".....	77 94

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1887.*

May 19.....	Pennsylvania R. R Co.....	Supply connection.....	\$150 60
27.....	James Comly.....	Fire ".....	70 84
June 3.....	Richard McGarigle.....	Drawing & redriving ferrules..	20 80
3.....	" ".....	" " ".....	2 75
11.....	Kline & Bros.....	Supply connection.....	39 64
13.....	Joseph Ladley.....	Stone.....	102 40
15.....	Baltimore & Ohio R. R. Co....	Unloading pipe and castings..	419 32
18.....	Pennsylvania R. R. Co.....	Repairing stop.....	21 26
21.....	H. C. Fox & Sons.....	Fire connection.....	80 84
22.....	Manuf. Fire Equipment Co...	" ".....	60 44
23.....	Vickers & Weston.....	" ".....	67 82
July 2.....	William Douglas.....	Stone.....	31 15
11.....	James Doak.....	Repairing fire hydrant.....	6 25
12.....	Pennsylvania R. R. Co.....	Stop.....	5 50
12.....	Henry Snyder.....	Rent at Fairmount.....	450 00
20.....	Thomas Atkinson.....	Fire connection.....	67 46
20.....	Charles Robert Simister.....	" ".....	67 64
26.....	Marshall C. Hong.....	Relaying pipe.....	84 65
26.....	" ".....	" ".....	40 49
26.....	Penn. Electric Light. Co.....	Altering stop.....	41 47
August 1.....	M. Viewegers.....	Supply connection.....	61 66
3.....	S. W. Evans & Son.....	Fire ".....	40 04
3.....	J. & J. Pearson.....	" ".....	60 23
5.....	Baltimore & Ohio R. R. Co....	Altering pipe.....	318 24
5.....	Warrant.....	Overdrawn.....	1 20
15.....	Baltimore & Ohio R. R. Co....	Supply connection.....	59 22
24.....	Peoples' P. B. W. Co.....	Repairing hydrant.....	10 76
September 3.....	Providence & Fall R. S. Co....	Removing fire hydrant.....	47 90
October 6.....	Edward Welsh.....	Repairing pipe.....	57 36
27.....	David McMahon.....	Drawing ferrule.....	2 75
31.....	Bergdoll Brewing Co.....	Supply connection.....	62 74
31.....	H. & G. Kessler.....	Fire ".....	64 56
November 2.....	John Schofield.....	" ".....	56 62
2.....	Unknown.....	Conscience.....	10 00

*Receipts through the Office of Bureau of Water, Department
of Public Works, for the year 1887.*

November 3.....	Bromley Bros.....	Fire connection.....	66 25
14.....	W. F. Reed.....	" "	64 96
22.....	P. & R. R. R. Co.....	Repairing stop.....	6 75
23.....	Wilde & Bro.....	Fire connection	16 05
25.....	Chas. M. Taylor & Sons.....	Supply connection.....	64 16
26.....	Adams Express Co.....	Fire "	115 39
28.....	Greenwood & Bault.....	" "	68 70
29.....	Hoyle, Harrison & Kaye.....	" "	57 16
December 6.....	King & Greaves.....	" "	62 09
9.....	Knickerbocker Ice Co.....	Cutting ice.....	300 00
20.....	J. & B. Allen.....	Fire connection.....	41 94
27.....	Butchers' Ice Co.....	Cutting ice.....	255 00
27.....	Hancock Ice Co.....	" "	185 00
29.....	J. J. Collins & Co.....	Fire connection.....	72 23
31.....	Quaker City Croquet Club.....	Rent 22d and Brown streets..	10 00
31.....	Thirteenth & Fifteenth Street Passenger R. W. Co.....	Fire connection.....	59 42
Total for year 1887.....			\$7,287 61

STATEMENT OF PERMITS ISSUED DURING THE YEAR 1887, 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													2
Bakeries.....	3				1		1	2				1	2		1	1		1	5			1		4	12	6	1	2	1	1	1	1			47	
Barber shops.....				1	3		5	1	3		2	2	2	2	1	2		2		2	4	3		6	6	2		2	3	1	1			56		
Bars.....	3	1		2	3	4	4	5	3		3	1		1	2		2	2	9	1	3	2	2	8	19	8		11	7	1	1			108		
Basins and sinks in dwellings.....		2	2	3	6	7	22	91	17	18	9	8	23	8	73	6	2	4	76	80	34	175	12	169	20	27	89	674	153	7	9			1,826		
Basins and sinks in offices, stores, factories, hotels, etc.....	16	1	1		134	42	2	24	67	29	5	6	6	12	19	10	3	8	18	14	3	5	3	17		2	3	14	14		23			501		
Baths in dwellings.....	205	12	5	5	9	1	30	29	9	13	9	7	16	18	147	11	13	45	354	82	154	356	83	450	893	1,007	189	932	316	62	94			5,556		
Baths in public buildings.....											4												1	10					2					17		
Bidets.....								15	1														3	1											20	
Bottling establishments.....		1													1			1		1	1			1	1			1						8		
Building purposes, number.....	19	1		1	4	3	3	11	4	4		1	1	7	16	1		10	50	15	96	184	47	81	156	73	42	176	35	2	15			1,058		
Carriages and wagons.....																						13				4	16								33	
Cut-offs.....	52	23	15	15	20	41	25	33	16	34	7	15	46	27	87	20	21	19	62	80	18	16	14	46	43	56		52	60	40	53			1,056		
Half-dwellings.....				12						5	5	1					11	1		4		3	3	3		1	1	2						52		
Drug stores.....							1	2	1										1	2		1	2	1	2	2	4		4	2			1		26	
Ferrules, number.....	323	8	14	11	19	4	16	10	32	11	7	9	9	14	162	7	16	49	540	164	235	485	211	705	1,617	1,374	212	1,737	630	51	112			8,794		
Fountains, counter.....	1					2				2	1			1					1	5	4	1	2	1	3	1		3	1					31		
Fountains, garden.....					2										1									1	1		1	1				1			8	
Forges.....																		18															1			22
Greenhouses.....																			1				7	1		2		3							14	
Hydrants, new buildings.....	283	7	13	9	13	4	16	6	12	11	7	6	9	13	132	6	11	47	365	78	225	474	165	558	1,294	1,038	195	1,140	349	50	90			6,626		
Ice cream saloons.....																																2			2	
Lawn sprinklers.....																							2	12		2		1							17	
Laundries.....					3		5	3	1	1				4		1		1		1	1			2				2			2		1		26	
Machines for scouring, washing, bleaching, and rinsing.....														3																						3
Milk-houses.....	1				3		2	1			1					1						2														12

STATEMENT OF PERMITS ISSUED DURING THE YEAR 1887, 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.....				2				3		1	7	2	1		3		2		6	2	1	3		2	4			2	3		1	45		
Motors, organ.....									1			1								2	2	1		1			2		1		11			
Photograph galleries.....		1					1	2	1			1		1															1		1	9		
Plug permits.....	3			1			2		1						3		1	1	4			8		2	5	3	2		9	4		49		
Pools in churches.....																						1		1								2		
Restaurants, eating and oyster saloons.....					5	5	1	4	1					3		2					1		1			1					2	26		
Screw nozzles.....								1							3					2	3	8	22	1	2	4	1	9	15	2		4	77	
Slaughter-houses.....																									2	2			2			6		
Stalls in stables.....	46	8					70	1	70	5	35			3	9	30	6	6	49	113	35	170	41	104	29	45	22	35	70	8	18	1,028		
Steam boilers, number.....	2	2		1	11	13		3	7		8	4	2	4	4	10	6	4	19	6	12	6	3	2	18	2	6	4			10	169		
Steam boilers, horse-power.....	13	66		10	338	121		153	197		43	44	11	48	80	97	104	89	362	97	295	75	150	27	829	7	55	82		235	3,628			
Steam engines, number.....	3			1	5	9		6	4	2	1			2	1				2	3	3	3	5	4	5	3	4			1	3	1	71	
Steam engines, horse-power.....	111			4	28	59		36	37	13	4			7	5				6	33	29	43	37	81	29	24	25			2	36	2	651	
Street sprinklers.....																																		69
Shower baths public.....																																2		2
Tubs, vats, and tanks.....											4	12			4	3	4			11		1		4									1	44
Urinals in dwellings.....				1					1	1				2											1	9				1			16	
Urinals in stores, offices, factories, hotels, etc.....					26	8		9	29		1	1	3	1	6	1	3	2	4	2		8		12	14				18	10	1		159	
Urinal troughs.....				1						1					1																			5
Wash-paves.....	84	5	1	6	15	7	10	9	9	9	7	5	18	7	128	9	8	18	314	71	36	154	36	191	455	176	97	711	248	17	48		2,909	
Wash-paves for watering horses.....		1			1	2		1						1	4	2	3	3	1			2			1	10	5		8	2	3		50	
Wash-tubs, stationary.....					3		9	24	5	13			3		27	3			5	12	3	121		60			41	67	39	40	3		481	
Water-closets in dwellings.....	145	11	13	33	38	19	58	97	42	103	26	44	110	109	405	75	63	30	725	409	24	426	18	703	741	381	229	1,689	761	4	121		7,652	
Water-closets in stores, offices, factories, hotels, etc.....	10	2	5	2	124	81	4	36	91	24	10	15	6	20	32	21	42	1	75	15	1	14		42	14		17	23	45		46		787	
Watering-vessels.....	5	81	5	8	3						3											1			6									112
Washing cars.....	40																																	40

STATEMENT BY WARDS OF THE NUMBER AND KIND OF PREMISES AND APPLIANCES ON THE GENERAL BOOKS OF THE WATER DEPARTMENT, JANUARY 1, 1888.

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		4			2				1		2				6	1		2					1		5						26
Bakeries.....	65	48	9	31	28	21	42	27	22	21	33	4	30	38	59	47	40	41	76	63	16	23	10	38	57	67	17	56	64	41	50			1,184	
Barber shops.....	45	32	12	28	52	30	22	31	55	17	23	29	35	33	49	23	29	30	63	52	27	21	27	41	41	33	17	34	50	40	41			1,533	
Bars.....	204	148	109	227	245	257	137	144	185	163	194	150	159	134	232	147	148	160	386	241	146	82	86	216	301	269	88	221	215	150	221			5,765	
Basins and sinks in dwellings.....	211	51	136	138	254	281	2,133	3,373	1,371	1,583	4	544	1,015	809	6,398	130	97	130	442	2,746	314	1,983	109	2,253	172	341	2,670	4,527	5,518	173	141			40,047	
Basins and sinks in offices, stores, etc.....	78	67	48	46	2,532	3,171	169	2,064	2,151	817	243	197	270	363	496	124	104	109	409	259	114	285	58	429	110	87	490	178	477	155	166			16,276	
Baths in dwellings.....	4,255	1,496	935	653	1,038	473	2,712	3,402	1,167	2,303	438	1,021	2,063	2,195	5,740	774	780	1,821	5,856	6,314	1,038	3,529	847	6,575	4,186	5,995	2,743	7,025	8,205	2,919	2,661			91,659	
Baths in public buildings.....			19		15	52	15	191	57	75	4	7	3		29	1	3		20	5	4	55		10		2	48	15	70	58			728		
Bath-houses, public.....								1																					1						2
Baths, foot.....							1						1		1				1					2	2										8
Beam houses.....		1									20	3																	2						26
Bidets.....					1	44	185	45	24				11	4	82					18	4	32	1	21		3	21	2	23					521	
Bottling establishments.....	2	4		2	5	1				1	3	4	3	2	4	2	6	6	2	5	2	1	2	2	6	1		3	5	2	1			77	
Brick-yards, gang of men.....																				1					5	22	16	26							70
Breweries.....	1		3	2		1			1		6	4	4	1	5	6	11	2	10	7	1	2	3	1	6	1		6	18	1	2			165	
Cars, steam and horse.....	40						30						25	30	33				78					124	23	7	28	156	80		129			783	
Carriages and wagons.....	63	45	27	94	52	26	79	313	274	248	43	111	237	168	488	59	71	70	351	402	224	258	155	341	52	99	210	172	234	88	61		5,115		
Coloring-rooms.....													23	5			3																		31
Condensers.....									1													1			1										3
Dash-wheels.....						2					10	1				1																	1		15
Dwellings without water.....	102	251	129	175	27	340	56	14	21	24	121	60	35	551	19	185	8	577	36	3	597	184	948	504	711	8	135	404	77	2	73		6,377		
Dwellings (half) without water.....	210	859	859	971	476	267	766	298	161	572	748	539	384	412	749	970	1,310	551	532	376	183	45	60	119	336	84	93	80	86	223	263		13,582		
Drug stores.....	21	15	12	12	5	13	21	26	26	18	8	10	19	23	31	8	12	19	38	39	10	19	12	25	14	33	17	38	38	21	18		621		
Dry docks.....			1																																1
Engines on railroads.....	1	5			1			4								31				43	18				78	6	1	8					7	203	
Filterers.....									1						1																		1		3
Fountains, counter.....	6	2	3	1		8	8	1	11	15		3	9	6	7	2	2	3	13	25	3	11	4	12	5	6	10	11	15	9	3		214		
Fountains, garden.....	3	2	3		5	3	7	21	13	8	2	6	6	7	52	2		8	5	17	7	31	4	32	6	3	34	13	31	11	4		343		
Forges.....	5	7	8	3	9	27			13	3	17	5	5	34	237	7	10	105	9	46	14	9	45	4	47		73	11	7	5	17		782		
Furnaces.....	8			4				1		22		3	9	2	10		8		6						4						2			79	
Gas works.....									1						1	1																			7
Glass works.....																			3	3						1		1				1	1		10
Greenhouses.....	21							1	13	1				1	3	2	1	5	4	8	27	126	46	45	80	30	129	45	24			1	613		
Grindstones.....					5	11					2									11									2			13		45	
Hatters' planks.....	8				12	2		4	2		2	9	3			5	3																	2	52
Hydrants.....	9,996	4,686	2,647	2,417	2,962	2,760	4,784	2,563	2,515	3,710	1,573	2,131	3,289	3,685	9,033	2,575	2,903	5,108	10,347	8,626	3,428	5,720	2,244	10,626	8,759	10,665	3,616	8,467	9,741	5,625	6,615		163,816		
Hydraulic elevators.....					3	6		2	8	3									2				1					1							26
Ice cream saloons.....	8	7	1	5	2		6	8	7	6	4		5		9	9	4	12	14	5	13	6	2	5	8	14	3	6	7	3	5		184		
Ice machines.....															1		1		1	1							1							1	9
Laboratories.....								1		1		1	1					1											1		1				7
Laundries.....	22	7	3	12	12		19	12	20	11	8	11	24	16	17	4	4	7	12	3	6	4	3	9	7	11	6	7	18	13	7		315		
Lawn sprinklers.....																					3	50	68	4	2		1	20	46	4				198	

STATEMENT BY WARDS OF THE NUMBER AND KIND OF PREMISES AND APPLIANCES ON THE GENERAL BOOKS OF THE WATER DEPARTMENT, JANUARY 1, 1888—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		
Machines for washing, scouring, etc.		2	1		2			4		3			3		8	5	16	16	4			12		56	12	2						31	177
Malt-houses				1						2	1			2		1	1	3	2							1			6			20	
Milk-houses	22	2	1		3		4	2		5	2	11	4	1	3	4	5	8	14	3	6	6	18	8	8	4	14	12	8	10	188		
Motors, beer	3	1	5	8	18	18	13	17	11	5	18	9	12	5	15	2	7	10	32	23	14	12	2	13	8	5	3	17	26	31	6	369	
Motors, organ					1		1	6	3	1		1		1	1	2			1	3	3	8		4		1	8	1	2	1	49		
Photograph galleries		3		3	5	3	2	14	20	4	5	1	6	2	6	1	3	3	6	6	1	3	1	2	2	1	3	3			5	114	
Pools in churches		1	1	1	3		1	1	1	3			1	2	3	1			4	3		2	5	2	1	2	3	6			50		
Premises with water	9,996	4,686	2,647	2,417	2,962	2,760	4,784	2,563	2,515	3,710	1,573	2,131	3,289	3,685	9,033	2,575	2,903	5,108	10,347	8,626	3,428	5,720	2,244	10,626	8,759	10,665	3,616	8,467	9,741	5,625	6,615	163,816	
Premises without water	312	1,110	988	1,146	503	607	822	312	182	596	869	599	419	963	768	1,155	1,318	1,128	568	379	780	229	1,008	623	1,047	92	228	484	163	225	336	19,959	
Rectifying establishments				1		1													1						1							4	
Restaurants, eating and oyster saloons	18	7	3	10	30	90	9	33	62	18	26	10	27	19	10	11	13	15	16	32	2	8	3	17	9	11	8	13	8	8	10	566	
Screw-nozzles	132	55	53	44	177	258	128	231	154	166	124	103	132	91	325	159	131	216	230	277	207	239	110	392	108	72	224	244	288	90	164	5,304	
Shot-towers		1																															1
Slaughter-houses	22										3	1	5	7	1	2	6	4	9	12	7	3	5	23	17	3	2	3	4	1	5	145	
Soap-boiling establishments	2		1								5		1		1	1		2	2	1												1	17
Standpipes for watering engines									1		2		1		1									2	2		1			2			12
Stalls in tables	1,678	753	168	427	136	359	861	926	1,031	1,070	622	460	636	950	2,416	590	547	1,692	2,850	1,824	793	1,410	756	1,872	1,121	1,216	1,027	1,396	1,972	744	1,701	33,935	
Stalls in markets			144		80	335	209		1,076		324	440	4	146	388		94		208	175	59		293	76	223	60		1,071	160	50	5,606		
Stalls, country			14	114	97	27	10	32	79	32	213	127		152	119	36		101	347	161	15	140	212	69	97		86	206		12	2,498		
Stalls, fish			1		17	3	1		6		3				2	1	1	1	2	5			3		1	1		13	2		63		
Steam boilers, number	68	48	12	13	11	247	220	87	132	6	28	32	33	44	167	102	63	63	197	61	82	67	62	47	147	59	42	38	71	26	120	2,455	
Steam boilers, horse-power	1,971	1,287	242	472	2,005	3,881	928	1,274	2,999	1,395	1,179	787	970	1,160	5,063	2,372	2,147	1,812	5,500	1,405	3,318	1,409	2,368	794	4,507	1,611	610	548	2,432	795	3,258	60,499	
Steam boilers, heating, number				4	34	36	5	20	32	5			3		15	3			2	4	5	14	8	13	3	3	8	3			231		
Steam boilers, heating, horse-power					351	313	254	237	214	207				3				130					50	50		33					1,832		
Steam engines, number	53	20	10	6	57	153	5	78	97	32	24	20	3	29	46	36	27	25	85	73	2	56	31	38	34	27	24	22	28	25	50	1,216	
Steam engines, horse-power	773	385	185	55	382	1,427	140	937	2,451	532	216	376	9	467	734	666	371	365	1,718	688	47	503	302	345	453	416	157	234	611	215	411	16,571	
Steam saws, number								4																									13
Swimming baths								2	1																	1	1		1				6
Tubs, tanks, and vats	20	18	4	1	88	66	15	9	50	22	114	410	6		111	167	378		184	45	64	73	73	37	87	29	6	49	12	32	160	2,330	
Turbine wheels								1																									1
Urinals in dwellings	35	12	7	6	8	2	13	72	13	28	2		34	6	24	3	7	23	14	14	2	29	10	9	10	9	16	22	28	1	1	460	
Urinals in offices, stores, factories, etc.	10	9	6	10	597	680	22	350	519	96	23	34	56	80	102	19	21	78	52	56	17	59	15	70	47	24	51	29	97	28	9	3,266	
Urinal troughs	2	1			4	1	2	2	3	1		2		2				2	5	2	1		5			4	7	5				51	
Vats, lime											198							23		38			5										264
Vats, tan											17	3						42		21													83
Vinegar establishments											1							1		1													3
Wash-paves	1,591	637	477	258	582	391	1,398	1,642	863	1,444	214	630	1,320	1,492	4,261	478	432	890	3,603	4,569	427	1,455	554	3,218	1,784	1,894	1,788	2,384	6,045	1,670	1,353	49,714	
Wash-paves for watering horses	40	13	13	5	19	4	13	4	20	10	14	8	4	15	32	20	32	42	69	32	17	17	16	46	81	32	21	31	29	17	36	752	
Wash-tubs	35	13	24	6	51	15	683	1,617	444	533		12	257	142	1,099	399	81	18	59	565	54	936	19	738	20	53	1,052	1,036	1,056	97	16	11,130	
Water-closets in dwellings	543	211	213	185	482	361	2,134	3,262	1,085	2,156	133	732	1,915	1,747	5,881	248	240	211	2,377	4,076	222	2,938	138	5,234	1,385	881	3,519	8,080	7,148	703	493	58,946	
Water-closets in offices, stores, factories, etc.	32	79	55	45	2,128	3,440	109	1,523	2,209	833	229	182	103	328	690	181	150	104	482	232	77	308	50	381	146	85	287	119	609	153	193	10,542	
Wool washers				1			1												1	4				3		2	9	1	1			5	28

Comparative Statement of Receipts, Bureau of Water, Years 1886 and 1887.

YEAR.	Searches.	Delinquent Rents.	Delinquent Penalties.	Rents.	Penalties.	Fractional Rents.	Water-pipe.	Bureau of Water, Department of Public Works.	City Solicitor's Office.	Totals.
1887.....	\$3,412 75	\$19,040 87	2,705 79	\$1,721,488 83	\$24,453 03	\$115,939 21	\$106,602 48	\$7,287 61	\$29,504 04	\$2,030,434 61
1886.....	2,960 00	15,019 50	1,964 42	1,637,296 69	21,377 89	97,219 62	122,743 91	10,121 36	24,594 95	1,933,328 34
Increase.....	\$452 75	\$3,991 37	\$741 37	\$84,192 14	\$3,075 14	\$18,719 59	.....	.....	\$4,909 09	\$97,106 27
Decrease.....	.....	.....	.....	.....	.....	.....	\$16,141 43	\$2,833 75	.....	.....

Schedule of Charges against Fire Stations at the Regular Rates.

Wards.	Name.	Location.	Amount.
First.....	Fire station, No. 10.....	South side Morris street, west of Eighth.....	\$28 00
Third.....	" " No. 3.....	117 and 119 Queen street.....	24 00
Fifth.....	" " No. 22.....	North side Evelina street, east of Third.....	26 00
"	Truck D Company.....	319 Union street.....	24 00
Sixth.....	" B ".....	321 and 323 Branch street.....	29 00
"	Fire station, No. 8.....	143 Race street.....	22 00
Seventh.....	" " No. 11.....	1635 Lombard street.....	24 00
"	" " No. 1.....	1837 and 1839 South street.....	30 00
Tenth.....	" " No. 17 and shops.....	1328 to 1331 Race street.....	138 00
Eleventh.....	" " No. 21.....	826 Now Market street.....	30 00
Fourteenth.....	" " No. 26.....	1011 and 1013 Hamilton street.....	39 00
Fifteenth.....	" " No. 18.....	1903 Callowhill street.....	21 00
"	Truck A Company.....	2132 Fairmount avenue.....	18 00
Eighteenth.....	Fire station, No. 6.....	1118 East Montgomery avenue.....	64 00
Nineteenth.....	" " No. 15.....	Southeast corner Howard street and Columbia avenue.....	18 00
Twenty-first.....	" " No. 12.....	4541 to 4545 Main street.....	24 00
Twenty-third.....	" " No. 7.....	22 East Church street.....	20 00
"	" " No. 14.....	4612 Frankford avenue.....	26 00
Twenty-fifth.....	" " No. 28.....	West side Belgrade street, south of Clearfield street.....	24 00
Twenty-seventh.....	" " No. 5.....	Southeast corner Thirty-seventh and Ludlow streets.....	21 00
Twenty-ninth.....	" " No. 27.....	2202 and 2204 Columbia avenue.....	24 00
		Total.....	\$674 00

Schedule of Charges against Police Station Houses at the Regular Rates.

Wards.	Names.	Locations.	Amount.
First.....	Seventeenth District Station House.....	South side Taylor street, east of Passyunk avenue.....	\$65 00
“	Twenty-fifth “ “	1507 and 1509 Moyamensing avenue.....	43 00
Third.....	Second “ “	East side Second street, north of Christian street.....	92 00
Fifth.....	Central Station House.....	Southwest corner Fifth and Chestnut streets.....	96 00
“	Third District Station House.....	North side Union, east of Fourth street.....	63 00
Sixth.....	Fourth “ “ “	219 and 221 North Fifth street.....	81 00
Seventh.....	Nineteenth District Station House.....	732 Lombard street	73 00
Eighth.....	Fifth “ “	East side Fifteenth street, south of Walnut street.....	72 00
Ninth.....	Twentieth “ “	1515 and 1517 Filbert street.....	57 00
Tenth.....	Sixth “ “	235 North Eleventh street.....	71 00
Eleventh.....	Seventh “ “	514 St. John street.....	35 00
Fourteenth.....	Eighth “ “	1012 and 1014 Buttonwood street.....	64 00
Fifteenth	Ninth “ “	Northwest corner Twenty-third and Brown streets.....	56 00
Seventeenth.....	Tenth “ “	East side Front, north of Master street.....	64 00
Eighteenth	Eleventh “ “	611 to 617 East Girard avenue.....	33 00
Twentieth.....	Twelfth “ “	Northeast corner Tenth and Thompson streets.....	62 00
Twenty-first.....	Thirteenth “ “	Station House alley, between Cotton and Mechanic streets.....	47 00
Twenty-second ..	Fourteenth “ “	North side Lafayette, east side of Adams street.....	60 00

Schedule of Charges against Station Houses at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Twenty-second	Sub-District Station House.....	Northwest corner of Twenty-seventh street and Highland avenue.....	\$23 00
Twenty-third	Fifteenth District Station House.....	Southwest corner Ruan and Paul streets.....	64 00
Twenty-fourth.....	Sixteenth " "	Southwest corner Thirty-ninth and Spring Garden streets.....	85 00
Twenty-fifth	Twenty-fourth District Station House...	Southwest corner Belgrade and Clearfield streets.....	28 00
"	Sub-District Station House.....	4746 Richmond street.....	55 00
"	Niactown Sub-District Station House.....	3883 Germantown avenue.....	33 00
Twenty-seventh...	Twenty-first District Station House.....	Southeast corner Spruce street and Woodland avenue.....	72 50
Twenty-eighth ...	Twenty-second " "	Northwest corner Park and Lehigh avenues.....	87 00
Twenty-ninth.....	Twenty-third " "	Southwest corner Twentieth and Jefferson streets.....	42 00
Thirtieth.....	First " "	1923 to 1927 Fitzwater street.....	37 00
Thirty-first.....	Eighteenth " "	2230 and 2232 Trenton avenue.....	51 00
		Total.....	\$1,711 50

Schedule of Charges against the Public Schools at the Regular Rates.

Wards.	Names.	Locations.	Amount.
First	Calhoun School	Tenth street and Snyder avenue	\$58 00
"	Tasker "	Southeast corner Ninth and Tasker streets	20 00
"	Colored Consolidated School	South side Dickinson street, below Seventh street	15 00
"	Weccacoe "	Second and Reed streets	53 00
"	William Welsh "	Southeast corner Thirteenth and Jackson streets	36 00
"	Levin Handy Smith "	Fifth street and Snyder avenue	37 00
"	Henry Clay "	West side Lancaster street, above Reed street	18 00
"	Morris "	South side Morris street, east of Second street	16 00
"	First Ward Grammar "	Southeast corner Seventh and Dickinson streets	37 00
Second	George W. Nebinger "	North side Carpenter street, above Sixth street	22 00
"	Wharton "	Fifth street, below Washington avenue	106 00
"	Washington "	Carpenter street, above Ninth street	32 00
"	Watson "	Mary street, below Second street	20 00
"	John Hockdale "	Thirteenth and South Marshall streets	62 00
Third	Mt. Vernon "	Catharine street, above Third street	39 00
"	Fletcher "	Christian street, above Front street	21 01
"	Thomas B. Florence "	Catharine street, below Eighth street	30 00
"	Lyons "	Southeast corner Catharine and Erie streets	8 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Location.	Amount.
Fourth.....	Ringgold School.....	Northeast corner Eighth and Fitzwater streets.....	\$46 00
“	Fagen “	Twelfth street and Fitzwater street.....	23 00
“	William M. Meredith School.....	Fifth street, above German street.....	47 00
“	Ralston “	Northeast corner Guilford and Bainbridge streets.....	18 00
“	Ronaldson “	605 Fitzwater street.....	8 00
Fifth.....	Horace Binney “	527 to 531 Spruce street.....	78 00
“	George W. Wharton “	Third street, above Lombard street.....	76 00
“	James Forten “	Southwest corner Sixth and Minster streets.....	42 00
Sixth.....	No. 1 Primary “	South side New street, below Second street.....	12 00
“	Northeast Boys' Grammar School.....	Northwest corner Crown and Race streets.....	32 00
“	Northeast Secondary “	222-224 Crown street.....	30 00
Seventh.....	U. S. Grant “	Northeast corner Seventeenth and Pine streets.....	35 00
“	Secondary No. 4 “	415 South Nineteenth street.....	22 00
“	O. V. Catto “	2028 Lombard street.....	20 00
“	Secondary No. 1 “	409 South Twenty-third street.....	14 00
“	Secondary No. 3 “	1119 Pine street, northeast corner Quince street.....	65 00
Eighth.....	James A. Garfield “	Southwest corner Twenty-second and Locust streets.....	25 00
“	Hollingsworth “	South side Locust street, west of Broad street.....	61 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Eighth.....	Locust Street School.....	Northeast corner Twelfth and Locust streets.....	\$33 00
Ninth.....	Filbert Street “.....	2015 Filbert street.....	21 00
“.....	Zane Street “.....	713 Filbert street.....	28 00
“.....	Keystone “.....	West side Nineteenth street, north of Chestnut street.....	45 00
Tenth.....	Sergeant Street School.....	920 Sergeant street.....	9 00
“.....	Northwest “.....	North side Race street, west of Broad street.....	32 00
“.....	Cherry Street “.....	1522 Cherry street.....	8 00
“.....	John Agnew “.....	1022 Cherry street.....	20 00
“.....	Edward Shippen “.....	North side Cherry street, west of Nineteenth street.....	24 00
Eleventh.....	Shunk Primary “.....	East side New Market, north of Brown street.....	16 00
“.....	Madison “.....	East side New Market, north of Noble street.....	22 00
“.....	Northern Liberties School.....	Third street, above Green street.....	22 00
“.....	Biedeman School.....	481 St. John street.....	20 00
Twelfth.....	Saunders “.....	Northwest corner Dillwyn and Callowhill streets.....	18 00
“.....	Rovoult “.....	432-34-36 Maria street.....	16 00
“.....	E. M. Paxton School.....	Noble street, below Sixth street.....	30 00
“.....	Mifflin School.....	810 North Third street.....	22 00
Thirteenth.....	Adams “.....	Garden street, below Buttonwood street.....	37 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Thirteenth.....	Warner School.....	Perth street, above Parrish street.....	\$22 00
“	Wyoming School.....	Northwest corner Sixth street and Fairmount avenue.....	35 00
Fourteenth	Robert Vaux School.....	North side Wood street, between Eleventh and Twelfth streets.....	75 00
“	Monroe “	Wood street, east of Twelfth street.....	72 00
“	Hancock “	Fairmount avenue, west of Twelfth street.....	51 00
“	John M. Ogden School.....	Northeast corner Twelfth and Wistar streets.....	69 00
“	Spring Garden “	Southeast corner Twelfth and Ogden streets.....	64 00
“	Central High “	Southeast corner Broad and Green streets.....	82 00
“	Robert T. Conrad “	South side Melon street, east of Twelfth street.....	24 00
Fifteenth.....	Lincoln School.....	Southeast corner Twentieth street and Fairmount avenue.....	88 00
“	Practice “	Nos. 1619, 1621 Spring Garden street.....	33 00
“	Girl's Normal School.....	Northeast corner Seventeenth and Spring Garden streets.....	89 00
“	A. D. Bache “	Northeast corner Twenty-second and Brown streets.....	74 00
“	Hoffman “	Northeast corner Seventeenth and Wood streets.....	98 00
“	Thaddeus Stevens' School.....	Northwest corner Seventeenth and Grayson streets.....	116 00
“	Livingston “	Northeast corner Twenty-third and Shamokin streets.....	76 00
Sixteenth	Wm. A. Lee “	Nos. 1111 to 1115 Howard street.....	22 00
“	Landenberger “	Nos. 1113 to 1117 North Fourth street.....	26 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Sixteenth	Wolfe School.....	Nos. 915 to 919 Charlotte street.....	\$25 00
“	Jefferson “	Nos. 912 to 916 North Fifth street.....	28 00
Seventeenth.....	Webster “	Nos. 1231 to 1239 Hancock street.....	16 00
“	Harrison “	Master street, above Second street.....	22 00
“	James R. Ludlow School.....	Northeast corner Master and Lawrence streets.....	29 00
Eighteenth.....	Vaughan “	Nos. 1324 to 1326 Marlborough street.....	48 00
“	Morris “	Nos. 1316 to 1322 Palmer street.....	16 00
“	George Chandler “	Nos. 1020 to 1024 Montgomery avenue.....	36 00
“	Douglass “	Southeast corner Edgemont and Huntingdon streets.....	16 00
“	T. K. Finletter “	Northeast corner Montgomery avenue and Gaul street.....	29 00
“	Primaries, Nos. 7 and 8.....	Southwest corner Belgrade and Otis streets.....	16 00
Nineteenth.....	Wm. H. Hunter School.....	Southeast corner Dauphin and Mascher streets.....	37 00
“	Cocksink “	Northwest corner Montgomery avenue and Fourth street.....	20 00
“	Cumberland “	Southwest corner Cumberland and Hancock streets.....	37 00
“	Wm. Anderson “	East side Fourth street, below Lehigh avenue.....	37 00
“	Price “	East side Howard street, north of Diamond street.....	27 00
“	Franklin “	East side American street, north of Columbia avenue.....	14 00
Twentieth.....	Penn “	Southeast corner Eighth and Thompson streets.....	63 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Twentieth	Rutledge School	Northwest corner Seventh and Norris streets.	\$73 00
"	James Todd School	Northwest corner Franklin and Norris streets.	66 00
"	James Lynd "	Twelfth street, above Columbia avenue.	54 00
"	Primary, No. 7 "	Nos. 1523 to 1531 Mervine street.	58 00
"	Daniel Webster "	Eleventh street, below Thompson street.	64 00
"	Park Avenue "	Park avenue, above Thompson street.	27 00
Twenty-first	Levering "	West side Ridge avenue, north of Roxborough avenue.	22 00
"	Roxborough "	West side Ridge avenue, north of Cinnaminson street.	7 00
"	Schuylkill Secondary School	East side Washington street, north of Hermitage street.	16 00
"	Fairview "	West side Manayunk avenue, north of Lyceum avenue.	45 00
"	Washington Primary "	East side Shur's lane, east of Cresson street.	23 00
"	Manayunk Grammar "	Nos. 175 to 187 Green lane.	20 00
Twenty-second	Rittenhouse "	South side Rittenhouse street, east of Green street.	16 00
"	C. W. Schaeffer "	Germantown avenue and Wyoming street.	22 00
"	Bringhurst "	North side Bringhurst street, west of Wakefield street.	16 00
"	Central Primary "	Nos. 128 to 136 Centre street.	16 00
"	Chestnut Hill "	South side Highland avenue, west of Twenty-ninth street.	21 00
"	Germantown "	Northeast corner Adams and Lafayette streets.	102 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Twenty-third.....	Henry Herbert School.....	East side Frankford avenue, south of Foulkrod street.....	\$37 00
“	Orchard Street “	Nos. 4278 to 4282 Orchard street.....	5 00
“	Marshall “	Northwest corner Sellers and Franklin streets.....	19 00
“	Wilmot “	South side Meadow street, 86 feet west of Mulberry street.....	8 00
“	White Hall “	Southwest corner Pratt and Tacony streets.....	24 00
Twenty-fourth.....	Norris J. Hoffman “	Northeast corner Fifty-fifth and Vine streets.....	31 00
“	Jesse George “	South side Hamilton street, west of Sixty-third street.....	28 00
“	Martha Washington School.....	Northwest corner Forty-fourth and Aspen streets.....	30 00
“	Belmont “	Southeast corner Forty-first and Oregon streets.....	32 00
“	Warren “	East side Thirty-eighth street, below Warren street.....	42 00
“	Mantua “	East side Thirty-eighth street, below Mt. Vernon street.....	30 00
“	Haverford “	No. 3415 Haverford avenue.....	28 00
Twenty-fifth.....	Carroll “	No. 1528 Salmon street.....	11 00
“	Henry W. Halliwell “	Northwest corner Frankford avenue and Clementine street.....	51 00
“	Sherman “	Northeast corner Frankford avenue and Somerset street.....	23 00
“	George B. McClellan, No. 1, School.....	Northeast corner Edgemont and Neff streets.....	16 00
“	George B. McClellan, No. 2, “	Northeast corner Thompson and Neff streets.....	29 00
“	Boulnot School.....	Southwest corner D street and Indiana avenue.....	26 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations;	Amount.
Twenty-fifth.....	Irving “	North side Kirkbride street, northwest of Howell street.....	\$16 00
“	Barton “	Southwest corner Frankford avenue and Buckius street.....	17 00
“	Asa Packer “	Southwest corner Broad and McFerron streets.....	20 00
“	Bayard Taylor School.....	West side Turner street, north of Venango street.....	26 00
“	Fairhill “	Southeast corner Somerset and Marshall street.....	25 00
Twenty-sixth.....	Jackson “	Southeast corner Twelfth and Federal streets.....	151 00
“	James Alcorn “	Northeast corner Thirty-fourth and Wharton streets.....	24 00
“	Landreth “	Southeast corner Twenty-third and Federal streets.....	16 00
“	Girard “	Northwest side Passyunk avenue, west of Eighteenth street.....	8 00
“	Point Breeze “	Twenty-seventh street and Passyunk avenue.....	16 00
“	Jeremiah Nichols “	Northeast corner Sixteenth and Wharton streets.....	113 00
“	James Logan “	Northwest corner Nineteenth and Reed streets.....	41 00
Twenty-seventh....	Newton Grammar “	Northwest corner Thirty-eighth street and Woodland avenue.....	45 00
“	Newton Primary “	3459 Ludlow street.....	24 00
“	Newton Secondary School.....	South side Chestnut street, east of Thirty-sixth street.....	30 00
“	Newton “	North side Sansom street, east of Thirty-sixth street.....	64 00
“	Greenway “	Fifty-second street and Woodland avenue.....	10 00
“	Price “	Northwest corner Forty-seventh and Locust streets.....	24 00

Schedule of Charges against the Public Schools at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
9 th W ^{ard} Twenty-seventh	Paschallville	Seventieth street and Woodland avenue.....	\$13 00
"	West End	Sixtieth and South streets.....	10 00
Twenty-eighth	Oakdale School.....	Northeast corner Eleventh and Huntingdon streets.....	34 00
"	Canac	Southwest corner Thirteenth street and Susquehanna avenue.....	64 00
"	James L. Claghorn School.....	Southwest corner Seventeenth street and Susquehanna avenue.....	36 00
"	T. H. Powers	Southwest corner Susquehanna avenue and Woodstock street.....	30 00
"	Bellevue	Northwest corner Twenty-sixth and Cumberland streets.....	32 00
"	Kenderton	Northwest corner Fifteenth and Ontario streets.....	34 00
"	Glenwood	East side Ridge avenue, west of Thirty-second street.....	16 00
"	Falls of Schuylkill	South side Queen lane, west of Railroad.....	5 00
Twenty-ninth	Muhlenberg	Southeast corner Seventeenth and Master streets.....	20 00
"	Elisha Kent Kane	Southeast corner Twenty-sixth and Jefferson streets.....	71 00
"	Morris City	Southeast corner Taney and Thompson streets.....	16 00
"	Edward Gratz	Southeast corner Twenty-third and Jefferson streets.....	29 00
"	Reynolds	Southwest corner Twentieth and Jefferson streets.....	14 00
"	George G. Meade	Northwest corner Eighteenth and Oxford streets.....	61 00
Thirtieth	James Pollock	Southeast corner Birch and Fitzwater streets.....	16 00
"	Curtin	Southwest corner Twentieth and Catharine streets.....	16 00

Schedule of Charges against the Public Schools at the Regular Rates.—Continued.

Wards.	Names.	Locations.	Amount.
Thirtieth	Edwin M. Stanton “	Southeast corner Seventeenth and Christian streets.....	\$77 00
“	William G. Pierce “	Southwest corner Twenty-fourth and Christian streets.....	65 00
“	Chester A. Arthur School.....	Southwest corner Twentieth and Catharine streets	62 00
Thirty-first	Lucretia Mott “	2206 to 2216 Huntingdon street.....	43 00
“	Adams “	2080 to 2086 Adams street	24 00
“	John S. Hart “	2334 to 2348 York street.....	41 00
“	Henry Armitt Brown School.....	South side Sergeant, west of Emerald street.....	49 00
Total.....			\$6,025 00

Schedule of Charges against Public Buildings at the Regular Rates.

Wards.	Names.	Locations.	Amount.
Fifth.....	Mayor's office.....	Square bounded by Fifth and Sixth and Chestnut and Walnut streets.....	\$20 00
"	Telegraph Department.....		40 00
"	Office Clerks of Councils.....		21 00
"	Council Chambers.....		12 00
"	Court of Common Pleas, No. 1.....		32 00
"	" " No. 2.....		26 00
"	" " No. 3.....		18 00
"	" " No. 4.....		12 00
"	Sheriff's office.....		12 00
"	Independence Hall.....		52 00
"	Prothonotary's office.....		36 00
"	Old Court House.....		25 00
"	New "		84 00
"	Independence Square.....		47 00
Ninth.....	Basement	New City Hall, Broad and Market streets.....	662 00
"	West end, first floor.....		85 00
"	City Treasurer.....		18 00
"	City Controller.....		8 00

Schedule of Charges against Public Buildings at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Ninth.....	City Commissioners.....		\$4 00
"	Southeast corner, first floor.....		48 00
"	Headquarters National Guards		4 00
"	Commissioner of City Property.....		6 00
"	Commissioners of Fairmount Park.....		8 00
"	Board of Revision of Taxes		4 00
"	Tax Assessor's office.....		2 00
"	Delinquent Tax office.....		4 00
"	Northeast corner, first floor.....	New City Hall, Broad and Filbert streets.....	48 00
"	Receiver of Taxes.....		16 00
"	Northeast corner, second floor.....		48 00
"	Survey Department		13 00
"	Highway Department		6 00
"	Southeast corner, second floor.....		27 00
"	Architect's office.....		6 00
"	Supreme Court.....		33 00
"	Superintendent's office.....		10 00
"	Board of Guardians' office.....	42 North Seventh street.....	12 00

Schedule of Charges against Public Buildings at the Regular Rates—Continued.

Wards.	Names.	Locations.	Amount.
Tenth.....	Water Department shops.....	916 and 918 Cherry streets.....	\$13 00
“	State Fencibles armory.....	East side Broad, south of Race street.....	65 00
Eleventh.....	Morgue.....	Northwest corner Beach and Noble streets.....	14 00
Fourteenth.....	Spring Garden Hall.....	Northwest corner Thirteenth and Spring Garden streets.....	41 00
Seventeenth.....	Purveyor's office (Water Department).....	Frankford avenue and Master street	5 00
Twenty-first.....	Engineer's houses (Water Department).....	West side Pennsylvania and Norristown railroad, south of Shawmont.....	22 00
Twenty-second.....	Town Hall.....	Northeast corner Germantown avenue and Lafayette street.....	27 00
“	Fountain (Ellis Post).....	East side Germantown avenue, north of Mills street.....	8 00
Twenty-third	Gas office.....	Southeast corner Frankford avenue and Ruan streets.....	12 00
Twenty-sixth.....	Water Department.....	South side of Wharton, east of Twelfth street.....	14 00
“	Highway Department.....	South side Wharton, east of Twelfth street.....	10 00
“	Public Baths.....	Southeast corner Wharton and Twelfth streets	500 00
“	Water Department shops.....	Northeast corner Reed and Twelfth streets.....	244 00
“	County Prison.....	West side Passyunk avenue, from Reed to Dickinson streets.....	2,376 00
Twenty-seventh.....	Philadelphia Almshouse.....	Thirty-fourth, south of Pine street.....	3,333 00
“	Highway Department.....	Southwest side Woodland avenue, west of Spruce street	7 00
Twenty-ninth.....	Water Department.....	Northeast corner Twenty-sixth and Master streets.....	19 00
		Total.....	\$8,219 00

Schedule of Charges against Fairmount Park at the Regular Rates.

Names.	Locations.	Amount.
West Park.....	Belmont, including sprinklers for entire Park.....	\$1,148 24
West Park.....	Belmont Mansion.....	83 00
West Park.....	British Building.....	18 00
West Park.....	Ohio Building.....	7 00
West Park.....	Memorial Hall.....	250 00
West Park.....	Horticultural Hall.....	98 00
West Park.....	Greenhouse adjoining Horticultural Hall.....	20 00
West Park.....	Outside grounds.....	128 00
West Park.....	Sweet Briar Mansion.....	15 00
West Park.....	Rhode Island Building.....	9 00
West Park, jet fountain.....	Lake west of Belmont avenue, north of Elm avenue.....	6,500 00
West Park, " ".....	Catholic Total Abstinence Society, north of Elm avenue.....	1,000 00
East Park, drinking fountain.....	North front Lemon Hill Mansion.....	168 00
East Park, " ".....	Northeast from Lemon Hill Mansion.....	112 00
East Park, " ".....	Northeast of Sedgley Guard-house.....	10 00
East Park, jet fountain.....	Northeast of Sedgley Guard-house.....	560 00
East Park, " ".....	East side forebay.....	560 00
East Park, " ".....	Green street entrance.....	756 00

Schedule of Charges against Fairmount Park at the Regular Rates—Continued.

Names.	Locations.	Amount.
East Park, jet fountain.....	On lawn east of steamboat landing.....	\$735 00
East Park, " "	On lawn northeast of steamboat landing.....	735 00
East Park, trefoil fountain.....	East of Lincoln Monument.....	2,205 00
East Park, fish pond.....	Main drive, near Brown street entrance.....	1,984 00
East Park, large fountain.....	West of Thirty-third street, south side Dauphin street.....	1,003 00
	Total.....	\$18,104 24

List of Charitable Institutions.

Which, under the provisions of the ordinance of June 21, 1878, and June 16, 1881, are charged 15 per cent. of the regular rates.

Wards.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
First.....	Sisters of St. Francis.....	505 Reed street.....	June 7, 1883	\$22 00	\$5 00
Second.....	St. Ann Widows' Asylum.....	906 Moyamensing avenue.....	June 21, 1878	24 00	5 00
"	Ridgway Library.....	Broad street, southeast corner Christian street.....	January 21, 1882	107 00	16 05
Third.....	Maternity Hospital.....	730-32-34 South Tenth street.....	December 21, 1883	12 00	5 00
"	Industrial Home.....	762 South Tenth street.....	June 21, 1878	50 00	7 50
"	Southern Home for Destitute Children..	Southeast corner Fitzwater and Twelfth streets.....	June 21, 1878	154 00	23 10
"	Philadelphia Society for Employment and Instruction of the Poor.....	714-718 Catharine street—Special ordinance.....	March 23, 1878	76 75	5 00
Fourth.....	Institute for Colored Youth.....	915-919 Bainbridge street.....	April 17, 1883	28 00	5 00
"	Bedford Mission.....	619-621 Alaska street.....	{ June 9, 1879 June 11, 1879 }	121 00	18 15
Fifth.....	City Mission.....	411 Spruce street.....	April 10, 1883	16 00	5 00
"	Philadelphia Dispensary.....	127 South Fifth street.....	April 19, 1881	34 50	5 00
"	Newsboys' Aid Society.....	251 South Sixth street.....	September 20, 1881	62 90	9 43
Sixth.....	National Guard's Hall.....	518-520 Race street.....	April 26, 1884	54 00	8 10
"	Apprentices' Library.....	Arch street, southwest corner Fifth street.....	June 21, 1878	23 00	5 00
Seventh.....	Howard Hospital.....	1518-1520 Lombard street.....	April 10, 1883	22 50	5 00
"	Pennsylvania Hospital.....	Southwest corner Eighth and Spruce streets.....	June 21, 1878	520 50	78 18

List of Charitable Institutions—Continued.

Wards.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
Seventh.....	Western Soup Society.....	1613-1615 South street.....	June 21, 1878	\$21 00	\$5 00
“	Clinton street Boarding House.....	913-915 Clinton street.....	{ June 21, 1879 { Sept. 30, 1879 }	80 00	12 00
“	Deaf and Dumb Asylum.....	1025 Clinton street.....	October 22, 1885	8 00	5 00
“	Deaf and Dumb Asylum.....	317 South Eleventh street.....	October 22, 1885	99 00	14 85
“	Deaf and Dumb Asylum.....	Broad street, northwest corner Pine street.....	June 21, 1878	698 00	104 70
“	Day Nursery.....	2218 Lombard street.....	October 3, 1882	12 00	5 00
“	Lincoln Institute.....	324 Eleventh street—Special Ordinance.....	March 23, 1873	106 00	5 00
Eighth.....	Midnight Mission.....	919 Locust street.....	December 21, 1883	23 00	5 00
“	Philadelphia Library.....	Northwest corner Juniper and Locust streets.....	January 31, 1882	66 00	9 90
“	Jefferson Hospital.....	Sansom street, south side, west of Tenth street.....	June 21, 1878	483 00	72 45
“	Union Benevolent Association.....	701 Sansom street.....	February 13, 1883	61 00	9 15
“	Jefferson College.....	Tenth street, west side, south of Sansom street.....	June 21, 1878	136 00	20 40
“	Children's Hospital.....	207 South Twenty-second street.....	June 21, 1878	103 00	15 45
“	St. James' School.....	151 South Twenty-fourth street.....	February 10, 1885	21 00	5 00
“	Historical Society.....	Southwest corner Thirteenth and Locust streets...	February 28, 1884	20 00	5 00
Ninth.....	Women's Christian Association.....	1605 Filbert street.....	June 21, 1878	23 00	5 00
“	Homeopathic Hospital.....	1116-1118 Cuthbert street.....	June 13, 1881	29 00	5 00

List of Charitable Institutions—Continued.

Wards.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
Tenth.....	Central Soup Society.....	709-711 Cherry street.....	June 13, 1881	\$103 00	\$15 45
“	Dental College and Chirurgical Hospital	North side Cherry street, east of Eighteenth street	{ June 21, 1878 { June 18, 1879	} 132 00	18 80
“	Catholic Home for Destitute Children and Orphan Girls.....	1718-1720 Race street.....	June 21, 1882			42 00	6 30
“	Wills' Eye Hospital.....	1810-1824 Race street.....	June 21, 1878	248 00	37 20
“	Academy of Natural Sciences.....	Race street, southwest corner Nineteenth street....	June 21, 1878	109 00	16 35
“	Presbyterian Historical Society.....	1227-1229 Race street.....	June 20, 1882	17 00	5 00
“	Pennsylvania Institute for the Instruc- tion of the Blind.....	Northeast corner Race and Twentieth streets.....	June 21, 1882	451 00	67 45
“	Orthopaedic Hospital.....	Summer st., northwest corner Seventeenth street...	June 21, 1878	126 00	18 90
“	Academy of Fine Arts.....	Northwest corner Broad and Cherry streets.....	June 21, 1878	276 00	41 40
“	Magdalen Society of Philadelphia.....	Northeast corner Twenty-first and Race streets....	June 21, 1878	67 00	10 05
“	Hahnemann College.....	222-232 North Broad street.....	August 16, 1886	186 00	27 90
“	Friends' School.....	North side Cherry st., east of Seventeenth street...	April 16, 1885	71 00	10 65
“	Friends' Library.....	Northwest corner Cherry and Sixteenth streets...	January 18, 1887	28 00	5 00
Twelfth.....	Northern Soup Society.....	817 North Fourth street.....	June 21, 1878	40 50	6 07
“	Home Association.....	505 North Sixth street.....	June 21, 1878	18 00	5 00
Thirteenth.....	Northern Dispensary.....	606-610 Fairmount avenue.....	June 21, 1878	41 50	6 23

List of Charitable Institutions—Continued.

Ward.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
Thirteenth.....	Sheltering Arms.....	717 Franklin street.....	September 16, 1885	\$29 00	\$5 00
Fourteenth.....	First Regiment Armory.....	Southeast corner Broad and Callowhill streets.....	March 19, 1884	119 00	17 85
".....	Spring Garden Institute.....	1349-53 Spring Garden street.....	October 22, 1883	45 00	6 75
Fifteenth.....	Preston Retreat.....	N. W. cor. Twentieth and Hamilton streets.....	June 21, 1878	121 00	18 15
".....	Home Infirmary.....	2208 Brown street.....	July 27, 1878	23 00	5 00
".....	Northern Home for Friendless Children.....	N. E. cor. Twenty-third and Brown streets.....	June 21, 1878	110 00	16 50
".....	Soldiers' Orphans' Home.....	N. E. cor. Twenty-third and Brown streets (rear).....	June 21, 1879	85 00	12 75
".....	House of Refuge.....	N. W. cor. Twenty-second and Parrish streets.....	March 18, 1879	1,050 42	157 57
".....	" " (colored).....	" " " ".....	March 18, 1879	400 00	60 00
".....	Howard Institute.....	1610 Poplar street.....	June 7, 1883	13 00	5 00
".....	" ".....	1612 " ".....	June 7, 1883	16 00	5 00
".....	Jewish Foster Home.....	S. W. cor. Twenty-fourth and Poplar streets.....	June 21, 1878	49 00	7 35
".....	C. Morrison.....	2426 Hare street.....	June 24, 1879	5 00	
".....	St. Vincent Home for Destitute Infants.....	N. W. cor. Eighteenth and Wood streets.....	June 22, 1878	109 00	16 58
".....	Northern Home Infirmary.....	826 North Twenty-third street.....	November 16, 1880	11 00	5 00
".....	Home for Aged Couples.....	1721-23 Francis street.....	December 5, 1883	14 00	5 00
".....	Charity Hospital.....	1832 Hamilton street.....	February 5, 1885	17 00	5 00

List of Charitable Institutions—Continued.

Ward.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
Fifteenth	Eastern Penitentiary.....	N. E. cor. Twenty-second and Fairmount ave.....	February 12, 1886	\$1,824 00	\$500 00
Sixteenth	Day Nursery.....	1008 North Fifth street	July 31, 1885	29 00	5 00
"	Wayfarers' Home.....	76-80 Laurel street	June 9, 1886	64 00	9 60
Eighteenth.....	St. Mary's Hospital.....	N. E. cor. Palmer street and Frankford avenue.....	June 21, 1878	56 00	8 40
Nineteenth	Episcopal "	S. E. cor. Front street and Lehigh avenue	June 21, 1878	649 00	97 35
"	Northeastern Soup Society	1940 North Front street.....	June 21, 1878	8 00	5 00
"	St. Christopher's Hospital.....	N. W. cor. Lawrence and Huntingdon streets.....	September 2, 1884	82 00	12 30
Twenty-second.....	Womens' Christian Association.....	4781 Germantown avenue	January 31, 1885	15 00	5 00
"	Young Men's Christian Association.....	5019 " "	January 25, 1882	71 00	10 65
"	Lutheran Orphan's Home.....	5576 " "	June 21, 1878	67 00	10 05
"	" Asylum for Aged.....	5580 " "	June 21, 1878	81 00	12 60
"	Jewish Hospital.....	Cottage avenue	June 21, 1878	194 50	29 50
"	Germantown Hospital.....	East Penn street, west of Chew street	June 21, 1878	92 00	13 80
"	Pauline Home	" " east of Ross street.....	March 4, 1883	39 00	5 85
"	Little Sisters of the poor	Mill street, fourth house east of Ross street.....	June 21, 1878	140 00	21 00
"	Jewish Foster Home	" first house west of Chew street.....	June 7, 1881	132 00	19 80
"	Germantown Poor House.....	Rittenhouse street	June 21, 1878	57 00	8 55

List of Charitable Institutions—Continued.

Ward.	Names.	Location.	When placed on charity list.	Amount assessed.	Amount charged.
Twenty-second.....	Home for Consumptives.....	East side county line, north of Evergreen avenue..	November 13, 1886	\$138 00	\$20 70
Twenty-fourth.....	Working Home for Blind Men.....	3518 Lancaster avenue.....	June 21, 1878	\$100 00	\$15 00
“	Union Home for Old Ladies.....	N. W. cor. Lancaster and Girard avenues.....	June 21, 1878	15 00	5 00
“	Presbyterian Hospital.....	S. W. cor. Powelton and Saunders avenues.....	June 21, 1878	305 00	45 75
“	Pennsylvania Home for Blind Women	N. E. “ “ “ “	June 18, 1881	73 00	10 95
“	Old Men's Home.....	N. W. “ “ “ “	June 18, 1871	170 00	25 50
“	Pennsylvania Hosp'l for Insane (female)	Haverford avenue, south side.....	{ June 21, 1878 }	880 00	132 00
“	“ “ “ (male)	S. E. cor. Haverford avenue and Fiftieth street....	{ Feb. 17, 1879 }		
“	Colored Home.....	S. W. “ Forty-fourth street and Girard avenue..	June 21, 1878	118 00	15 45
“	House of Good Shepherd.....	S. W. “ Thirty-fifth street and Fairmount ave..	June 21, 1878	516 00	77 40
“	Philadelphia Home for Infants.....	S. E. “ Westminster avenue and Markoe street	June 21, 1878	88 00	13 20
“	St. John's Orphan Asylum.....	Westminster avenue, north side.....	June 21, 1878	105 00	15 75
“	Western Home for Poor Children.....	S. E. cor. Forty-first and Baring streets.....	April 18, 1882	44 60	6 60
“	Pennsylvania Homoeopathic Hospital for Children.....	S. W. “ Forty-third and Brown streets.....	June 21, 1878	37 00	5 55
“	Colored Orphans' Home.....	S. W. “ Forty-fourth and Wallace sts. (sp. ord.)	March 23, 1878	71 50	11 17
“	Baptist Orphanage.....	S. W. “ Forty-fifth street and Fairmount ave....	June 21, 1878	26 00	5 00
“	Zoological Garden.....	S. W. “ Thirty-fifth street and Girard avenue..	Nov. 3, 1886	1,000 00	150 00

List of Charitable Institutions—Continued.

Ward.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
Twenty-fourth.....	Presbyterian Home.....	S. W. cor. Sixty-fifth and Vine streets.....	April 19, 1887	\$25 00	\$5 00
Twenty-fifth.....	Old Ladies' Home.....	Frankford avenue, north of cemetery.....	May 31, 1881	11 00	5 00
Twenty-seventh.....	West Philadelphia Industrial School.....	N. W. cor. Thirty-ninth and Pine streets.....	June 21, 1878	118 00	17 70
"	House of the Guardian Angel.....	N. E. " Seventieth street and Woodland avenue.....	April 16, 1886	97 00	14 55
"	University of Pennsylvania.....	N. E. " Thirty-sixth and Spruce streets.....	June 21, 1878	1,323 50	198 50
"	" " Veterinary Dep't.....	S. W. " Thirty-sixth and Pine streets.....	June 21, 1878	127 00	19 05
"	" " Biological Dep't.....	S. side Pine, bet. Thirty-seventh and Cleveland.....	June 21, 1878	95 00	14 25
"	" " Nurse Dep't.....	S. side Spruce street, west of Thirty-fourth street.....	June 21, 1878	47 00	7 05
"	Home for Colored Children.....	Woodland avenue, east of Forty-sixth street.....	April 15, 1885	32 00	5 00
"	Home for Incurables.....	" " " Forty-eighth street.....	Jan. 1, 1883	190 00	28 50
"	Divinity School.....	" " S. E. cor. Fiftieth street.....	April 16, 1883	200 00	30 00
"	Presbyterian Orphans' Home.....	" " west of Fifty-eighth street.....	July 18, 1878	128 00	19 20
"	Presbyterian Home for Widows and Single Women.....	" " " " " ".....	Nov. 29, 1887	152 00	22 80
"	Educational Home.....	" " and Forty-ninth st. (sp. ord.).....	March 23, 1878	179 50	5 00
"	Indigent Home for Women.....	N. side Chestnut street, west of Thirty-sixth.....	May 15, 1887	135 00	20 25
Twenty-eighth.....	Baptist Home.....	S. E. cor. Seventeenth and Norris streets.....	June 21, 1878	223 00	33 45
"	Odd Fellows' Home.....	S. E. " Seventeenth and Tioga streets.....	June 21, 1878	97 00	14 55

List of Charitable Institutions—Continued.

Ward.	Names.	Locations.	When placed on charity list.	Amount assessed.	Amount charged.
Twenty-eighth.....	Methodist Episcopal Home.....	N. E. cor. Thirteenth street and Lehigh avenue.....	June 21, 1878	\$178 00	\$26 70
“	Women's Homœopathic Hospital.....	2135 and 2137 North Twentieth street.....	Oct. 1, 1884	40 00	6 00
“	Masonic Home.....	3333 North Broad street.....	Nov. 2, 1886	12 00	5 00
“	Rosine Home.....	3216 Germantown avenue.....	April 18, 1887	33 00	5 00
“	Masonic Home.....	3337 North Broad street.....	November 2, 1886	\$14 00	5 00
Twenty-ninth.....	Homœopathic Hospital for Children.....	914 North Broad street.....	December 21, 1883	61 00	9 15
“	School of Design for Women.....	1346 North Broad street.....	June 21, 1878	129 00	19 35
“	Little Sisters of the Poor.....	East side Eighteenth street, north of Jefferson st...	June 21, 1878	192 00	28 80
“	German Hospital.....	Southwest cor. Corinthian and Girard avenues.....	June 21, 1878	786 00	117 90
“	House of Refuge.....	Northwest cor. Twenty-second and Poplar streets..	June 22, 1878	439 00	65 85
“	St. Joseph's Hospital.....	Southeast cor. Seventeenth street and Girard ave..	June 21, 1878	485 00	72 75
“	Women's Medical College.....	Northwest cor. Twenty-first st. and N. College ave..	June 21, 1878	110 00	16 50
“	Women's Hospital.....	Northeast cor. Twenty-second st. and N. College av.	June 21, 1878	282 50	42 38
“	Girard College.....	South College avenue, north side.....	June 23, 1879	5,476 26	821 44
“	Union Temporary Home for Children..	1525 Poplar street.....	June 21, 1878	69 00	10 35
“	Northwest Soup Society.....	1300 North Nineteenth street.....	June 21, 1879	11 00	5 00
				\$27,392 33	\$4,347 18
Loss of revenue to the city....				\$22,945 15	

APPENDIX B.

REPORT OF CHIEF CLERK.

Philadelphia, January 25, 1884.

JOHN L. OGDEN,
Chief Engineer.

SIR:—I have the honor to submit herewith a detailed statement of the expenditures of this Bureau for the year 1887.

The recapitulation shows the total amounts available, the subdivisions of expenditures, and the balances remaining to the credit of the Bureau at the close of the year.

Respectfully,

J. T. HICKMAN,
Chief Clerk.

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging.
An Ordinance to make an appropriation to the Water Department for the year 1887, approved December 31, 1886.....	\$871,748 00			
Increased by transfer:				
From Highways.....	\$32,800			
From Surveys.....	30,000			
From Gas Loan				
No. 9.....	10,000			
	<u>\$72,800 00</u>			
	\$944,548 00			
Diminished by transfer to Receiver of Taxes:				
April 29, 1887.....	\$25,657 50			
July 16, 1887.....	3,000 00			
	<u>28,657 50</u>			
Net appropriation.....		\$915,890 50		
Item 1. Salaries.....	\$181,748 00			
Diminished by transfer to Receiver of Taxes:				
April 29.....	\$25,657 50			
July 16.....	3,000 00			
Item 2, Dec. 24.....	600 00			
" 3, " ".....	600 00			
" 4, " ".....	300 00			
	<u>\$30,157 50</u>			
Net appropriation to Item 1.....		\$151,590 50		
Salary of:				
Chief engineer.....	\$7,000 00	\$7,000 00		
General superintendent.....	3,500 00	3,500 00		
Assistant engineers.....	3,200 00	3,200 00		
Draughtsmen.....	4,000 00	4,000 00		
Chief clerk.....	2,000 00	2,000 00		
Assistant clerks.....	1,980 00	1,980 00		
Janitor Spring Garden Hall.....	675 00	675 00		
Watchman.....	675 00	675 00		
Lineman.....	720 00	720 00		
Telephone operators.....	840 00	840 00		
Foreman of laborers.....	720 00	720 00		
Watchmen (reservoirs).....	8,100 00	8,100 00		
Policemen, \$10 each for uniforms.....	2,860 00	2,860 00		
River watchmen.....	750 00	750 00		
General storekeeper.....	800 00	800 00		
Correspondence clerk.....	900 00	900 00		
Clerk to general superintendent.....	900 00	900 00		
Assistant clerk gen'l superintendent.....	850 00	850 00		
Search clerk.....	1,100 00	1,100 00		
Assistant clerks.....	1,750 00	1,750 00		
Time clerk.....	900 00	900 00		
Messenger.....	600 00	600 00		
Pipe inspector.....	1,200 00	1,200 00		
Registrar of bureau.....	37,210 00	9,068 68		
Purveyors.....	9,000 00	8,843 74		
Clerks to purveyors.....	4,320 00	4,260 00		
General foreman.....	6,573 00	6,573 00		
Foremen of repairs.....	3,120 00	3,120 00		
Watchmen district yards.....	2,025 00	2,025 00		
Superintendent of shop.....	1,500 00	1,500 00		
Clerk to superintendent of shop.....	850 00	850 00		

Detailed Expenditures of the Department for 1887.

General Appropriation.							Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item No. 1, continued.										
SALARIES OF EMPLOYEES AT PUMPING STATIONS.										
	Engineers.	Oilers.	Firemen.	Storekeepers.	Telephone Operators.	Coal Passers.				
Fairmount.....	2	4		1			5,600 00	5,583 87		
Spring Garden.....	4	10	24	1	1	6	32,797 50	31,412 73		
Belmont.....	2	2	4	1		4	9,800 00	9,657 65		
Roxborough.....	2	1	4			2	7,507 50	7,095 98		
Mt. Airy.....	2					2	2,970 00	2,970 00		
Chestnut Hill.....	1					1	1,500 00	1,500 00		
Frankford.....	1	1	2	1			3,925 00	3,887 31		
Kensington.....		2					1,620 00	1,620 00		

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropri'd.	Amount expended.	Amount merging.	Amount not merging
Item 1, continued.				
Salary of:				
Foreman Bricklayers.....	\$350 00	\$350 00		
“ Carpenters.....	900 00	900 00		
“ Laborers.....	780 00	780 00		
“ Painters.....	900 00	900 00		
“ Riggers.....	900 00	900 00		
“ Stonemasons.....	900 00	900 00		
Electrician.....	800 00	732 34		
General storekeeper.....	800 00	800 00		
Totals.....		\$151,308 30	\$282 20	
Item 2. For regular supplies, including fuel, oil, and small stores.....				
	\$100,000 00			
Transferred from Item 1, December 24, 1887.....	690 00			
Net appropriation to Item 2.....	\$100,690 00			
Deficiencies of 1886:				
Brass fittings.....	\$105 69			
Hauling coal.....	91 30			
Oil.....	9 21			
Packing.....	15 12			
Wood.....	30 93			
Coal for office and shop.....	330 13			
Coal for stations:				
399.09 tons per Roxborough, at \$2 25.....	898 76			
4397.01 tons per Spring Garden, at \$2 13.....	10,067 51			
		\$12,148 56		
Alcohol.....		13 25		
Brass fittings.....		1,570 53		
Chandlery.....		1,554 56		
Coke.....		91 85		
Corporation cocks, 1289 1/2 in. at 55 cts.....		708 95		
Electric supplies.....		6 22		
Forage.....		84 12		
Grease.....		2 85		
Gum goods.....		2,310 49		
Hardware.....		1,468 17		
Iron fittings.....		1,216 71		
Lumber.....		1,104 93		
Hauling coal.....		283 25		
OIL.				
55 gals. Arctic, at 35c.....	\$19 25			
30 2 1/2 “ Black, at 9 3/8c.....	4 76			
52 “ Black, at 10 1/2c.....	5 46			
3656 “ Cylinder, at 45c.....	1,645 20			
45 “ Castor, at \$1.38.....	62 10			
49 “ Electric, at 38c.....	18 62			
98 “ Engine, at 28c.....	27 44			
867 “ Engine, at 35c.....	303 45			
150 “ Gasoline, at 16 1/2c.....	24 75			
1339 1/2 “ Gasoline, at 15c.....	200 91			
1466 1/2 “ Headlight, at 10 1/2c.....	154 02			
253 1/2 “ Lard, at 60c.....	153 30			
858 2/3 “ Lard, at 54c.....	463 80			
		3,083 06		

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 2, continued.				
Paint, &c.....		\$2,701 11		
Packing.....		87 80		
Tallow, 300 lbs. at 7½c.....		22 50		
COAL FOR OFFICE AND SHOP.				
5 tons stove, at \$6 00.....	\$30 00			
8 " " at 7 00.....	56 00			
27 " " at 5 50.....	148 50			
22¼ " " at 5 75.....	185 41			
62 " 1350 lbs., bitumi- nous, at \$5 50.....	344 70			
225 tons nut, at \$5 50.....	1,237 50			
		\$2,002 14		
COAL FOR STATIONS.				
Fairmount:				
24.04 tons egg, at \$4 50	\$108 52			
Roxborough:				
24.00 tons egg, at 5 25	126 00			
Chestnut Hill:				
638.11 tons pea, at 2 75	1,756 01			
Frankford:				
1,246.09 tons pea, at 2 41	3,003 94			
Kensington:				
1,679.17 tons pea, at 2 41	4,048 43			
Belmont:				
5,493.10 tons pea, at 2 41	13,239 32			
Roxborough:				
7,390.05 tons pea, at 2 38	17,588 79			
Spring Garden:				
12,566.05 tons pea, at 2 38	29,905 30			
		\$69,788 31		
WOOD.				
8 cords, at \$6 95.....	\$55 60			
22 " at 7 95.....	174 90			
		230 50		
Totals.....		\$10,479 95	120 05	
Item 3. For repairs to machinery, in- cluding the conveyance of workmen incident thereto.....				
		\$50,000 00		
Increased by transfer:				
From Item 1, Dec. 24, 1887,	600 00			
Net appropriation to Item 3.....		\$50,600 00		
Deficiencies of 1887:				
Repairs to pipe covering.....	\$59 41			
Tube cleaner.....	318 43			
		\$377 84		
Brass fittings.....		251 11		
Bricks, lime, and cement.....		216 81		
Fire Clay.....		140 00		
Hardware.....		19 50		
Hauling.....		120 00		
Iron fittings.....		119 00		
Machine work.....		5 43		
Repairs to instruments.....		68 15		
Repairs to submerged main.....		136 00		

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 3 continued.				
Transportation.....		\$1,554 20		
Valves.....		1,875 00		
Wages, buildings, grounds and reser- voirs:				
Bricklayers.....	\$226 80			
Carpenters.....	1,918 50			
Helpers.....	3,019 25			
Laborers.....	4,834 68			
Painters.....	2,065 50			
Stoneasons.....	999 00			
		13,063 78		
Carpenters, pumping main, Spring Garden.....		1,500 99		

Detailed Expenditures of the Department for 1887.

General Appropriation.							Amount appropri'd.	Amount expended.	Amount merging.	Amount not merging.
Item No. 3, continued.										
MATERIAL.	Fairmount.	Spring Garden.	Belmont.	Roxborough.	Frankford.	Kensington.				
Boiler fluid.....				\$32 30				\$32 30		
Bricks, lime and cement.....		\$70 64						70 64		
Electric supplies.....		44 96	\$39 31					84 27		
Fire brick.....		489 50	104 75	75 45				669 70		
Grate bars.....		91 35						91 35		
Iron castings.....	\$78 93							78 93		
Lumber.....	93 99	190 17						284 16		
Repairs to boilers.....	145 77	151 12		4 90	\$97 55	\$100 03		499 37		
Repairs to engine.....			100 72			20 10		121 82		
Repairs to pump.....	160 00							160 00		
Repairs to pipe covering.....		382 78		40 07	197 09			619 94		
Repairs to shaking bars.....		918 00						918 00		
Total.....	\$478 09	\$2,338 52	\$245 78	\$152 72	\$294 64	\$120 13		\$3,630 48		

Detailed Expenditures of the Department for 1887.

General Appropriation.							Amount appropriat'd.	Amount expended.	Amount merging	Amount not merging
Item 3, continued.										
WAGES.	Fairmount.	Spring Garden.	Bedmont.	Roxborough.	Frankford.	Kensington.				
Bricklayers.....	\$323 15	\$1,202 22	\$526 00	\$565 12						\$5,616 49
Carpenters.....	1,497 00	405 00	75 00	111 00	153 00					2,241 00
Laborers.....		303 00	373 38	241 50						917 88
Machinists.....	2,881 99	5,777 37	2,356 25	2,291 25	2,465 62	916 50				16,688 98
Painters.....	202 00	262 00			985 00					1,419 00
Plasterers.....		21 00								21 00
Stone Cutters.....		583 00								583 00
Totals.....	\$4,904 14	\$11,553 59	\$3,330 63	\$3,208 87	\$3,603 62	\$916 50				\$27,517 35
										\$50,595 59
										\$4 41

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging.
Item 4. For maintenance and repairs: to buildings, grounds, and reser- voirs.....	\$10,000 00			
Increased by transfer:				
From Item 1, Dec. 24.....	300 00			
Net appropriation to Item 4.....	\$40,300 00			
Deficiencies of 1886:				
Brick, lime, and cement.....	\$62 81			
Forage.....	52 52			
Gong.....	80 00			
Horse blankets.....	16 00			
Repairs to electric plant.....	87 00			
		\$298 33		
Blue stone.....		3 00		
Bricks, lime, and cement.....		1,993 10		
Chandlery.....		115 13		
Cleaning well.....		30 00		
Electric supplies.....		418 56		
Forage.....		635 21		
Gum goods.....		916 00		
Hardware.....		873 02		
Hauling ashes, Frankford.....	\$126 00			
" Kensington.....	275 00			
" Roxborough.....	263 88			
		664 88		
Horses.....		500 00		
Horse shoeing.....		88 80		
Lumber.....		1,676 25		
Paints.....		12 90		
Professional services V. S.....		13 00		
Repairs to carts.....	\$119 00			
" harness.....	16 00			
" heaters.....	13 25			
" jacks.....	11 56			
" roofs.....	658 03			
" scales.....	98 47			
" tracks.....	20 25			
		936 56		
Retaining wall Fairhill basin.....		2,197 60		
Telephone rental.....		612 50		
Window shades.....		44 28		
Wages, bricklayers.....		654 50		
" carpenters.....		3,777 00		
" helpers.....		1,278 50		
" horses and carts.....		614 00		
" laborers.....		12,168 75		
" painters.....		3,229 50		
" stonemasons.....		1,282 50		
" Fourth District.....		1,895 75		
Totals.....		\$36,949 62	47 98	3,302 40
Item 5. For maintenance and im- provement of the distribution, in- cluding the purchase of material and cost of labor in connection therewith and expenses incident thereto.....	\$135,000 00			
Increased by transfer:				
From Highways Dec. 24.....	6,000 00			
Net appropriation to Item 5.....	\$141,000 00			

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 5 continued.				
Deficiencies of 1886:				
Brick, lime, and cement.....	\$292 36			
Coke.....	15 45			
Gum goods.....	7 98			
Hauling pipe.....	370 36			
Iron fittings.....	24 86			
Iron pipe.....	4,694 85			
Measuring over pipe.....	3 75			
Travelling expenses (pipe inspector).....	20 24			
Rent of shop.....	25 00			
		\$5,454 85		
Awning.....		8 00		
Brass fittings.....		583 98		
Bricks, lime and cement.....		752 10		
Chandlery.....		283 89		
Coke.....		186 05		
Corporation cocks:				
3,716— $\frac{1}{2}$ -inch, at 55c. . .	\$2,043 80			
350— $\frac{3}{4}$ -inch, at 62c.....	217 00			
100— $\frac{1}{2}$ -inch, at 75c.....	75 00			
100—1-inch, at \$1.10 . . .	110 00			
		2,445 80		
Diving apparatus.....		652 65		
Dynamite.....		69 45		
Freight.....		17 00		
Gum goods.....		822 19		
Hauling pipe.....		2,682 38		
Hardware.....		814 70		
Iron fittings.....		143 09		
“ specials, 144,399 pounds, small, at .02 $\frac{1}{16}$		3,537 75		
Iron specials, 50,500 pounds, large, at .02 $\frac{3}{16}$		1,186 74		
Iron pipe, 4,689 lengths—6-inch— 1,674,848 lbs., at .01 $\frac{1}{16}$		24,285 59		
“ 250 lengths—10-inch— 169,712 lbs., at .01 $\frac{1}{16}$		2,426 89		
“ 75 lengths—16-inch—99, 368 lbs., at .01 $\frac{1}{16}$		1,411 02		
“ 125 lengths—20-inch— 215,602 lbs., at .01 $\frac{1}{16}$		3,040 00		
Lead (pig), 100,664 lbs., at .04 $\frac{1}{16}$		4,922 46		
Lumber.....		2,510 85		
Machine work.....		179 90		
Measuring over pipe.....		1,812 50		
Plumbing.....		7 50		
Parts of water meters.....		338 67		
Powder, blasting.....		191 48		
Repairs to house injured by blasting.....		97 00		
“ pavements.....		187 69		
“ tools.....		141 69		
Rent of shop.....		50 00		
Services of diver.....		232 00		
Spars.....		30 00		
Stop valves, 25 lengths—3-inch—at \$25.45.....		637 50		
Stop valves, 25 lengths—4-inch—at \$72.25.....		1,806 25		
Supporting tracks.....		19 95		
Transportation.....		121 80		
Traveling expenses (pipe inspector)....		93 36		
Wages, First District.....		11,451 99		
“ Second “.....		10,564 86		
“ Third “.....		15,019 27		

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 5, continued.				
Wages, Fourth District.....		\$22,144 11		
" Fifth " 		4,170 41		
" Sixth " 		6,889 03		
Improvement to distribution.....		5,763 00		
Buildings, grounds, and reservoirs.....		753 25		
Totals.....		\$140,940 64	59 36	
Item 6. For supplies and labor at the city repair shop.....\$50,000 00				
Increased by transfer from Highways, December 24..... 1,000 00				
Net appropriation to Item 6.....	\$51,000 00			
Deficiencies of 1886:				
Bricks, lime, and cement.....		\$572 43		
Bricks, lime, and cement, 1887.....		239 17		
Brass castings, 20,405½ pounds, at 10%.....	\$2,219 11			
Brass castings, 4,414¼ lbs. at 13.....	573 90			
Brass castings, 120 pounds, at 22.....	26 40			
	\$2,819 41			
Item 5 A.				
2,985 pounds scrap brass, at 6 cents.....	\$179 10			
4,000 pounds turn- ings, at 5 cents.....	200 00			
	\$379 10			
		2,440 31		
Brass fittings.....		194 80		
Brushes.....		8 93		
Calometer.....		4 00		
Chandlery.....		429 65		
Fire brick.....		19 25		
Galvanizing.....		226 08		
Gas fittings.....		55 00		
Gum goods.....		300 71		
Gum valves for plugs.....		500 00		
Hardware.....		1,536 72		
Iron (bar).....		1,257 69		
Iron fittings.....		161 74		
Lumber.....		1,398 34		
Machine work.....		10 55		
Paraffine.....		10 40		
Repairs to roof.....		69 78		
Shop castings, 281,264½ lbs., at 3½c.....		9,844 27		
" " 49,780 " at 3c.....		1,493 40		
Wages.....		30,207 72		
Totals.....		\$50,998 94	\$1 06	

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 7. For general, incidental, and contingent expenses, including six hundred and fifty (650) dollars for keep of horse for Chief Engineer, and seven hundred and fifty (750) dollars for keep of horse for General Superintendent and Ass't Engineer.				
	\$15,000 00			
Increased by transfer from December 21.....	1,000 00			
Net appropriation to Item 7.....		\$16,000 00		
Deficiencies of 1886:				
Incidentals.....	\$169 00			
Maps.....	59 00			
Stationery.....	716 24			
			\$984 30	
Advertising.....			518 00	
Carriage hire.....			110 45	
Desks, chairs, &c.....			899 00	
Incidentals, hydrostatics.....			263 22	
" office.....			476 63	
Ice.....			495 47	
Keep of horse:				
Chief Engineer.....	\$650 00			
Supt. & Assistant Engineer.....	750 00			
				1,400 00
Maps.....			120 00	
Meals.....			193 10	
Rent of shop.....			50 00	
Subscriptions.....			20 50	
Stationery.....			5,217 74	
Telephone rental.....			316 25	
Transportation.....			1,531 70	
Washing towels.....			84 00	
Wages, hydrostatics.....			992 00	
" office.....			2,233 50	
Totals.....		\$15,933 86	\$66 14	
Item 8. For the further extension of the Water Works.....	\$300,000 00			
Deficiency of 1886:				
Repairs of tur-				
bines.....	\$8,221 22			
Iron pipe and				
specials.....	27,992 86			
		36,314 08		
			\$263,685 92	
Amount set aside for the completion of the small section of East Park Reservoir, and called for convenience Item 8-A.....		100,248 25		
Bricks, lime, and cement.....			\$583 47	
Cable for telephone.....			230 43	
Chandlery.....			5 85	
Carriage hire.....			107 40	
Gun goods.....			115 00	
Hardware.....			55 00	
Incidentals.....			53 14	
Iron bar.....			372 19	
Iron castings.....			1,434 13	
Iron fittings.....			194 08	

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 8 A, continued.				
Lining basin.....		\$59,155 53		
Lumber.....		1,018 23		
Machine work.....		50 00		
Portable engine.....		875 00		
Testing machine.....		109 90		
Horses, carts and drivers.....		5,964 04		
Horses and drivers for rollers.....		231 64		
Wages.....		29,665 84		
Totals.....		100,220 96	27 29	
Amount set aside for a 30-inch main: from Wentz farm to Fairhill basin, and called for convenience Item 8— B..... \$163,437 67				
Increased by transfer: From Highways, Dec. 24 1,800 00				
Net appropriat'n to Item 8—B.....	\$165,237 67			
Hauling pipe.....		\$2,349 04		
Incidentals.....		194 70		
Lead (pig) 231,687 lbs. at .04 $\frac{3}{4}$		11,329 47		
Lumber.....		309 61		
Stone broken.....		112 50		
Transportation.....		340 00		
Shop castings, 34,423 lbs., at .03.....		1,032 69		
Shop castings, 244,740 lbs., at .03 $\frac{1}{2}$		8,751 93		
Special pipe castings:				
47,087 lbs., at .02 $\frac{3}{4}$		1,153 63		
75,289 lbs., at .02 $\frac{3}{4}$		1,769 23		
Breeches, pipes, 63,154 lbs., at .00 $\frac{3}{4}$		2,463 01		
Iron pipes:				
800, 30-inch, 2,637,825 lbs., at .01 $\frac{3}{4}$		30,435 62		
1201, 30-inch, 3,981,143 lbs., at .01 $\frac{3}{4}$		63,698 34		
Pipe trench excavation.....		7,922 16		
Wages, First District.....		1,517 74		
“ Second “.....		1,924 12		
“ Third “.....		3,135 99		
“ Fourth “.....		13,118 75		
“ Fifth “.....		774 06		
“ Sixth “.....		1,360 62		
“ improvement to distribution.....		1,515 75		
“ pipe inspection.....		1,198 00		
Totals.....		\$165,236 87	80	
Transferred from Surveys and In- spectors of County Prison to Item 8, for June 21, 1887. Extensions. Called for convenience Item 8—C..... \$30,000 00				
Bricks, lime and cement.....		\$139 58		
Brass castings.....		80 42		
Chandlery.....		80 01		
Corporation cocks 1,995, $\frac{1}{2}$ in., at 55c.....		1,096 25		
Coke.....		31 10		
Dynamite.....		29 00		
Gum goods.....		93 48		
Hauling pipe.....		1,919 24		
Incidentals.....		68 04		
Iron pipe, 864, 6-inch, 318,923 lbs., at .01 $\frac{3}{4}$		4,624 37		

Detailed Expenditures of the Department for 1887.

General Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 8 C, continued.				
Iron specials, 9,350 lbs., at .02 ³⁵ / ₁₀₀		219 73		
Iron specials, 35,953 lbs., at .02 ³⁵ / ₁₀₀		880 85		
Lead (pig), 10,047 lbs., at .04 ⁸⁹ / ₁₀₀		491 29		
Lumber.....		549 09		
Measuring over pipes.....		26 81		
Powder, blasting.....		61 65		
Supporting tracks.....		19 89		
Wages, First District.....		\$2,606 62		
“ Second “.....		3,064 00		
“ Third “.....		3,867 12		
“ Fourth “.....		4,455 01		
“ Fifth “.....		1,475 39		
“ Sixth “.....		2,540 82		
Improvement to distribution.....		1,871 50		
Totals		\$29,982 26	\$1,774	
Special Appropriation.				
To maintenance and repairs to build- ings, grounds, and reservoirs:				
Transferred from surplus Gas Loan No. 9, November 12, 1887.....	\$3,000 00			
Carpenters.....		\$411 00		
Painters.....		342 00		
Laborers.....		1,886 55		
Telephone rental.....		316 75		
Totals		\$2,986 30		\$13 70
To supplies and labor at the city re- pair shop:				
Transferred from surplus Gas Loan No. 9, November 12th, 1887.....	\$5,000 00			
Galvanizing.....		\$17 60		
Iron bar.....		79 20		
Shop castings, 5,139 ¹ / ₂ lbs., at 3 ¹ / ₂ c.....		1,805 71		
Wages.....		2,097 49		
Totals		\$5,000 00		
For coal transferred from surplus Gas Loan No. 9, November 12, 1887.....				
Coal, 160.18 tons egg, Fairmount, at \$4.50.....	\$2,000 00			
Coal, 223 tons pea, Spring Garden, at \$2.58.....		\$723 98		
Coal, 271 tons pea, Chestnut Hill, at \$2.75.....		530 77		
		745 25		
Totals		\$2,000 00		

Detailed Expenditures of the Department for 1887.

Special Appropriation.	Amount appropriat'd.	Amount expended.	Amount merging.	Amount not merging
Item 8 C, continued.				
For coal transferred from highway, November 12, 1887.....	\$23,000 00			
Coal, 9,974.10 tons pea, Spring Garden, at \$2.38.....		\$16,599 28.		
Coal, 1,746.01 tons pea, Belmont, at \$2.41.....		4,207 91		
Coal, 718.16 tons pea, Roxborough, at \$2.38.....		1,710 74		
Coal, 200 tons pea, Kensington, at \$2.41.....		482 00		
Totals.....		\$23,000 00		
FOR THE EXTENSION OF WORKS.				
Appropriation from surplus of Gas Loan No. 9. Ordinance, May 18, 1886. Balance to credit of item, January 1, 1887.....	\$103,389 37			
Boilers.....		\$26,965 00		
Engines.....		55,200 00		
Rebuilding stack.....		1,237 50		
Stop valves.....		6,160 00		
Totals.....		\$89,562 50		\$13,826 87
An Ordinance to repeal certain twice- paid, over-paid, and paid-in-error water-rent and pipe-laying bills, transferred from surplus, 1882. Bal- ance, January 1, 1882.....	\$394 95			\$394 95
An Ordinance to refund certain twice- paid, over-paid, and paid-in-error water-rent and pipe-laying bills, approved December 12, 1886. Balance January 1, 1888.....	2,475 89	672 29		1,803 60
An Ordinance to refund certain twice- paid, over-paid, and paid-in-error water-rent and pipe-laying bills, approved March 1, 1886. Balance January 1, 1888.....	268 98	16 55		252 43
An Ordinance to refund certain twice- paid, over-paid, and paid-in-error water-rents and pipe bills, approved July 17, 1886..... Balance January 1, 1888.....	834 23	212 70		621 53

Detailed Expenditures of the Department for 1887.

RECAPITULATION.		
Available for 1887.		
Balance January 1, 1887, from Annual Report of 1886.....	\$103,389 37	
Refunds.....	3,974 05	
		\$107,363 42
Annual appropriation.....		871,748 00
Transferred from other Bureaus.....	\$72,800 00	
Transferred to other Departments.....	28,657 59	
		44,142 50
Expended from annual appropriation:		\$1,023,253 92
For deficiencies.....	\$56,150 39	
For extensions.....	265,457 83	
For maintenance.....	599,339 15	
Expended from special appropriation:		911,947 37
Refunds.....	\$901 54	
Extensions.....	89,562 59	
Total expenditure.....		90,464 04
		\$1,092,411 41
Amount merging.....	\$627 03	
Amount not merging.....	20,215 48	
		20,842 51
		\$1,023,253 92

APPENDIX C.

REPORT

OF THE

GENERAL SUPERINTENDENT

OF

WORK DONE DURING 1887 TO BUILDINGS, GROUNDS AND
RESERVOIRS, AND BOILERS AND MACHINERY OF
THE SEVERAL PUMPING STATIONS.

OFFICE OF THE GENERAL SUPERINTENDENT,
BUREAU OF WATER.

January 9, 1888.

JOHN L. OGDEN,
Chief Engineer.

SIR:—The following report of the work performed under my direction for the year 1887 is respectfully submitted:

There have been pumped 32,426,779.765 gallons of water; an increase of 3,767,813.196 gallons over the pumpage of the year 1886.

The maximum daily pumpage was 118,604,079 gallons; an increase of 16,401,222 gallons over the maximum daily pumpage of the preceding year. The minimum daily pumpage was 61,232,735 gallons, an increase of 12,045,131 gallons.

One new pumping engine of 20,000,000 gallons capacity, has been erected at the Spring Garden pumping station. It was built by the Holly Manufacturing Company, of Lockport, New York, and is known as a Gaskill Horizontal Compound Condensing Crank and Flywheel high duty pumping engine. It began pumping September 28; the duty test was made November 29 and 30.

There have also been added at the same station, five new boilers, designed by the Bureau, and built by the I. P. Morris Company of Philadelphia. They are of the type known as the two furnace flue tubular boilers, built of steel throughout, and with Fox's patent corrugated furnaces.

The southern section of the East Park reservoir was completed during the year, and water first pumped into it on November 19.

During the summer months each of the employés of the several stations was granted a vacation of ten days, with pay.

This practice, I think, is conducive of good results, and is highly appreciated by the men, who are capable and attentive to their respective duties.

Respectfully,

F. L. HAND,

General Superintendent.

Summary of the work performed during the year.

FAIRMOUNT.

BUILDINGS AND GROUNDS.

The engineers' office was torn out and refitted with new joists and floors: stairway erected from office to mill house; new closets put in for use of engineers; room fitted up for use of janitor; all sashes in wheel house repaired; new boat built for use of men when working at the turbines; new box drain laid for draining garden: new flash boards placed the entire length of the dam, and apron of dam repaired; new fence built around watch-house and new fence erected on north side of forebay from meter shop to end of wharf; new benches made and placed around garden and reservoir; summer house rebuilt, fence repaired and new steps placed at the bridge entrance.

The piers on abutments of bridge over forebay were torn down and rebuilt for flower urns; new borders laid around grass plots; gutters laid for drains from drinking fountains, and one new fountain erected; gutter and drain laid around abutment on the mound dam; walls in Nos. 7, 8 and 9 wheel

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 “ “

1887.	Running Time of 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.
																	Quarts.	Quarts.
January.....	464	625	690½	683	658	664	660	39,466,512	163,351,201	182,037,861	175,422,486	145,716,675	144,994,525	147,904,900	998,924,100	32,223,358	23	168
February.....	511½	554	660	648½	610½	615½	615	47,137,140	148,019,263	174,321,157	168,824,654	139,758,775	142,393,225	142,823,525	963,277,739	34,402,776	19	203
March.....	523	634½	738	532	695	695	675	50,367,944	176,598,036	204,427,223	131,170,174	163,952,100	164,876,075	159,651,375	1,051,042,927	33,904,610	32	176
April.....	651	659½	698½	685	602	598	607	60,243,356	172,920,639	181,249,526	170,162,937	138,834,475	137,515,300	141,026,600	1,001,952,833	33,398,427	35	137
May.....	635	709	697	708	540½	697	697	62,178,276	189,792,317	183,450,340	178,421,291	125,262,150	158,629,250	158,919,475	1,056,653,099	34,085,583	60	192
June.....	384	663	700½	695	603½	601½	485	36,740,300	171,651,967	183,732,472	168,764,263	137,172,425	134,556,175	108,424,550	941,042,152	31,368,071	50	216
July.....	8	639½	733½	417½	543	516	524	730,780	160,912,511	197,582,295	104,562,176	126,546,550	117,561,600	122,731,050	830,626,962	26,794,418	72	249
August.....	169½	724½	725½	.....	728	721	729	15,611,364	184,779,403	194,208,592	.....	167,265,150	163,892,950	164,001,500	889,848,959	28,704,805	29	222
September.....	663	700	651½	.....	446½	450½	362½	62,236,348	175,358,868	133,327,654	.....	104,800,800	104,551,525	85,893,925	666,169,120	22,205,637	16	182
October.....	728	718½	524	37½	185	188	188	71,971,958	179,391,235	130,142,144	9,684,227	45,571,825	45,978,400	47,023,600	530,763,389	17,121,399	14	140
November.....	685	666	440	273	20½	18½	20½	73,384,320	171,485,085	112,427,297	69,167,518	4,802,525	3,997,175	4,966,000	440,229,920	14,674,330	10	92
December.....	616½	534½	645	603½	4	371	372	69,545,280	142,788,757	172,641,273	155,515,123	924,625	96,120,050	98,670,325	735,205,433	23,716,304	13	144
Totals.....	6,043½	7,829	7,904	5,283	5,636½	6,203	5,935	589,613,578	2,037,049,282	2,049,667,774	1,331,694,849	1,300,608,075	1,415,066,250	1,382,036,825	10,105,736,633	27,716,643	373	2,121

house replastered; joist holes and fireplace in engineer's office walled up; old flagging removed on inside of slope on east side of basin, and slope puddled, graded and lined with brick and grouting; new gutters laid around banks, and new pavement laid over stop house; entire inside of engineers' office, ladies' toilet rooms, police quarters and janitor's rooms painted with two coats of paint and varnish.

Two coats of paint were put on the iron girders in wheel house, No. 5 turbine, sky-light and wall connecting wheel houses, new garden benches, fence around Callowhill street entrance, round house on dam, summer house on basin, fountains, flower urns, stop gates, new fence around forebay and on watch house on basin; windows in buildings glazed and signs lettered.

The entire east wall on Twenty-fifth street was pointed; river wall in front of garden built up; drinking fountain reset; walls in wheel-house repaired; flagging reset in walk from forebay to Green street entrance; drinking fountain along walk on north side of basin reset; walks around basin graded and rolled; forebay at meter shop partly cleaned out; drive-way paved; road from Green street entrance filled with ashes and gravel and rolled; trees trimmed; basins weeded and banks mowed; wheel-houses whitewashed; coal cellars cleaned and whitewashed; roofs repaired; new roof and rain conductors placed on summer house on reservoir; a new reel and hose placed, to be kept in readiness in case of fire.

MACHINERY.

Turbine No. 1.—New blades were put in guide wheel and new floors in flume; pump screens and step repaired; pump bored out and fitted with a new piston and rod; crosshead repaired and brasses fitted to journals; new steel key fitted in spur wheel and new set-screw in bevel wheel; all lost motion taken out of journals; new drip pans placed under bearings.

Turbine No. 3.—New step placed under wheel; side boxes set up; air check valves put in; new studs in gland of upright shaft.

Turbine No. 4.—Wheel examined; step adjusted and studs put in glands of upright shaft.

Turbine No. 5.—Main shaft jacked up and turned and trued up; pillow blocks taken to shop and bored to suit shaft; spur wheel shifted on shaft in order to make it gear correctly; spur and bevel wheels entirely recogged; new crank pin on north side of pump; all brasses fitted to journals.

Turbine No. 7.—The old cornish valves, 26 inches in diameter, were taken out and replaced with new valve seats fitted with 180 four inch rubber valves; step removed and new one placed in position; new studs in gland of upright shaft; all lost motion taken out of journals.

Turbine No. 8.—Step taken out and repaired and adjusted; new studs put in gland; spur and bevel wheels repaired with new cogs, and old cogs trimmed up.

Turbine No. 9.—Old step taken out and new one put in and adjusted; valves taken out and repaired; new studs put in glands and all lost motion taken up.

Iron railing erected at stairway of No. 9 turbine; repaired iron railing around forebay; upright boiler for heating wheel-house thoroughly repaired; twenty-two new tubes put in; hand holes cut in shell; feed and blow-off pipes altered; all heaters throughout the buildings examined and repaired; new pipe laid along forebay for washing decks over wheel-house.

SPRING GARDEN—(New Station).

BUILDINGS AND GROUNDS.

Bridge was built over pumping wells of Nos. 9 and 10 engines; new steps from engine room put up in cellar; frames and sashes fitted to ventilating windows in cellar; closets built for men and for tools; all sashes in boiler and engine-house rehung; doors repaired and rehung. All inside walls, including those of telephone and donkey pump rooms, were covered with three coats of paint, and granited and laid out in blocks; all hard woods cleaned, shellaced with two coats and varnished; all glasses in upper sashes frosted; electric engine room shellaced and varnished; all the outside of engine and boiler house, including roof, painted; cellar floor leveled off,

**NEW SPRING GARDEN
PUMPING STATION.**

No. 9, Worthington Duplex.—Capacity
15,000,000 gallons per day.
No. 10, Worthington Duplex.—Capacity
15,000,000 gallons per day.

Total capacity 30,000,000 gallons per day.

	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. in.	Gallons raised 100 feet per pound of coal.		
	No. 9.	No. 10.	No. 9.	No. 10.					Cylinder.	Quarts.			No. 9.	No. 10.
January.....	744	85½	395,255,703	35,490,290	430,745,993	13,895,029	885 1,946	20	309	101	72	76	346.2	
February.....	607½	64½	264,782,963	28,274,420	293,057,383	10,466,385	620 1,968	19	263	87	75	75	336.0	
March.....	105½	68½	54,438,955	343,618,303	398,057,258	12,841,201	698 1,332	20	311	102	73	73	405.7	
April.....	658¼	667	294,654,442	296,952,054	591,606,496	19,724,216	1,096 269	19	354½	89	77	77	384.3	
May.....	501	694¼	260,433,311	363,128,662	623,561,973	20,111,902	1,056 1,086	19	308	60	73	74	423.2	
June.....	720	694¼	363,663,827	351,976,161	715,639,988	25,852,636	1,239 590	19	287	60	75	75	411.1	
July.....	742	733¼	387,414,219	385,944,151	773,358,370	24,917,041	1,322 1,793	20	297½	62	75	75	416.3	
August.....	719	731½	395,819,173	394,706,241	790,525,414	25,525,755	1,424 1,956	20	339½	62	71	74	395.0	
September.....	693¼	690	370,423,496	372,576,456	742,999,952	24,766,665	1,320 1,721	19	349½	60	71	71	400.5	
October.....	620	682¼	337,874,272	378,860,659	716,734,932	25,120,772	1,278 300	19	338½	62	75	75	399.3	
November.....	552	552¼	309,145,331	301,371,509	610,516,840	21,051,561	1,062 945	20	307	60	74	75	392.0	
December.....	580	584¼	297,245,563	290,549,062	598,794,625	19,251,439	1,153 1,618	19	324½	54½	78	75	368.3	
Totals and averages.....	7,263¾	6,864¼	3,722,111,256	3,552,516,878	7,274,628,134	19,930,488	13,189 2,073	19	3,809	850½	74	75	392.7	

cemented, and walls plastered; windows cut through foundation walls for ventilation; wall built up around ash pit; grounds in front of works leveled off and sown with grass seed; river wall built up from gates of conduit to tunnel; fence put up under bridge; drains laid for draining the grounds in front of engine-house; flower beds laid out and the grounds kept in good condition. In the electric engine room a zinc floor was laid and the sides lined with zinc.

ENGINES.

Engine No. 9.—Heads were removed on high and low pressure cylinders; elliptic springs put in low pressure pistons to set out packing rings, and cast-iron blocks put in to take the weight off pistons. All steam chest covers were removed in order to examine and reset valves; one new valve rod put in; made new joints on cylinder heads, steam chests, steam pipes, stop valves, and bonnet of cut-off valve; altered jacket, steam pipes and lowered traps; new studs, guards and valves put in air pump, and pumps refastened to foundation; refastened all pump valves on suction side with rust joints and bolts and lugs; all old valves removed and replaced by new ones; lagging around steam cylinders rubbed and varnished, and pumps cleaned and varnished.

Engine No. 10.—Repaired broken bell crank; elliptic springs put in low pressure piston; high pressure piston rings set out; all new joints made as in engine No. 9; altered jacket steam-pipes and traps; new studs put in air pumps and pumps refastened to foundation; lagging around steam cylinders rubbed and varnished, and pumps cleaned and varnished. The two electric engines were painted, striped and varnished; steam-pipes covered and new joints made; all lost motion taken up; exhaust from engines turned into the flue of boilers; donkey pumps repaired with new piston rod, and frequently packed; all screens frequently cleaned.

BOILERS.

Marine Boilers Nos. 22 to 27 and 30 to 33, all inclusive.—New joints made on all steam, feed and blow-off pipes; stop valves altered so that they could be properly drained; all water columns altered to blow directly into fire room instead of into blow-off pipes; new studs put in all furnace fronts; feed pipes altered to feed into bottom of boilers; all boilers scaled and cleaned.

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.

1887.	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 square inch.				Gallons raised 100 feet per pound of coal.
	No. 6.	No. 7.	No. 8.	No. 11.	No. 6.	No. 7.	No. 8.	No. 11.	Gallons.	Gallons.	Tons.	Lbs.		Cylinder.	Engine.	No. 6.	No. 7.	No. 8.	No. 11.	
January		56 $\frac{3}{4}$	496 $\frac{1}{2}$			37,127,560	198,308,320		235,435,880	7,594,705	457	277	19	121	52 $\frac{1}{2}$		43	71		366.7
February			600						221,045,040	7,894,465	456	962	19	66	16			77		344.8
March			508 $\frac{1}{2}$						189,028,000	6,097,677	411	112	19	92	22 $\frac{1}{2}$			74		327.4
April			627 $\frac{1}{2}$						271,684,000	9,056,133	489	1,412	19	165 $\frac{1}{2}$	32			63		385.9
May	117	59 $\frac{1}{4}$	695 $\frac{1}{2}$		45,855,000	41,799,630	316,794,800		404,449,930	13,046,771	687	964	19	267	98 $\frac{1}{2}$	43	43	71		418.9
June	33 $\frac{1}{2}$	317 $\frac{1}{2}$	710		10,380,500	226,718,650	348,901,840		586,000,990	19,533,366	827	454	19	322 $\frac{1}{2}$	161	43	43	65		504.4
July	60	576 $\frac{1}{2}$	740 $\frac{1}{4}$		22,212,500	435,837,150	365,279,600		823,329,250	26,559,068	1,017	1,395	20	389 $\frac{1}{2}$	273	43	44	65		576.1
August		464 $\frac{1}{4}$	738 $\frac{1}{4}$			356,738,150	360,408,760		717,146,910	23,133,771	992	1,564	20	334 $\frac{1}{2}$	236		44	65		514.4
September	7	559 $\frac{1}{4}$	706 $\frac{3}{4}$	12 $\frac{1}{2}$	2,675,500	442,125,230	346,470,320	7,400,000	798,671,050	26,622,368	1,089	57	20	357 $\frac{1}{2}$	181	43	43	65	44	526.5
October		500 $\frac{1}{2}$	732 $\frac{3}{4}$	257 $\frac{1}{4}$		391,495,230	355,490,240	174,779,200	921,764,670	29,734,344	1,171	102	19	356	158		44	66	44	560.4
November		157	690 $\frac{1}{4}$	576 $\frac{1}{4}$		116,962,770	328,437,200	418,486,400	863,886,370	28,796,212	1,164	1,179	19	267 $\frac{1}{2}$	101		43	68	46	528.2
December		154 $\frac{1}{4}$	610 $\frac{1}{4}$	52 $\frac{1}{2}$		116,452,320	295,693,440	42,143,200	454,288,900	14,654,482	779	452	19	206 $\frac{1}{2}$	65 $\frac{3}{4}$		43	67	46	415.1
Totals and averages..	217 $\frac{1}{2}$	2,845 $\frac{1}{4}$	7,854 $\frac{1}{2}$	898 $\frac{1}{2}$	81,124,000	2,165,256,690	3,597,541,560	642,808,800	6,486,731,050	18,758,157	9,533	2,210	19	2,945 $\frac{1}{2}$	1,397 $\frac{1}{2}$	43	43	68	45	484.4

SPRING GARDEN—(Old Station).

BUILDINGS AND GROUNDS.

Door jamb in boiler house and window frames in engine house removed in order to get boilers and engine in, and afterwards replaced; new blacksmith shop built with a tool room over it for the foreman laborer, and steps erected outside; tool rooms for foreman bricklayer and stonemason fitted up; new paint shop in storeroom built and fitted up with shelves; new steps laid from general store house to engine room; door, stalls and floor of stables repaired; floor of engine house torn out and relaid after engine had been erected, with new joists and new floor; new wainscoting in engine room and around new engine; old gallery torn down; new steps built in No. 7 room and in cellar of No. 6. Moulding for electric light wire was run around forebay; two coats of paint put on the entire length of coal shed; outside of general storehouse, including roof, roofs of engine and boiler houses, machine shop and floor of No. 6 engine room were painted; all sashes and doors painted, grained and varnished; window frames of No. 7 engine house painted and granited, and smoke stack painted.

The bridge over forebay was painted, and the railing and lamp posts around it were painted, bronzed and varnished; all new hard woods in and around new engine room filled, shellaced and varnished.

The foundation of old No. 4 engine was torn down and cellar cleaned out and leveled up for foundation of new engine; the well was covered over with 12-inch I beams, and the stone foundation laid on the beams; cellar walls cleaned and dashed with cement; stone steps erected to fire room from cellar, and passageway cut through to No. 7 cellar; walls torn out and a new pump room made under No. 6 room; walls of building torn out to get new boilers and engine into place and afterwards built up; piers built for pumping main; steps laid from new to old fire room; arches turned for delivery pipes of new engine and piers built for heaters; the walls of new boiler room were packed, plastered and laid out in blocks; floor graded and paved; railroad track and fire room plates put down; ash pit paved and wall built around it; cement pavement laid between and along side of railroad track from fire room to coal shed; drains laid and inlet built to drain grounds around old engine house. All the walks around machine shop

were graded and paved; grounds around station kept clean and lawns mowed; cellars and boiler rooms whitewashed, and the under side of coal chute cleaned and whitewashed; forebay and screens frequently cleaned.

ENGINES.

Engine No. 6.—Plunger on crank end taken out; bucket repaired, new rod put in through plunger and bucket; plunger packed, new joints made on pumps; discharge valves repaired; wells pumped out; receiving valves to both pumps examined; steam valves ground in; air pump examined; piston repaired.

Engine No. 7.—All bearings examined and leads taken from them; removed heads of high and low pressure cylinders; pistons examined, packing set out; steam chest covers taken off, valves examined and reset; air pumps examined, valves renewed and piston packed; pump bonnets taken off and new valves and springs put in where required; through bolts put in air pump crosshead in place of studs; water-pipes run to all bearings.

Engine No. 8.—New foot valves put in; air pump fitted with new valves and studs; new wrist pin in bell crank; steam valves reset.

Donkey pumps repaired and erected in a new room prepared for them under the floor of No. 6 engine room, and connected up to pump into all boilers and to drain the pump wells.

BOILERS.

Boilers Nos. 7 to 11, inclusive.—New joints made on cross pipes; stop valves overhauled and ground in; stop safety valves, blow off and water columns all cleaned; new through bolts put in to hold fronts in place; floor plates renewed; platform erected around boilers; boilers scaled and cleaned; furnaces and bridge walls repaired.

Boilers Nos. 12 to 21, inclusive.—All valves examined, ground in and packed; new joints made on steam, feed and blow off pipes, and water columns cleaned; ash pit doors fitted on boilers Nos. 17 to 21, inclusive, and furnaces altered for

McClave's patent shaking grate bars; boilers scaled and cleaned. All the brickwork of boilers Nos. 12 to 21, inclusive, was torn out, bricks cleaned, and the boilers blocked up and reset.

Boilers Nos. 34 to 38, inclusive.—These are five new steel furnace flue tubular boilers, erected and connected complete, with steam pipes, safety valves, feed pipes, surface and bottom blows, gauge cocks, glass gauges and damper regulators. The boilers are so arranged that any of the engines at the old station can be run by them. Boilers painted, all pipe and connections blacked, and new foundations built.

EAST PARK RESERVOIR.

During the year the southern division of the reservoir was completed. Work was begun on March 16, with a laboring force, to clear the bottom and slopes of a growth of trees and saplings, the roots of which had penetrated deep into the earth. The entire surface of the inside slope was washed down at various depths, making deposits in the bottom of the basin extending as far as fifty feet from the foot of slope, with an average depth of two feet. Especially was this marked upon the northern slope of the embankment that divides the northern from the southern division, in which case the cuts reached to the centre of the top of the embankment.

During the month of March a survey was made of this division, resulting in the locating of the original centre lines, from which the positions of the top and foot of slope were determined, with a view to the most economical working lines. A frame building, 16 by 40 feet, was built on the northern side of the stop house, partitioned off for office and tool and store room. A gangway, 317 feet long, 18 feet wide, with a rise of 28 feet, with guard and safety rails, was erected in the southern side of the basin. Steps were built for ascending and descending the banks both inside and out.

In the month of April the force was increased and the work of restoring the banks was begun by puddling. The method employed was to cut benches into the embankment, of a sufficient width to secure a base for the puddle to rest on, which was applied in layers four inches high and thoroughly rammed. The bottom and slopes were completed by contract work begun

on August 3. The bottom was lined with concrete five inches thick, mixed in the proportions of one part cement, two parts sand, and four parts broken stone. The best brands of Portland cement, bar sand, and hard lime-stone were used. All cement was tested, resulting in an average tensile strain of 340 pounds per square inch, after being allowed to harden in water for seven days. All the sand used was screened. The stone was clean angular, $1\frac{1}{2}$ -inch ring stone. The mixings were made on platforms, then evenly spread upon the clay bottom and consolidated by ramming. A covering composed of two parts sand and one part cement was laid on top of concrete, floated and trowel finished.

The slopes in the entire area were lined with brick set on edge in cement mortar two inches thick, composed of one part cement and two parts sand. The bricks used were hard burned, well shaped and of good wearing qualities. The work of the contractors was completed November 19.

A brick curbing 2,500 feet in length was laid in two inches of cement on the top of slopes. The manholes to the stop-chambers on the division banks were raised to the top of the embankments. The stop-houses of this section were cleaned out and bottom repaired and cemented; the walls entirely repointed with cement mortar; the wing walls repointed and repaired and covered with cast-iron plates; the buttresses covered with cement copings. The top was set with beams for supporting grating, and brackets for the gate hoists; ten iron gates set with grouted joints of pure Portland cement, and rods put in to operate them from the top of stop-house; wire screens placed in all communications between basins and the water mains, communication between the two basins shut off by a heavy plank bulk head of two thicknesses, filled between with cement. The brick piers supporting the pipes connecting the several sections were rebuilt and the stops overhauled. The old terra cotta drain of this section of the reservoir was found to be clogged up with clay, and was taken out and a ten inch iron pipe laid, and provided with a new stop. The masonry and brickwork throughout were repaired; a fence of yellow pine was placed around the top of the basin; the office was connected by telephone to the Spring Garden Station by an underground cable laid in a wooden box built for it and run into the trench of the pumping main.

The dimensions of the completed section are :

Area of bottom.....	32,388 square yards.
Area of slopes.....	13,469 " "
Elevation of bottom.....	108.462 feet C. D.
Elevation of water line.....	133.417 " "
Elevation of top of embankment.....	137.385 " "
Distance around top of slope.....	2,500 feet.
Distance around foot of slope.....	2,200 feet.
Capacity.....	62,000,000 gallons.

CORINTHIAN AVENUE BASIN.

Slopes were weeded and repaired; banks sodded; trees trimmed, and dead ones cut down and removed; stumps of trees on Poplar street dug up and removed; sidewalks on Poplar and Twenty-second streets repaired; gutters made to run water off from leak in the wall on Twenty-second street; cedar posts placed around top of the bank and wire fence erected; inclines graded and a fence run up; coal boxes built and placed at watch house.

SPRING GARDEN BASIN.

Inside slope of southern bank and division bank repaired, and stop houses repaired, cleaned and whitewashed. Inside slopes of basin kept free from weeds, and grass taken out of bottom.

BELMONT.

BUILDINGS AND GROUNDS.

Platform built over forebay the length of engine room; new steps and screen racks made; also frames for cellar windows; sashes in engine room repaired; closets built for use of firemen; new door jambs placed in oil room; new floor partly laid in engine room; bath room and tub repaired; new gate made for inlet on tow path; windows glazed and painted; new closets, door frames in oil room, flower boxes and smokestack painted; addition to base of smokestack built; arch turned over gate at conduit on tow path; new pavements laid

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

BELMONT PUMPING STATION.

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

1887.	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 Menn Section Lift in lbs. per sq. inch.	Gallons raised 100 ft. per pound of coal.		
	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.		Qts.	Qts.			No. 1.	No. 2.	No. 3.
January	50	84	570	11,912,100	20,860,941	208,929,755	241,702,799	7,796,864	563	1,859	15	69 1/4	22 1/2	88	88	88	421.6
February	181 1/2	188 1/2	356 3/4	43,398,900	46,977,840	135,013,330	225,390,070	8,019,645	560	1,370	14	75	29 1/4	88	88	88	388.0
March	189 3/4	368 1/2	221	45,756,600	94,191,552	81,358,680	220,306,832	7,106,672	511	1,777	15	74 3/4	17 1/2	88	88	88	113.0
April	219	256 3/4	409 1/2	52,653,600	64,625,184	132,527,705	249,806,489	8,326,882	611	126	15	87	18 1/4	88	88	88	394.5
May	36	65	675	8,589,300	16,507,920	261,719,095	286,816,315	9,252,139	641	296	15	90 1/2	19 1/4	88	88	88	431.7
June	261	271	397 1/2	64,106,400	69,726,384	151,358,315	285,191,099	9,506,369	638	1,850	15	89 1/4	19 1/2	88	88	88	437.8
July	497 1/2	577 3/4	180	121,761,900	148,344,456	68,893,765	339,000,121	10,935,487	787	77	15	104 3/4	27	88	88	88	413.7
August	96	237 1/2	629 1/2	22,522,800	56,809,896	240,647,785	319,989,481	10,321,951	708	1,661	16	92 1/2	25 3/4	88	88	88	435.7
September	217	187	523 1/4	51,115,500	46,028,424	202,147,030	299,290,954	9,976,365	671	80	19	95	22 3/4	88	88	88	431.8
October	303	379	368	69,293,100	91,201,968	138,167,770	298,662,838	9,634,285	606	1,473	15	101 1/4	26 3/4	88	88	88	475.1
November		23 1/2	687 1/4		6,132,984	252,578,300	258,711,284	8,623,709	503	61	15	68 3/4	15 1/2		88	88	498.1
December	213	432 3/4	254 1/2	45,474,900	106,567,344	87,346,075	239,388,319	7,722,203	501	915	14	80	22 1/4	88	88	88	460.7
Totals and averages.	2,263 3/4	3,071 1/4	5,272 1/4	536,585,100	767,974,896	1,959,687,605	3,264,247,601	8,943,144	7,308	345	15	1,028	26 6 3/4	88	88	88	431.0

in the fire room of the tubular boilers; drains laid for draining fire rooms; pavements and turn tables repaired; grounds graded, fence erected around drive, fire room whitewashed; buildings and grounds kept in good condition.

RESERVOIR.

Slopes repaired; banks mowed and kept free from weeds.

ENGINES.

Engine No. 1.—Heads of high and low pressure cylinders taken off and the pistons examined; new joints made on heads; slide valves taken out and rebored; balance piston overhauled; new pins made for holding rods; new joints made on steam chest, steam-pipe and stop valves; lubricator and registers overhauled; drip-pipes examined; air-pumps repaired and packed; brass boxes fitted to journals; new drip pans placed under guides; pumps cleaned out, valves examined and new ones put in where needed; bands for lagging shifted.

Engine No. 2.—New elliptic springs put in low pressure pistons, and cast iron blocks put under pistons to take the weight; new joints made on high and low pressure cylinder heads and steam chests, steam-pipes and stop valves; stop and cushion valves packed; balance pistons examined; new drip pans placed under guides; air-pumps examined, and new valves and springs put in where needed; new bolts in foundation of air-pump; pumps cleaned out, valves examined and new ones put in where required; bands for lagging shifted.

Engine No. 3.—High and low pressure pistons overhauled, and new joints made on high and low pressure cylinder heads; steam chest bonnets taken off, valve rods sent to machine shop and repaired; new joints made on steam-pipe and stop valves; slide and piston valves examined, new wrist pins made and valves reset; new joints made on bonnets; lubricator repaired; rock shafts trued up, and pistons overhauled and packed; new brass studs, valves and guard plates put in pumps; new drip pans placed under guides, and bands for lagging shifted.

Donkey pump overhauled and new springs and valves put in; stuffing boxes and valves packed, and all lost motion taken up on journals.

ROXBOROUGH.

BUILDINGS AND GROUNDS.

New cornice put on engine house: tool house built at end of coal shed: house built over coal scales: new top put over the stop of conduit: tanks erected for testing new marine boilers; pavement in fire room relaid, railroad tracks reset, and turn table repaired: foundation of No. 3 engine repaired; stop covers, new cornice around engine house, and fence around engineer's residence painted: new glass put in engine and fire rooms: coal shed and fire room whitewashed: grounds cleared up: cellar and well cleaned out.

RESERVOIR AND AUXILIARY STATION.

New covers made for stop houses and new beams put in for operating stops: engine and fire room whitewashed: grounds weeded and banks mowed.

ENGINES.

Engine No. 2.—New brass boxes made and fitted to wrist pins in bell crank: air-pumps overhauled: pump heads taken off, pumps cleaned out, and old valves and broken springs taken out and replaced by new ones, where necessary.

Engine No. 3.—Heads of high and low pressure cylinders taken off, followers removed from pistons, new elliptic springs put in, low pressure pistons and cast iron blocks put under both pistons to take the weight: bonnets taken off steam chests, slide valves and balance pistons examined: new joints made on high and low pressure cylinder heads and steam chest's bonnets: air-pumps examined and buckets packed: heads and bonnets taken off pumps: pumps cleaned out, old valves and broken springs taken out and replaced by new ones, where necessary.

Donkey pumps altered to exhaust into condensers.

BOILERS.

Marine Boilers Nos. 1, 2, 3, and 4.—New joints made on stop, feed and safety valves, and all valves ground in: water columns taken down, pipes cleaned out, and new gauges fitted

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

1887.	Running Time of each Engine in Hours.		Gallons Pumped by each Engine.		Total Pumpage of each Month.	Average Pumpage per Day.	Coal.		Percentage of Shares.	Oil.		Mean Water Pressure and Mean Suction Lift in lbs. per sq. in.		Gallons raised 100 feet per pound of coal.
	No. 2.	No. 3.	No. 2.	No. 3.	Gallons.	Gallons.	Tons. Lbs.			Cylinder.	Engine.	No. 2.	No. 3.	
							Quarts.	Quarts.						
January	608½	.....	146,208,785	.....	146,208,785	4,716,412	602	1,591	19	185	62¼	152	.....	400.2
February	223	348	18,393,570	90,149,181	138,842,751	4,958,669	540	618	20	188	52½	152	156	424.0
March	148	139	109,199,855	31,432,047	140,631,902	4,536,512	578	2,066	19	179½	57	154	155	409.8
April	290	272	70,111,485	72,783,990	143,195,475	4,773,182	558	1,665	21	199½	71¼	157	157	422.8
May	330	317	80,464,790	86,536,050	167,000,840	5,387,123	638	1,445	22	246½	65½	159	156	431.4
June	156	490	38,882,180	135,614,796	174,526,976	5,817,565	678	1,569	21	229½	75	157	157	424.2
July	22	707	5,746,600	244,090,681	249,837,281	6,768,944	812	672	22	225½	65	158	158	426.2
August	254½	450½	68,580,420	132,935,212	201,535,632	6,501,149	771	1,351	22	219½	63½	160	160	430.9
September	372	294	101,400,055	82,561,968	183,965,023	6,132,167	721	1,285	25	211	62	160	160	420.6
October	253½	415	69,633,865	117,784,791	187,418,656	6,045,763	756	1,788	24	222½	59½	159	159	408.6
November	166	421	43,858,240	124,559,673	168,408,913	5,613,630	679	1,626	21	185	19½	158	159	408.8
December	85	459	22,543,605	133,872,742	156,415,347	5,046,946	618	1,511	25	179½	44	157	158	417.1
Totals and averages.	3,208½	4,306½	805,323,450	1,212,661,131	2,017,987,581	5,528,733	7,958	1,543	22	2,471	727	157	157	418.0

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.

1887.	Running Time of each Engine in Hours.		Gallons Pumped by each Engine.		Total Pump- age of each Month.	Average Pumpage per Day.	Coal.		Percentage of Ashes.	Oil. Cylinder. Quarts.	Mean Water Pressure.	
	No. 1.	No. 2.	No. 1.	No. 2.	Gallons.	Gallons.	Tons.	Lbs.			No. 1.	No. 2.
January.....	27	38	505,950	458,755	964,705	31,119	11	1,162	19.	7½	34	34
February.....	23	39	468,659	505,791	974,441	34,801	8	2,032	19.	6	35	35
March.....	25	47	450,750	571,032	1,021,782	32,960	8	624	19.	6	35	35
April.....	27	45	531,800	462,143	993,943	33,131	6	1,025	19.	7½	35	35
May.....	33	43	744,150	497,337	1,242,087	4,067	5	748	19.	7	36	36
June.....	23	54	548,300	634,414	1,182,714	39,423	4	850	19.	7½	36	36
July.....	24	63	631,500	739,629	1,371,129	44,229	4	725	20.	4	36	36
August.....	29	50	660,400	601,929	1,262,329	40,720	4	1,152	20.	6¼	36	36
September.....	39½	38	918,150	454,927	1,373,077	45,769	4	622	19.	7	36	36
October.....	16	49	374,350	563,629	937,979	30,257	4	1,252	19.	6½	36	36
November.....	21	50	405,950	579,964	985,914	32,863	6	257	19.	7½	36	36
December.....	17	52	435,000	594,341	1,029,341	33,204	7	954	19.	3½	36	36
Totals and averages.....	304½	568	6,674,950	6,664,491	13,339,441	36,546	76	183	19.	76¼	36	36

to them; new blow-off-pipes put in; ash pan doors all made new; cast iron doors put in bridge walls in ash pits for cleaning out combustion chambers; boilers scaled and cleaned; bridge walls rebuilt.

Boilers Nos. 5, 6, and 7.—New joints made on steam, stop and safety valves; steam-pipe altered; water columns examined; new through bolts put in for binding walls together; boilers scaled and cleaned; furnaces relined.

Boilers Nos. 8 and 9.—Furnace flue tubular. New boilers connected up complete with steam, safety valve, feed, blow and surface valves; steam-pipe altered by putting in copper expansion bends; damper regulators put up and all gauge connections made.

MOUNT AIRY.

BUILDINGS AND GROUNDS.

Engine and fire rooms whitewashed; grounds cleared up; basin weeded and banks mowed; six-inch pipe run from engine room to low grounds at foot of bank to turn high pressure exhaust into; station supplied with 200 feet of hose with reel, to be kept in readiness in case of fire.

ENGINES.

Engine No. 1.—Piston of engine taken out and packing set out; air pumps examined and repaired; new feed pipe run to boilers.

Engine No. 2.—Piston and valves examined; exhaust turned into pipe laid under ground.

BOILERS.

New joints made on boilers; safety valves examined; water columns cleaned out; boilers scaled and cleaned; furnaces relined.

Total Capacity.—2,000,000 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.

1887.	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.	Quarts.		Quarts.	No. 1. No. 2.			
												No. 1.	No. 2.		
January.....		744		24,261,000	24,261,000	782,612	56	1,341	20	31	15½	57	255.2		
February.....		672		21,901,500	21,901,500	782,196	51	1,908	19	28	14	57	251.5		
March.....		744		24,334,000	24,334,000	784,967	58	1,035	20	31	15½	57	247.7		
April.....	75	645	2,469,250	21,397,000	23,866,250	795,541	60	362	21	35¼	15	57	236.2		
May.....	327	417	10,706,625	15,115,125	25,821,750	892,959	69	1,898	20	43¼	15½	57	220.1		
June.....		720		26,318,250	26,318,250	877,275	53	1,907	20	31¼	15	57	291.0		
July.....		744		28,738,750	28,738,750	927,056	55	1,734	19	32	15½	57	306.8		
August.....		744		29,189,250	29,189,250	941,588	55	1,338	20	31½	15½	57	312.6		
September.....		720		27,785,250	27,785,250	926,175	55	1,813	19	30	15	57	296.4		
October.....		744		27,695,000	27,695,000	893,387	55	242	20	32	15½	57	299.2		
November.....	36	684	1,157,125	24,841,875	25,999,000	866,633	55	871	20	32	15	57	279.5		
December.....		744		25,790,750	25,790,750	831,959	54	1,080	20	31	15½	57	281.9		
Totals and averages..	438	8,322	14,333,000	297,367,750	311,700,750	853,974	682	2,089	20	388¼	182½	57	271.0		

CHESTNUT HILL.

BUILDINGS AND GROUNDS.

Coal shed completed; engineers' house repaired; scaffold erected for use of painters in working on the tower; tower filled in on the outside with cement and then dashed; roof, doors, steps, and windows repaired; new rail put on top; windows glazed and sashes painted; tank, top of tower, coal shed, roofs of engine and fire rooms painted; engine and fire rooms whitewashed; dam cleaned of all floating debris.

ENGINES.

Engine No. 1.—Pistons examined and packing rings set out; valves renewed where necessary.

BOILERS.

New joints made on steam pipes and safety valves; water columns and feed pipes examined; injector and damper regulator put on No. 1 boiler.

FRANKFORD.

BUILDINGS AND GROUNDS.

Coal shed raised over entire length of car tracks and inside lined; roof repaired and covered with tin; shed painted and bulkhead put in to protect scales; engine room painted inside and out; sashes in all windows rehung, scraped, and varnished; windows glazed; new rain conductors put on engine rooms; brick pier built in engine room for brace to pedestal of No. 2 engine; station supplied with fire hose and reel; wharf in front of coal shed repaired with new cap log and the derrick altered.

WENTZ FARM RESERVOIR.

Slope repaired from six to ten feet line; stop-house repaired, banks weeded and kept mowed.

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.

1887.	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. in.		Gallons raised 100 feet per pound of coal.
	No. 2.	No. 3.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.		Quarts.	Quarts.	No. 2.	No. 3.	
January		744		8,395,920	8,395,920	270,836	27	255	18	15½	15½		53	171.2
February		672		7,516,089	7,516,080	238,431	24	1,294	18	14	14		53	169.1
March		744		8,339,760	8,339,760	269,024	27	1,514	18	15½	15½		53	166.6
April		720		8,667,360	8,667,360	288,912	29	1,798	20	15	15		53	168.0
May		744		9,238,329	9,238,320	298,010	31	1,541	21	15½	15½		53	161.2
June.....		720		8,882,610	8,882,610	296,088	30	916	18	15	15		53	161.5
July.....		744		9,771,810	9,771,840	315,220	32	1,089	19	15½	15½		53	166.3
August.....		744		9,846,720	9,846,720	317,636	32	793	18	15½	15½		53	168.3
September		720		9,987,120	9,987,120	332,904	31	1,226	18	21¼	21¼		53	175.1
October.....		744		9,397,440	9,397,449	303,143	29	1,607	18	23¼	23¼		53	174.9
November.....		716		8,464,560	8,464,560	282,152	26	1,393	18	22½	22½		53	175.8
December.....		741		8,236,800	8,236,800	265,703	26	762	19	23¼	23¼		53	172.9
Totals and averages.....		8,753		106,744,560	106,741,560	292,450	350	778	19	21¼	21¼		53	168.0

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

FRANKFORD PUMPING STATION.

No. 1.—Marine Compound Rotary.—
Capacity, 10,000,000 galls. per day.
No. 2.—(Orliss) Compound Rotary.—
Capacity, 10,000,000 galls. per day.

1887.	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.	
January.....	157	58	53,874,558	19,245,927	73,120,485	2,358,725	130	872	23	50	25	74	75	456.1
February.....	107½	67	38,954,856	22,901,535	61,856,391	2,209,156	102	520	22	42	21	76	75	492.1
March.....	49	118	18,453,918	38,646,672	57,100,590	1,841,954	98	1,240	22	42½	21½	75	73	471.2
April.....	211½	.....	.....	71,329,740	71,329,740	2,377,658	103	940	22	47	25½	.....	73	561.0
May.....	32½	198	11,233,758	66,781,569	78,018,327	2,516,720	108	1,315	21	49½	27½	73	74	584.0
June.....	106½	130	35,975,886	44,841,954	80,817,840	2,693,928	117	.....	21	60	30	70	76	561.8
July.....	15	237	5,093,892	80,262,702	85,362,594	2,753,632	119	400	23	56	28	81	82	582.5
August.....	277	2½	94,641,283	1,749,278	96,192,561	3,102,985	163	900	24	56	29	82	78	478.8
September.....	176½	64½	63,071,433	22,533,888	85,605,321	2,853,510	135	630	22	50	25	75	78	514.7
October.....	134	223	45,503,685	50,866,497	96,370,182	3,103,715	142	1,360	21	60	29	76	64	549.6
November.....	76	136¼	26,240,115	42,011,676	68,251,791	2,275,059	104	1,410	22	42	26	73	71	530.5
December.....	147½	68½	50,971,125	21,493,899	72,465,024	2,337,581	95	420	19	53	27	73	73	619.2
Totals and averages.	1,278½	1,514¼	414,922,509	482,168,337	926,490,846	2,538,331	1,420	1,077	22	608	314½	75	74	530.9

ENGINES.

Engine No. 1.—All journals examined and leads taken from them; steam chest bonnets removed, valves reset; air pumps examined, new studs put in, lift of valves altered; new joints made on steam chest bonnets and throttle valve; pumps examined, new studs, valves, and springs put in where necessary; engine painted, striped, and varnished.

Engine No 2.—Boxes taken out of main bearings and new wedges made for setting out side boxes; brace made from pedestal to foundation wall, to strengthen and steady the pedestal; air pumps taken out, new valves and studs put in; heads taken off pumps, valve seats refastened, new studs put in seats, new springs and valves put in pumps where necessary; web on suction side of south pump repaired by bolting braces under it, and putting through bolts on the pressure side of pump; new 8-inch steam pipe run from boilers to engines in order that they may be run at the same time from separate boilers.

BOILERS.

New joints made on steam pipes and safety valves, and valves ground in; extra stop valves placed on boilers, and connected them with the extra steam pipes; hat flanges put on boilers for steam pipe connection to drums; extra bolts put in steam pipe flanges; new bolts put in for holding boiler fronts; water columns and blow-offs repaired and cleaned.

 KENSINGTON.

BUILDINGS AND GROUNDS.

New benches placed on wharf, wharf repaired; gate put up on north side of engine-house; skylights repaired; fire room whitewashed, cellar cleaned out and whitewashed; coal shed repaired; boiler fronts painted; brick arches built in back of boiler settings; new brick pavement laid in fire room.

KENSINGTON PUMPING STATION.

No. 3.—Worthington Duplex.—
Capacity, 6,000,000 gals. per day.

1887.	Running Time in Hours.	Gallons Pumped.	Average pump- age per day.			Coal.	Percentage of Ashes.	OIL.		Mean Water Pressure and Mean Suction Lift in lbs. per square inch.	Gallons raised 100 ft. per pound of coal.
								Cylinder.	Engine.		
								No. 3.	No. 3.			Gallons.	Tons.	Lbs.	Quarts.	Quarts.	No. 3.
January.....	629	187,412,462	6,045,563	236	1,230	25	79¼	28½	50	455.5	
February.....	619	186,779,514	6,670,698	227	647	25	72½	28½	50	472.5	
March.....	712	217,584,360	7,018,850	269	1,439	24	84½	31	50	430.8	
April.....	94½	27,850,998	928,366	96	697	25	18	12	50	166.2	
May.....	583½	173,362,770	5,592,347	225	1,842	24	89	29	50	441.4	
June.....	457½	136,707,795	4,556,926	174	321	24	80½	29½	50	466.7	
July.....	692	209,149,164	6,746,747	234	1,288	25	117	35	50	510.8	
August.....	715½	214,951,185	6,988,918	233	1,319	24	120	31	50	529.1	
September.....	645½	192,047,079	6,401,569	212	838	24	115½	29½	50	519.9	
October.....	569	168,805,308	5,445,332	202	1,092	24	80½	26½	50	478.3	
November.....	442½	101,667,174	3,388,905	146	1,225	24	37	16¼	50	398.9	
December.....	352½	102,855,030	3,317,904	140	798	25	32	16	50	421.3	
Totals and averages.....	6,512½	1,919,173,169	5,258,008	2,400	116	24	925¼	312¾	50	459.0	

LEHIGH RESERVOIR.

A retaining wall was built a distance of 769 feet on the north side, extending from Sixth to Eighth streets. The work was done by contract, under the supervision of this Bureau. All stone used for backing, facing and coping was inspected before being used; all cement tested, several brands being used. The cement was mixed in the proportion of one part cement to two parts of good sharp, clean sand. The results of tests of the several brands used ranged from 220 pounds per square inch tensile strength, after hardening in water for six days, to 690 pounds, after hardening in water for seventeen days. The wall was pointed and filled in behind with earth, and the banks graded. Pavement laid around watch box on the division wall; stop house repaired; fence taken down on north side, and other parts repaired; basin weeded and banks kept mowed.

ENGINES.

Engine No. 3.—High and low pressure cylinder heads taken off: piston rings set out; new joints made on cylinder heads; steam chest bonnets taken off, valves examined and reset; new joints made on bonnets; valve rods sent to the machine shop and repaired; new joints made on steam-pipe and stop valves: air-pumps overhauled and packed, new springs and valves put in; all lost motion taken out of journals; new bolts put in air-pump foundations, foot valves examined, and a new steel key put in plunger on the left hand side of engine: pumps cleaned out and examined, new valve put in where necessary; new bonnet put on hot well; steam trap overhauled: lubricator cleaned out and repaired.

BOILERS.

Boilers Nos. 1 to 5, inclusive.—New joints made on all steam-pipe, stop and safety valves, all valves overhauled, ground in and packed: blow-off-pipes repaired; water columns taken down, cleaned out and overhauled; old sheets from back parts of boilers Nos. 1, 3 and 5 cut out, and new sheets put in for blow-off-pipe connections; boilers scaled and cleaned; bridge walls taken out and rebuilt.

TOTAL GALLONS PUMPED DURING 1887.

1887.	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 Pumpage.
January	998,924,100	666,181,783	241,702,799	146,208,785	964,705	24,261,000	8,395,920	73,120,485	187,412,462	2,347,172,639	75,715,227	7.27	85,720,293	61,600,064	1,348,247,939
February	963,277,739	514,102,423	225,390,070	138,842,751	974,441	21,901,500	7,516,080	61,856,391	186,779,544	2,120,640,939	75,737,176	6.58	86,153,819	65,218,460	1,157,363,200
March	1,051,042,927	587,105,258	220,306,832	140,631,902	1,021,782	24,324,000	8,330,760	57,100,590	217,584,360	2,307,467,411	74,434,432	7.15	88,623,140	62,550,738	1,256,424,484
April	1,001,952,833	863,290,496	249,803,489	143,195,475	993,943	23,866,250	8,667,350	71,329,749	27,850,998	2,390,953,584	79,698,452	7.41	87,989,137	70,657,803	1,389,000,751
May	1,056,653,099	1,028,011,903	286,816,315	167,000,840	1,242,087	25,821,750	9,238,320	78,018,327	173,362,770	2,826,165,411	91,166,626	8.69	116,188,627	71,349,294	1,769,512,312
June	941,042,152	1,301,580,978	285,191,099	174,526,976	1,182,714	26,318,250	8,882,640	80,817,840	136,707,795	2,956,250,444	98,541,681	9.15	109,389,505	85,349,457	2,015,208,292
July	830,626,962	1,596,687,620	339,000,121	209,837,281	1,371,129	28,738,750	9,771,840	85,362,594	209,149,164	3,310,545,431	106,791,789	10.24	118,604,079	89,896,105	2,479,918,499
August	889,848,959	1,507,732,324	319,980,481	201,535,632	1,262,329	29,189,250	9,846,720	96,192,561	214,951,485	3,270,539,741	105,501,281	10.04	118,461,321	94,532,908	2,380,690,782
September	666,169,120	1,541,671,002	299,290,954	183,965,023	1,373,077	27,785,250	9,987,120	85,605,321	192,047,079	3,007,893,946	100,263,131	9.32	108,257,850	84,966,221	2,341,724,826
October	530,763,389	1,638,503,602	298,662,838	187,418,656	937,979	27,695,000	9,397,440	96,370,182	168,805,308	2,958,559,394	95,437,399	9.16	106,757,280	73,139,650	2,427,796,005
November	440,229,920	1,465,403,210	258,711,284	168,408,913	985,914	25,999,000	8,464,560	68,251,791	101,667,174	2,538,121,766	84,604,068	7.57	97,649,602	68,773,094	2,097,891,846
December	735,205,433	1,051,083,585	239,388,319	156,415,347	1,029,341	25,790,750	8,236,800	72,455,024	162,855,030	2,392,469,629	77,176,439	7.42	97,301,486	61,232,735	1,657,264,196
Totals and averages.	10,105,736,633	13,761,359,184	3,264,247,601	2,017,987,581	13,339,441	311,700,750	103,744,560	926,490,846	1,919,173,169	32,426,779,765	88,840,402	100.00			22,321,043,132
Increase over 1886...	2,823,182,838		382,294,523	297,693,003		8,690,762	25,188,114	43,350,605	445,105,766	3,767,813,196	10,407,203		16,401,222	12,045,137	944,630,358
Decrease from 1886.....		257,110,363			582,502										

CURRENT EXPENSES AND WORK OF THE PUMPING STATIONS FOR THE YEAR 1887.

Stations.	Pay of employés at the stations.	COAL.			LUBRICATING OILS.		LIGHTING STATIONS.		Repairs to boilers and machinery.	Packing and 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 high.	Percentage of work done at each station.	Height of surface of basins above pumps in feet.
		Tons.	Price per ton.	Cost.	Gallons.	Cost.	Oil.	Electr'y.									
Fairmount.....	\$5,583 87				624	\$310 52	\$10 00		\$5,582 83	\$430 00	\$11,967 22	10,105,736,633	100.0	10,105,736,633	\$1 18	19.76	90.00
Spring Garden.....	31,412 73	22,724	\$2 38	\$54,083 12	2,253	1,041 90	12 00	\$719 42	13,892 11	1,365 13	102,526 41	13,761,359,184	159.5	21,949,367,898	4 67	42.81	115.00
Belmont.....	9,657 65	7,308	2 41	17,612 28	323	151 69	11 00	457 47	3,576 41	432 00	31,898 41	3,264,247,601	216.2	7,057,303,313	4 51	13.71	102.00
Roxborough.....	7,095 98	7,959	2 38	18,942 42	800	372 20	200 64		3,361 59	495 00	30,615 77	2,017,987,581	369.6	7,458,482,099	4 09	14.49	317.00
Roxborough auxiliary *.....		76	2 81	213 56	19	9 50	5 88											13,339,441	82.7	11,031,717	00.25	80.00
Mount Airy.....	2,970 00	683	3 18	2,171 94	143	64 60				65 23	5,271 82	311,700,750	133.4	415,808,800	12 67	00.84	† 128.80
Chestnut Hill.....	1,500 00	350	2 75	962 50	106	45 05	12 08			38 00	2,557 63	106,744,560	123.9	132,256,509	19 26	00.23	128.65
Frankford.....	3,887 31	1,420	2 41	3,422 20	231	103 65	29 00		3,898 26	120 00	11,460 42	926,490,846	182.2	1,688,066,321	6 78	03.15	168.63
Kensington.....	1,620 00	2,400	2 41	5,784 00	310	142 80	1 95		1,036 63	93 00	8,678 38	1,919,173,169	123.8	2,471,895,041	3 51	04.71	107.75
Totals and averages deducted from totals.....	\$63,727 54	42,900	\$2 40	\$103,192 02	4,809	\$2,241 82	\$291 55	\$1,176,89	\$31,347 83	\$2,998 41	\$204,976 06	32,426,779,765	158.1	51,289,948,331	\$3 99	100.00	

* Repumpage from Roxborough.

† On Distribution.

MACHINE SHOP.

TWELFTH AND REED STREETS.

Two coats of paint put on inside and outside of building ; storerooms, wash room, superintendent and clerk's office, boilers and engine, and all hard wood shellaced and varnished.

THIRD DISTRICT.

Blacksmith shop built, and closets put in office and yard.

FOURTH DISTRICT.

Pile driver built and a number of hoisting crabs made ; closets built in office and storeroom, and all painted.

SIXTH DISTRICT.

New wagon shed and tool room built and covered with tin ; roof and all painted.

OFFICE.

New racks made for drawing-room and Chief Clerk's room ; closets altered ; case for records made ; roof and rain spouts repaired ; weather strips put on all windows.

Telephones kept in working order and new wires run to superintendent's residence.

Two new horses purchased for the use of the Bureau, and the two that had become old and useless were sold ; one wagon rebuilt and the carts kept in repair.

The iron fence around Norris Square was taken down and hauled to the Fourth District yard, to be used around the Corinthian avenue and Spring Garden reservoirs.

Total Gallons Pumped during 1887.

Month.	Water Power.	Steam Power.	Totals.	GALLONS PER DAY.		
				Average.	Maximum.	Minimum.
January.....	998,924,100	1,348,247,939	2,347,172,039	75,715,227	85,720,293	61,600,064
February.....	963,277,739	1,157,363,200	2,120,640,939	75,737,176	86,153,819	65,218,460
March.....	1,051,012,927	1,256,424,484	2,307,467,411	74,434,432	88,623,140	62,560,738
April.....	1,001,952,833	1,389,000,751	2,390,953,584	79,698,452	87,989,137	70,657,803
May.....	1,056,653,099	1,769,512,312	2,826,165,411	91,166,626	116,188,627	71,349,294
June.....	941,042,152	2,015,208,292	2,956,250,444	98,541,681	109,389,595	85,349,457
July.....	830,626,962	2,479,918,499	3,310,545,461	106,791,789	118,604,079	89,896,105
August.....	889,848,959	2,380,690,782	3,270,539,741	105,501,281	118,461,321	94,332,908
September.....	666,169,120	2,341,724,826	3,007,893,946	100,263,131	108,257,850	84,966,221
October.....	530,763,389	2,427,796,005	2,958,559,394	95,437,399	106,757,280	73,139,650
November.....	440,229,920	2,097,891,846	2,538,121,766	84,604,058	97,649,602	68,773,094
December.....	735,205,433	1,657,264,196	2,392,469,629	77,176,439	97,391,486	61,232,735
Totals.....	10,105,736,633	22,321,043,132	32,426,779,765	88,840,492		

APPENDIX D.

REPORT

ON THE

OPERATIONS IN CONNECTION WITH THE

DISTRIBUTION SYSTEM

DURING 1887.

BUREAU OF WATER.

January 20, 1888.

MR. JOHN L. OGDEN.
Chief Engineer.

SIR:—The following report of the alterations and additions to the Distribution System during the year 1887, is respectfully submitted :

At the close of the year 1886 the 48-inch pumping main from Spring Garden station to Twenty-fourth and Parrish streets, the 20-inch supply main on Girard avenue, from Otis street to Front, the relaying of the two 16-inch supply mains on North College avenue, and the extension of the 20-inch main on Broad street, from Wolf street south, were unfinished. Within the past year this work was completed. The 48-inch pumping main was finished May 28, and put into use on the completion of the new engine at the Spring Garden station ; the 20-inch main on Girard avenue was finished and in use April 26 ; the two 16-inch mains, on North College avenue, April 30, and the 20-inch main, on Broad street, March 25.

A 48-inch supply main was laid from the standpipe lot to the East Park reservoir, connecting at the first named place

to the Master street 48-inch main, and a 36-inch connection was also laid between it and No. 7 pumping main, east of the standpipe.

The new twenty million gallon engine at the Spring Garden station has been connected to Nos. 6, 7 and 9 mains, and to its own main, No. 11. By means of these connections this engine can pump into Fairmount, Corinthian, or East Park reservoir, and into the distribution.

A 30-inch supply main for conveying the water from the Frankford reservoir to Fairhill reservoir and its vicinity has been laid. This main, with its connections, is twenty-four thousand nine hundred and eighty-six (24,986) feet long. The excavation, refilling and repaving (also the keeping of the ditch in repair for one year) was contracted for by Mr. Marshall C. Hong, at a cost of seven thousand nine hundred and twenty-two dollars and sixteen cents (7,922.16). The total amount of excavation was nineteen thousand two hundred and eighty-three and one-half (19,283½) cubic yards, of which five hundred and twenty-nine (529) yards were rock.

The work of unloading pipe from the cars, laying the main and building the bridge was done by this Bureau at a cost of seven thousand nine hundred and fifty-eight dollars and eighty-one cents (7,958.81). The cost of material, including pipe, special castings, lead, lumber, gasket, etc., was one hundred and twenty-two thousand three hundred and ninety dollars (122,390); hauling, surveys and transportation, four thousand and one dollars and eighty cents (4,001.80)—making a total of one hundred and forty-two thousand two hundred and seventy-two dollars and seventy-seven cents (142,272.77), or five dollars and sixty-nine cents (5.69) per lineal foot.

This main is not yet in use, as there are tie rods to be put on where it is suspended across the North Penn Railroad at Fifth street, and the Newtown Railroad at Second street, which will be done in a few days.

The distribution of water remains practically the same as outlined in the report for the year 1886, there being no necessity for any change. Throughout the past year the City has had an ample supply of water, with the exception of a small section east of Sixth street, between Tioga and Pike streets, and on the hills north and east of the Falls of Schuylkill. In the former case an improvement was made September 2, by letting the water into the new 30-inch main on Sixth

street from Lehigh avenue as far north as Erie avenue. The supply was from direct pumpage and the result satisfactory. At the Falls of Schuylkill the trouble is due to the large quantity of water required by the manufacturers, and to their being supplied through a 6-inch pipe, which is inadequate for manufacturing purposes and the supply of the high ground in that vicinity. A 12-inch main 7,000 feet long, laid on Ridge avenue from 200 feet west of Rodman street to Hermit street, would remove all cause for complaint from this section, and in case the 20-inch main from Roxborough reservoir—upon which Manayunk depends entirely for its supply—should become disabled, it would furnish a limited quantity of water, thus avoiding a recurrence of a case similar to that of March 27, 1887, when, owing to the bursting of this 20-inch main, the supply had to be shut off.

When this break occurred the ground was frozen hard and the water came to the surface 30 feet away from the break, necessitating considerable digging before the leak was found. Fortunately, the accident happened early on Sunday morning. At 4.25 A. M. the purveyor was notified, and within a half-hour had his men at work. By midnight the break was repaired. During the time required to do the work part of Manayunk was without water, and had it been any other day than Sunday the entire section would have been deprived of its supply.

MAINS.

The quantity of new pipe added to the Distribution System in 1887 was one hundred and twenty-two thousand seven hundred and ninety (122,790) feet, or twenty-three (23) miles, and one thousand three hundred and fifty (1,350) feet, making a total of eight hundred and seventy-six (876) miles and one thousand one hundred and fifty-four (1,154) feet now in use.

There have been six thousand one hundred and seventy-one (6,171) feet of 6-inch pipe laid to replace one thousand two hundred and fifty-seven (1,257) feet of old 3-inch, one thousand seven hundred and ninety-five (1,795) feet of 4-inch, and eight hundred and eighteen (818) feet of 6-inch pipe, which had become defective by corrosion, etc.

The quantity of pipe used for relays and repairs was twelve thousand nine hundred and twenty-seven (12,927) feet, and that taken up, lowered, raised and shifted, was twenty-one thousand one hundred and seventy-one (21,171) feet—making

a total of one hundred and fifty-six thousand eight hundred and eighty-eight (156,888) feet, or sixteen millions one hundred and nine thousand one hundred and sixty-five (16,109,165) pounds handled.

FIRE-HYDRANTS.

Four hundred and twenty (420) new and nine (9) old style fire-hydrants have been put in new locations. One hundred and fifty (150) new and seventy-two (72) of the old style were substituted for defective ones, making a total of five hundred and seventy (570) new style and eighty-one (81) old style hydrants put in.

The total number of fire-hydrants in use throughout the City is six thousand nine hundred and nineteen (6,919).

DRILLS.

The increase in the number of attachments is five hundred and twenty-three (523). There were seven thousand eight hundred and ninety-two (7,892) $\frac{1}{2}$ -inch, three hundred and seventeen (317) $\frac{3}{8}$ -inch, one hundred and twenty-four (124) $\frac{3}{4}$ -inch, one hundred and forty-three (143) 1-inch, two (2) $1\frac{1}{2}$ -inch, and fifty-four (54) 2-inch attachments made, or a total of eight thousand five hundred and thirty-two (8,532).

METERS.

Fourteen (14) meters have been put in new locations, nine (9) have been discontinued, and forty (40) renewed. The total now in use is two hundred and fifty-three (253.)

Thirty-six (36) meters in use have been dismantled at the request of the consumers, and the water allowed to flow through without registering, the charges being made according to schedule prices.

A list showing the location, size, the kind of establishment and meter, the quantity of water registered, and miscellaneous work done by the meter force, accompanies this report.

Respectfully,

ALLEN J. FULLER,

Assistant Engineer in charge of Distribution.

IRON SERVICE AND SUPPLY MAINS LAID IN 1887.

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>			
Ash street, from south house line of Tasker. to centre of Dickinson		6	475
Broad street, east side, from centre of Wolf, north.....		6	31
Broad street, east side, from Centre of Jackson, north.....		6	32
Carlisle street, from Morris to Tasker.....		6	450
Carpenter street, from Twenty-third to 2 feet east of south-east curb line of Gray's Ferry road.....		12	1,296
Dickinson street, from dead end, 3 feet west of west curb line of Ash, east.....		6	15
Hayes street, from 5 feet east of centre of Seventh, west...		6	5
Hazlewood street, from centre of Carpenter, north		6	37
Hicks street, from Morris to Tasker.....		6	450
Jackson street, from 5 feet west of east curb line of Broad, west		6	32
Jackson street, from Long lane, to east house line of Twenty-ninth		6	519
Lambert street, from Centre of Tasker, north.....		6	175
Latona street, from Twenty-first to Twenty-second.....		6	451
Latona street, from west curb line of Thirty-second, to centre of Thirty-third		6	236
Long lane, from south curb line of Jackson, to dead end, 128 feet southwest of McKean		6	1,599
Manton street, from dead end, 271 feet west of west house line of Twenty-second, west.....		6	80
McKean street from 29 feet east of west curb line of Broad, west		6	37
Mole street, from Morris to Tasker.....		6	450
Mole street, from north curb line of McKean, to centre of Millin.....		6	487
Moore street, from west house line of Eleventh, west		6	129
Moore street, from Twentieth to Twenty-first.....		8	545
Morris street, from 15 feet west of west house line of Broad, to Sixteenth.....		6	852
Nineteenth street, from dead end, 2 feet south of south curb line of Watkins, to Morris		12	178
Peltz street, from centre of Gray's Ferry road, to east house line of Schuylkill avenue		6	976
Pierce street, from centre of Twentieth, to east curb line of Twenty-first.....		6	532
Rosewood street, from Morris to Tasker.....		6	450
Rye street, from Reed to Wyoming.....		6	198
Sears street, from centre of Twenty-first, west.....		6	216

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains—Continued.</i>			
Siegel street, from west curb line of Fifth, to centre of Sixth.....		6	445
Sober street, from Tasker north, to connect dead end.....		6	175
Tasker street, from dead end, 233 feet west of centre of Thirteenth to Juniper.....		6	89
Tasker street, from dead end, 47 feet east of west house line of Broad, to Seventeenth.....		6	1,360
Thirty-second street, from north house line of Reed, to Wharton.....		6	425
Tiernan street, from Tasker north, to dead end, 148 feet 3 inches south of south house line of Dickinson.....		6	277
Titan street, from Long lane to Twenty-second.....		6	714
Twentieth street, from centre of Moore, to dead end, 18 feet north of centre of Watkins.....		6	307
Twenty-first street, from centre of Watkins, north.....		6	11
Twenty-first street, from Reed to Oakford.....		6	835
Twenty-second street, from dead end south house line of Titan, to Latona.....		12	140
Watkins street, from Nineteenth to Twenty-first.....		6	991
Welling street, from north house line of Bainbridge, to South.....		6	297
Wolf street, from 5 feet west of east curb line of Broad, west.....		6	32
Total.....			16,981
<i>Supply Mains.</i>			
Broad street, from 3 feet south of south house line of Wolf, to 58 feet north of north house line of Jackson.....		20	582
<i>Supply Main Connections.</i>			
Twenty-second street, west side, 3 feet north of north house line of Federal, connecting 12-inch with 20-inch main.....		12	9
<i>Fire-hydrant Connections.....</i>		6	1,200
<i>Fire connections (private).</i>			
Moore street, north side, 80 feet west of west house line of Sixth, for John D. Raggio.....		4	3
Twelfth street, west side, 270 feet south of south house line of Snyder avenue, for William F. Read.....		4	17

Street.	Location.	Size in inches.	Distance in feet.
<i>Fire connections (private)—Continued.</i>			
Twelfth street, west side, south house line of Albert, for Thomas J. Martin.....		4	18
Verner street, northwest side, 12 feet northeast of north house line of Kansas, for H. C. Fox & Sons.....		4	30
Total.....			68
<i>Supply connections (private).</i>			
Pier No. 63, South Wharves, from centre of Ash, east, for Baltimore & Ohio Railroad Company.....		4	634
<i>Pipe relaid.</i>			
Dudley street, from 191 feet east of east house line of Seventh, west.....		6	217
Mountain street, from 1 foot 6 inches east of centre of Ninth, west.....		6	20
Twenty-second street, from 7 feet south of centre of Federal, north.....		12	43
Washington avenue, south side, from east house line of Seventh, west.....		6	32
Washington avenue, south side, from east house line of Ninth, west.....		6	25
Total.....			337
<i>Fire-hydrant connections.....</i>		6	346
<i>Repairs, general.....</i>			
" ".....		4	27
" ".....		6	1,859
" ".....		8	2
" ".....		10	5
" ".....		20	6
Total.....			1,899
<i>Pipe taken up.</i>			
Dudley street, from 191 feet east of east house line of Seventh, west.....		4	217
Mountain street, from 1 foot 6 inches east of centre of Ninth, west.....		4	20

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe taken up—Continued.</i>			
Twenty-second street, from 7 feet south of centre of Federal, north.....		6	43
Washington avenue, south side, from east house line of Seventh, west.....		4	32
Washington avenue, south side, from east house line of Ninth, west.....		4	25
Total.....			337
<i>Fire-hydrant connections taken up.</i>		4	346
<i>Pipe lowered.</i>			
Ninth street, from centre of McKean to 2 feet north of centre of Moore.....		6	902
Ninth street, from north curb line of Morris to south curb line of South.....		6	5,200
Seventh street, from centre of McKean to 128 feet south of centre of Carpenter.....		6	4,500
Seventh street, from centre of Carpenter to south house line of South.....		6	1,950
Total.....			12,552
<i>Pipe cut off and abandoned.</i>			
<i>Fire-hydrant connections</i>		3	10
“ “		4	267
Total.....			277

RECAPITULATION OF FIRST DISTRICT.

Purposes for which used.	Size—inches.							Totals in feet and pounds.	
	3	4	6	8	10	12	20		
New pipe or feet added.	Service mains.....			14,822	545		1,614	16,981	
	Supply mains.....						582	582	
	Supply main connection....						9	9	
	Fire hydrant connection....			1,200				1,200	
	Fire connections (private).....		68					68	
	Supply connect's (private).....		633					633	
	Total.....								
	{ feet.....		701	16,022	545		1,623	582	19,473
	{ pounds.....		13,319	528,726	22,890		116,856	92,538	774,329
	Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....			640			43	683
Repairs, general.....			27	1,859	2	5		6	1,899
Pipe taken up.....			640	43					683
Pipe lowered.....				12,552					12,552
Total.....									
{ feet.....		667	15,094	2	5	43	6	15,817	
{ pounds.....		12,673	498,102	84	275	3,096	954	515,184	
Total handled.....	{ feet.....		1,368	31,116	547	5	1,666	588	35,290
	{ pounds.....		25,992	1,026,828	22,974	275	119,952	93,492	1,289,513
Pipe cut off and abandoned.....	10	267						277	

SECOND DISTRICT.

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

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Aberdeen street, from dead end, 8 feet 8 inches south of centre of Spruce, north.....		6	9
Aspen street, from centre of Thirty-seventh to 2 feet east of centre of DeKalb.....		6	203
Brown street, from 95 feet east of east house line of Thirtieth, west.....		6	125
Chester avenue, from dead end line 290 feet west of west house line of Forty-second to Forty-sixth.....		6	1,337
Forty-second street, from 313 feet south of centre of Woodland avenue, north.....		6	313
Forty-eighth street, from north house line of Gray's Ferry road to centre of Woodland avenue.....		6	377
Forty-ninth street, from centre of Seneca to 9 feet north of centre of Dohan.....		6	194
Fiftieth street, from Kershaw to Paschall.....		6	219
Fifty-third street, from 367 feet south of south house line of Vine to Haverford avenue.....		6	662
Fifty-fourth street, from Paschall to 469 feet 9 inches north of centre of Media.....		6	1,054
Green street, from Fortieth to Preston or Wyoming.....		6	459
Hamilton street, from 1 foot east of centre of Sixty-third west.....		6	191
Hamilton street, from centre of Thirty-first, west, to connect dead end.....		6	26
Hanson street, from 117 feet southeast of southeast house line of Saybrook, northwest.....		6	170
Haverford avenue, from 25 feet west of west house line of Sixty-fifth to 4 feet 8 inches west of centre of Sixty-eighth.....		12	1,665
Haverford avenue, from 4 feet 8 inches west of centre of Sixty-eighth to east house line of Lansdowne avenue..		6	1,017
Kingsley place, from centre of Kempton, north.....		6	75
Pine street, from centre of Thirty-fourth, west.....		6	30
Saybrook street, from centre of Forty-ninth, west.....		6	342
Thirty-first street, from centre of Hamilton, north.....		6	136
Thirty-fourth street, from centre of Pine porch.....		6	59
Thirty-fourth street, from 1 foot north of centre of Chestnut north to dead end.....		6	29
Warren street, from centre of Fifty-second, west.....		6	107
Wiota street, from 1 foot north of centre of Baring to 123 feet 8 inches south of centre of Spring Garden...		6	324
Total.....			9,123

Street.	Locaton.	Size in inches.	Distance in feet.
<i>Fire-hydrant connections</i>		6	837
<i>Fire connections (private).</i>			
Delaware avenue, east side, 23 feet south of south house line of Lombard.....		4	102
		6	62
Delaware avenue, east side, 87 feet south of south house line of Lombard, on Pier 24, south wharves; for Baltimore and Ohio Railroad Co.....		4	70
Delaware avenue, east side, 277 feet north of north house line of Race, on Pier 12, north wharves; for Baltimore and Ohio Railroad Co.....		4	101
		6	43
Filbert street, north side, 167 feet west of west house line of Seventeenth; for Adams' Express Co.....		4	6
Fourth street, west side, 60 feet north of north house line of Arch; for John L. Ketterlihus.....		4	13
Winfried street, south side, 140 feet 6 inches east of east house line of Eighth; for S. May & Bro.....		4	7
Total			404
<i>Motor connections (private).</i>			
Fifteenth street, east side, 89 feet south of south house line of Chestnut; for Young Men's Christian Association Building.....		4	15
Twentieth street, east side, 76 feet south of south house line of Walnut; for Mrs. Newbold.....		4	17
Twenty-fourth street, west side, 138 feet 8 inches north of north house line of Chestnut; for Bureau of Gas.....		4	14
Twenty-fourth street, west side, 135 feet 6 inches north of north house line of Chestnut; for Bureau of Gas.....		4	26
Total			72
<i>Supply connections (private).</i>			
Belmont avenue, west side, 21 feet north of north house line of Girard avenue; for Pennsylvania Railroad Co.		4	34
Elm avenue, south side, 50 feet east of east house line of Forty-eighth; for Pennsylvania Railroad Co.....		6	21
Total.....			55

Street.	Location.	Size in inches.	Distance in feet.
<i>Drains.</i>			
Broad street, west side, 7 feet south of centre of Vine, from 20-inch main.....		6	9
Fifteenth street, 5 feet south of south house line of Arch, from 20-inch main.....		6	14
Total.....			23
<i>Repairs, general.</i>			
" ".....		3	4
" ".....		4	40
" ".....		6	605
" ".....		8	32
" ".....		10	45
" ".....		12	48
" ".....		16	10
" ".....		20	12
Total.....			796
<i>Pipe relaid.</i>			
Aurora street, from 7 feet east of centre of Ninth, west....		6	16
Barclay street, from 17 feet 6 inches east of centre of Seventh, west.....		6	29
Bay street, from 15 feet east of centre of Seventh, west....		6	15
Bond street, from 6 feet east of centre of Ninth, west.....		6	26
Clinton street, from 6 feet east of centre of Ninth, west....		6	16
Cullen street, from centre of Seventh, west.....		6	27
Forty-third street, from 51 feet south of south house line of Locust, north.....		6	81
Forty-third street, from 184 feet south of south curb line of Pine, north.....		6	117
Keble street, from 8 feet 6 inches east of centre of Ninth west.....		6	9
Marble alley, from Tenth to Eleventh.....		6	450
Middle alley, from 15 feet east of centre of Seventh, west....		6	15
Minster street, from 8 feet east of centre of Seventh, west....		6	16
Pryors court, from 7 feet east of centre of Ninth, west.....		6	17
Rodman street, from centre of Ninth, west.....		6	8
St. Mary street, from 6 feet 6 inches east of centre of Seventh, west.....		6	25
Thirty-fourth street, from 26 feet north of north house line of Pine, north.....		6	105
Twenty-fourth street, west side, 138 feet 8 inches north of north house line of Chestnut; motor connection for Bureau of Gas.....		6	16
Woodland avenue, from 97 feet east of east house line of Sixtieth, west; across bridge over Baltimore and Ohio Railroad.....		6	292
Total.....			1,280

Street.	Location.	Size in inches.	Distance in feet.
<i>Fire-hydrant connections, relaid.....</i>			
“	“	4	12
“	“	6	394
Total.....			406

Pipe taken up.

Aurora street, from 7 feet east of centre of Ninth, west....	3	16
Barclay street, from 7 feet 6 inches east of centre of Seventh, west.....	3	29
Bay street, from 15 feet east of centre of Seventh, west....	3	15
Bond street, from 6 feet east of centre of Ninth, west.....	3	26
Clinton street, from 6 feet east of centre of Ninth, west....	3	16
Cullen street, from centre of Seventh, west.....	3	27
Forty-third street, from 76 feet north of north house line of Osage, north.....	6	36
Keble street, from 9 feet east of centre of Ninth, west.....	3	9
Marble alley, from Tenth to Eleventh.....	3	450
Middle alley, from 15 feet east of centre of Seventh, west.	3	15
Minster street, from 8 feet east of centre of Seventh, west	3	16
Pryors court, from 7 feet east of centre of Ninth, west.....	3	17
Rodman street, from centre of Ninth, west.....	3	8
St. Mary street, from 6 feet east of centre of Seventh, west	3	25
Thirty-fourth street, from 26 feet north of north house line of Pine, north.....	6	105
Twenty-fourth street, west side, 138 feet 8 inches north of north house line of Chestnut.....	4	14

Motor connection.

Woodland avenue, intersection of Forty-second street.....	6	28
Total.....		852

<i>Taken up, repairs.....</i>	6	159
“ “ “	10	4
“ “ “	12	10
Total.....		173

<i>Fire-hydrant connections taken up.....</i>	3	283
“ “ “	4	372
“ “ “	6	7
Total.....		662

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe lowered.</i>			
Forty-ninth street, from 187 feet north of north house line of Chester avenue, north.....		6	150
Ninth street, from 6 feet north of centre of South, to centre of Pine.....		6	741
Seventh street, from 261 feet south of centre of Lombard, to south house line of Spruce.....		6	1,047
Total			1,938
<i>Cut off and abandoned.</i>			
Pine street, northeast across property of the University of Pennsylvania to Thirty-fourth.....		6	95
Woodland avenue, from 97 feet east of east house line of Sixtieth, west across Baltimore & Ohio Railroad.....		12	232
Total			327
<i>Fire-hydrant connections cut and abandoned.....</i>			
" " " "		3	93
" " " "		4	323
" " " "		6	45
" " " "		10	15
Total			476
<i>Shifted.</i>			
Ninth street, from 7 feet north of centre of Pine, north...		6	75
Ninth street, from 250 feet north of north house line of Pine, north.....		6	206
Ninth street, from 131 feet south of south house line of Sansom, north.....		6	111
Total			392

RECAPITULATION OF SECOND DISTRICT.

Purposes for which used.		Size—Inches.							Total in feet and pounds.	
		3	4	6	8	10	12	16		20
New pipe or feet added.	Service mains.....			7,458			1,665		9,123	
	Fire-hydrant connections.....			837					837	
	Fire connections (private).....		299	105					404	
	Supply connections (private).....		34	21					55	
	Motor connections (private).....		72						72	
	Drains.....			23					23	
	Total.....		405	8,414			1,665		10,514	
			7,695	278,652			119,880		406,227	
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....		12	1,674					1,686	
	Repairs, general.....	4	40	605	32	45	48	10	12	796
	Pipe taken up.....	952	386			4	10			1,687
	Pipe lowered.....			1,938						1,938
	Pipe shifted.....			392						392
		Total.....	956	438	4,914	32	49	58	10	12	6,499
		14,340	8,322	163,152	1,344	2,695	4,176	1,100	1,908	197,037
	Total handled	956	843	13,388	32	49	1,723	10	12	17,013
		14,340	16,017	441,804	1,344	2,695	124,056	1,100	1,908	603,264
	Pipe cut off and abandoned.....	93	323	140		15	232			803

THIRD DISTRICT.

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

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Amber street, from 355 feet 6 inches southwest of south-west house line of Tioga, northeast.....		6	198
Bley street, from 180 feet northeast of Hull, to 3 feet 6 inches northeast of southwest house line of Clearfield.....		6	265
Bodine street, from Dauphin to York.....		6	553
Bordeaux street, from Marshall to Marshall.....		6	555
Cambria street, from center of Second to dead end, 2 feet west of east house line of Philip.....		6	153
Cherry street, from center of Meadow, northeast.....		6	123
Crease street, from 24 feet 6 inches northwest of southeast house line of Girard avenue, northwest.....		6	72
Crescentville lane, from 30-inch main on Kensington pike, northwest.....		6	9
Emeline street, from dead end, 171 feet southwest of southwest house line of Somerset, northeast.....		6	210
Euston avenue, from 121 feet east of east house line of Third, west.....		6	246
*Fifth street, from dead end, 10 feet south of south house line of Luzerne, north.....		6	11
Foulkrod street, from Frankford avenue to Franklin.....		6	300
Fourth street, from 3 feet 7 inches south of 30-inch main on Bristol avenue, north.....		6	8
Franklin street, from center of Church to dead end, 123 feet southwest of southwest house line of Unity.....		6	506
Fulton street, from Tulip to Trenton avenue.....		6	623
Girard avenue, from 25 feet 6 inches west of east house line of Front, west.....		12	59
Hancock street, from 25 feet north of south house line of Lehigh avenue, north.....		6	44
Hancock street, from 35 feet south of north house line of Lehigh avenue, north.....		6	10
Hanover street, from 27 feet northwest of southeast house line of Girard avenue, northwest.....		6	68
Hope street, from dead end, 25 feet north of south house line of Lehigh avenue, north.....		6	43
Howard street, from 25 feet north of south house line of Lehigh avenue, north.....		10	36
Howard street, from 41 feet south of north house line of Lehigh avenue, north.....		6	16
Hutchinson street, from center of Tyson, north.....		6	33
Hutchinson street, from dead end, 88 feet north of north house line of Somerset, to center of Richfield.....		6	132
Kelly's lane, from 30-inch main on Kensington pike, west.....		6	4
Leiper street, from center of Church, northeast.....		6	36

Street.	Location.	Size in inches.	Distance in feet.
<i>Service mains—Continued.</i>			
Leithgow street, from center of Somerset, north.....		6	151
Leithgow street, from Indiana to Clearfield.....		6	553
Leopard street, from 28 feet 6 inches northwest of south-east house line of Girard avenue, northwest.....		6	73
Lewellen street, from center of Beach, west.....		6	193
Louden street, from 30-inch main on Kensington pike, west		6	4
Mulberry street, from center of Harrison to southwest house line of Wakeling.....		6	496
Ninth street, from north house line of Lehigh avenue to 3 feet north of south house line of Somerset.....		6	507
Olney road, from 8 feet 5 inches east of 30-inch main on Kensington pike, west.....		6	19
Ontario street, from Amber to Frankford avenue.....		8	278
Orianna street, from Lehigh avenue to Somerset.....		6	551
Orkney street, from dead end, 200 feet north of north house line of Indiana avenue, to 3 feet north of south house line of Clearfield.....		6	303
Palethorp street, from Huntingdon to Lehigh avenue.....		6	595
Palethorp street, from 48 feet south of north house line of Lehigh avenue, north.....		6	13
Palmer street, from 6-inch main southeast side of Girard avenue to 6-inch main northwest side.....		6	78
Philip street, from Lehigh avenue to Somerset.....		6	552
Pine (or Church), from Penn to Leiper.....		6	326
Reese street, from center of Indiana to south curb line of Clearfield.....		6	538
Richfield street, from 104 feet east of east house line of Hutchinson, west.....		6	137
Ridge street, from Leiper to Johnson.....		6	377
Rush street, from 19 feet southeast of northwest house line of Trenton avenue, northwest.....		6	12
Russell street, from 120 feet southeast of southeast house line of Kensington avenue, northwest, to dead end....		6	120
Savery street, from 26 feet northwest of southeast house line of Girard avenue, northwest.....		6	65
Second street, from dead end, 16 feet 8 inches south of center of Cambria, north.....		6	17
Seltzer street, from Ninth to Hutchinson.....		6	225
Seventh street, from dead end, 113 feet north of north house line of Huntingdon to Lehigh avenue.....		6	415
Silver street, from Ninth to Hutchinson.....		6	225
Sternier street, from Ninth to Hutchinson.....		6	225
Third street, from Cambria to Indiana.....		6	550
Third street, from 4 feet 5 inches south of 30-inch main on Bristol avenue, north.....		6	8
Tilton street, from center of Anthracite, north.....		6	95
Trenton avenue, northwest side, from Rush to Fulton.....		6	43
Tyson street, from Ninth to Huntingdon.....		6	623
Vienna street, from 6 inch main southeast side of Girard avenue, to 6 inch main northwest side.....		6	79

Street.	Location.	Size in inches.	Distance in feet.
<i>Service mains</i> —Continued.			
Waterloo street, from Lehigh avenue to Somerset street...		6	555
Weikle street, from 324 feet 9 inches southwest of southwest house line of Tioga, northeast.....		6	343
Westmoreland street, from 121 feet 2 inches southeast of southeast house line of Waterloo, northwest.....		6	141
Whitby avenue, from 232 feet 6 inches east of east house line of Third, west.....		6	258
Willey street, from center of Ross, northeast.....		6	9
Total			14,065

* Omitted in report for 1882.

Supply mains.

Girard avenue, from southwest house line of E. Susquehanna avenue, to 25 feet 6 inches west of east house line of Front.....	20	3,452
Sixth street, from Lehigh avenue to Erie avenue.....	30	5,668
Erie avenue, from Sixth to Fifth.....	30	562
Fifth street, from Erie avenue to Bristol avenue.....	30	3,423
Bristol avenue, from Fifth to Kensington pike.....	30	1,503
Kensington pike, from Bristol avenue to Comly street.....	30	13,286

NOTE.—At this point the Frankford supply main on Comly street was cut off, and the portion west of Kensington pike was connected to the above main and continued on.

Comly street, from 400 feet west of center of Kensington pike to No. 3 outlet from reservoir	30	43
Comly street, from dead end, east side of Kensington pike to No. 2 outlet from reservoir.....	30	452

NOTE.—The Frankford supply main east of Kensington pike is connected to Frankford reservoir by the above main.

Total.....	28,389
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Supply main connections.

Sixth street and Lehigh avenue, between 30-inch main on Sixth and 36-inch main on south side of Lehigh avenue	30	49
Sixth street, north curb line of Somerset, between 10-inch and 30-inch.....	10	9
Sixth street, north curb line of Cambria, between 10-inch and 30-inch.....	10	10

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply main connections—Continued.</i>			
Sixth street, north curb line of Indiana, between 10-inch and 30-inch.....		10	8
Sixth street, north house line of Clearfield, between 10-inch and 30-inch.....		10	6
Sixth street, north intersection of Westmoreland, between 10-inch and 30-inch.....		10	11
Sixth street, north intersection of Tioga, between 10-inch and 30-inch.....		10	10
Sixth street and Erie avenue, between 10-inch and 30-inch		10	9
Sixth and Venango streets, between 10-inch and 30-inch..		10	12
Fifth street, 18 feet south of north house line of Erie avenue, between 10-inch and 30-inch.....		6	12
Fifth street, north curb line of Butler, between 10-inch and 30-inch.....		10	12
Fifth street, south house line of Luzerne, between 6-inch and 30-inch.....		6	12
Fifth street, intersection of Pike, between 6-inch and 30-inch.....		6	10
Frankford reservoir, between No. 1 and No 2 outlets from reservoir.....		30	14
Total.....			184
<i>Fire-hydrant Connections.....</i>		6	2,808

Fire connections (private).

Allen street, west side, 203 feet south of south house line of Shackamaxon, for King & Graves.....	4	14
Columbia avenue, south side, 9 feet east of east house line of Cadwallader, for Thomas Atkinson.....	4	17
Girard avenue, north side, 164 feet west of west house line of Morton, for H. & G. Kessler.....	4	12
Leshner street, northwest side, 168 feet southeast of southeast house line of Meadow, for S. W. Evans & Son....	4	25
Myrtle street from Centre of Venango, south, for Twenty-fifth Ward Gas Works.....	6	7
Orianna street, east side, 101 feet north of north house line of Lehigh avenue, for Hoyle, Harrison & Kaye..	4	11
Palethorpe street, west side, 85 feet south of south house line of Oxford, for Jas. Long, Bro. & Co.....	4	12
Paul street, east side, 41 feet 6 inches southwest of southwest house line of Meadow, for James Comley.....	4	20
Sixth street, east side, 71 feet north of north house line of Master, for Theo. Kraan & Co.....	4	12
Taylor street, north side, 183 feet 4 inches west of west house line of Jasper, for J. & S. Pearson.....	4	14

Street.	Location.	Size in inches.	Distance in feet.
<i>Fire connections (private)</i> —Continued.			
Third street, west side, 119 feet 7 inches south of south house line of Somerset, for Henry Grant.....		4	18
Thompson street, southeast side, 50 feet southwest of southwest house line of Savery, for John E. Hanifen.....		4	17
Tulip street, east side, 126 feet south of south house line of Deal, for Vickers & Weston.....		4	17
Worth street, northwest side, 94 feet northeast of northeast house line of Oxford, for Greenwood & Bault.....		4	20
York street, north side, 84 feet east of east house line of Jasper, for Bromley Bros.....		4	17
Total.....			233
<i>Supply connections (private).</i>			
Brabant, southeast side, 91 feet northeast of northeast house line of William, for the Philadelphia Grain Elevator Company.....		4	16
<i>Drains.</i>			
Fifth street, south house line of Luzerne, from connection between 6-inch and 30-inch mains.....		6	33
Kensington avenue, intersection of Lehigh, from 6-inch main.....		6	18
Kensington pike, northeast side of Wingohocking creek, from fire hydrant connection.....		6	13
Kensington pike, southwest side of Rock creek, from 30-inch main.....		6	15
Kensington pike, southwest side of Tacony creek, from 30-inch main.....		6	34
Sixth street, northeast corner of Clearfield, from 30-inch main.....		6	10
Vienna street, 50 feet northwest of southeast house line of Girard avenue, from 20-inch main.....		6	9
Total.....			132
<i>Repairs, general</i>		4	47
“ “.....		6	773
“ “.....		8	48
“ “.....		10	105
“ “.....		12	195
Total.....			1,168

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe relaid.</i>			
Girard avenue, from 30 feet southwest of southwest house line of East Susquehanna avenue, northeast.....		6	33
<i>Fire-hydrant connections, relaid.....</i>		6	241
<i>Pipe taken up.</i>			
Frankford reservoir, from connection between 30 inch main and No. 2 outlet from reservoir.....		30	20
Girard avenue, from 30 feet 6 inches southwest of southwest house line of E. Susquehanna avenue, northeast		4	31
Total.....			51
<i>Fire-hydrant connections taken up.....</i>		4	372
" " "		6	19
Total.....			391
<i>Pipe taken up, repairs.....</i>			
" " "		4	10
" " "		6	97
" " "		8	5
" " "		10	23
" " "		12	5
" " "		20	4
Total.....			144
<i>Cut off and abandoned.</i>			
<i>Fire-hydrant connections.....</i>		4	422
" "		6	4
Total.....			426

RECAPITULATION OF THIRD DISTRICT.

Purposes for which used.	Size—Inches.							Totals in feet and pounds.	
	4	6	8	10	12	20	30		
New pipe, or feet added.	Service mains.....	13,692	278	36	59			14,065	
	Supply mains.....						3,452	24,987	28,389
	Supply main connections.....		34		87			63	184
	Fire hydrant connect'ns.....		2,808						2,808
	Fire connect'ns (private).....	226	7						233
	Supply connect'ns (priv.).....	16							16
	Drains.....		132						132
	Total {								
	feet.....	242	16,673	278	123	59	3,452	25,000	45,827
	pounds.....	4,598	550,209	11,676	6,765	4,248	548,868	8,300,000	9,426,364
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....		274					274	
	Repairs, general.....	47	773	48	105	195		1,168	
	Pipe taken up.....	413	116	5	23	5	4	20	586
	Total {								
feet.....	460	1,163	53	128	200	4	20	2,028	
pounds.....	8,740	38,379	2,226	7,010	14,400	636	6,640	78,061	
Total handled.	{ feet.....	702	17,836	331	251	259	3,456	25,020	47,855
	{ pounds.....	13,338	588,588	13,902	13,805	18,648	549,504	8,306,640	9,504,425
Pipe cut off and abandoned..	422	4						426	

FOURTH DISTRICT.

Comprising the Thirteenth, Fourteenth, Fifteenth, Twentieth, Twenty-ninth and part of the Twenty-eighth Wards.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service mains.</i>			
Allegheny avenue, north side, from centre of Fifteenth west, to dead end.....		6	180
Arizona street, from centre of Twenty-sixth, west.....		6	225
Baltz street, from 26 feet east of west house line of Thirtieth, west.....		6	160
Berks street, from 178 feet east of east house line of Seventeenth to Eighteenth.....		6	649
Bouvier street, from dead end 300 feet 3 inches north of north house line of Montgomery avenue to Berks.....		6	224
Bouvier street, from north house line of Susquehanna avenue to north house line of Dauphin.....		6	556
Cabot street, from centre of Thirtieth, west.....		6	156
Cambridge street, from centre of Thirtieth, west.....		6	293
Carlisle street, from dead end 293 feet north of north house line of Cumberland, north.....		6	3
Charlsee street, from centre of Gratz, west.....		6	142
Clearfield street, from Broad to Fifteenth.....		6	472
Colorado street, from 20 feet 6 inches south of north house line of Susquehanna avenue to 26 feet north of north house line of Dauphin.....		6	577
Dauphin street, from 15 feet east of west house line of Colorado to 15 feet west of east house line of Bouvier		6	130
Diamond street, south side, from Carlisle to Sixteenth.....		6	642
Diamond street, north side, from Sixteenth to Seventeenth		6	438
Diamond street, south side, from centre of Eighteenth, west		6	275
Diamond street, north side, from Lambert to Twenty-first		6	188
Dover street, from 291 feet south of south house line of Thompson, north.....		6	308
Dover street, from 17 feet north of south house line of Thompson, north.....		8	8
Dover street, from 25 feet north of south house line of Thompson to Master.....		6	480
Edgely street, from centre of Sixteenth to centre of Seventeenth.....		6	446
Eighteenth street, from Diamond to Susquehanna avenue		6	547
Fifteenth street, from centre of Huntingdon to 6 feet north of south house line of Lehigh avenue.....		6	551
Fifteenth street, from 6 feet north of south house line of Allegheny avenue, north.....		6	53
Freemont st., from Twelfth to 227 feet west of Thirteenth		6	673
French street, from Sixteenth to Seventeenth.....		6	448
Gratz street, from 188 feet south of south house line of Diamond street, north.....		6	189
Harold street, from centre of Twelfth, west.....		6	419
Hibbard street, from Girard avenue to Stiles.....		6	311

Street.	Location.	Size in inches.	Distance in feet.
<i>Service mains—Continued.</i>			
Hollywood street, from centre of Stiles to 3 feet south of north house line of Thompson.....		6	410
Huntingdon street, from centre of Twelfth, west.....		6	423
Huntingdon street, from Broad to Fifteenth.....		6	454
Linden square, from Thirtieth to Thirty-first.....		6	452
Mayfield street, from Broad to Fifteenth.....		6	460
Meredith street, from centre of Twenty-fifth, west.....		6	186
Myrtlewood street, from centre of Stiles to 1 foot 8 inches north of north curb line of Thompson.....		6	401
Newkirk street, from 258 feet south of south house line of Thompson to Master.....		6	768
Norris street, from centre of Twenty-ninth, west.....		8	439
Pennsylvania avenue, northeast side, from centre of Pagoda to Twenty-fifth.....		6	330
Sedgeley avenue, from dead end 91 feet 8 inches northeast of east house line of Twenty-fourth to dead end 13 feet northeast of west curb line of Twenty-eighth.....		8	2,651
Seventeenth street, from dead end 52 feet south of south house line of Susquehanna avenue, north.....		6	92
Sixteenth street, from 48 feet 3 inches north of north house line of Herbine, north.....		6	60
Susquehanna avenue, from centre of Sedgeley ave., west.....		6	12
Susquehanna avenue, from 25 feet east of west house line of Seventeenth to 15 feet west of east house line of Colorado.....		6	158
Taney street, from Montgomery to Columbia avenues.....		6	564
Thompson street, north side, from dead end 28 feet east of centre of Twenty-eighth, west.....		6	28
Thompson street, south side, from Thirtieth to Thirty-first.....		6	448
Twenty-first street, from 51 feet south of south house line of Susquehanna avenue, north.....		6	56
Twenty-eighth street, from 6 feet north of south house line of Thompson, north.....		6	42
Twenty-ninth street, from 17 feet south of north house line of Stiles, north.....		6	401
Twenty-seventh street, from Huntingdon to 1 foot north of south house line of Lehigh avenue.....		6	546
Twenty-sixth street, from 25 feet south of north house line of York to 34 feet north of south house line of Cumberland.....		6	550
Twelfth street, from dead end 107 feet 6 inches south of south house line of Huntingdon, north.....		6	133
Tucker street, from centre of Twelfth, west.....		6	421
Van Pelt street, from 2 feet south of north house line of Diamond to south house line of Dauphin.....		6	110
Warnock st., from dead end 14 feet 8 inches north of north house line of Diamond street to Susquehanna avenue.....		6	412
Total.....			20,750

Street.	Location.	Size in inches.	Distance in feet.
<i>Supply mains.</i>			
Spring Garden Station, from dead end of 48-inch main northeast of Stand Pipe to East Park Reservoir.....		48	2,158
Twenty-fifth street, from dead end 45 feet 4 inches south of south curb line of Green north to dead end.....		48	99
Total.....			2,257
<i>Pumping mains.</i>			
Parrish street, from 8 feet 6 inches west of east house line of Twenty-fourth, west.....		48	49
Parrish street, from 4 feet west of east house line of Twenty-sixth, west.....		48	18
Pennsylvania avenue, southwest side, from 592 feet 7 inches southeast of abutment of Girard avenue bridge to 69 feet west of east house line of Thirty-third.....		48	1,717
Poplar street, from 108 feet 5 inches west of west house line of Thirtieth, west.....		48	132
Spring Garden Station, north of No. 11 Engine House....		36	21
Spring Garden Station, north of No. 11 Engine House....		48	19
Spring Garden Station, from dead end of 48-inch pumping main to East Park Reservoir, northwest.....		48	7
Twenty-sixth street, from 34 feet 8 inches south of north house line of Parrish, north.....		48	12
Total.....			1,975
<i>Supply main connections.</i>			
Montgomery avenue, No. 1 and No. 2 connections between 48-inch main and East Park Reservoir.....		36	70
Twenty-fifth and Green streets, east side, connecting 22-inch with 48-inch main.....		30	83
Twenty-fourth and Thompson streets, north side, connecting 6-inch with 16-inch main.....		10	9
Total.....			162
<i>Pumping main connections.</i>			
Spring Garden Station, from No. 7 to No. 11 pumping main		48	138
Spring Garden Station, from No. 11 pumping main to 48-inch supply main 23 feet southeast of stand pipe...		36	262
Total.....			400

Street.	Location.	Size in inches.	Distance in feet.
<i>Fire-hydrant connections.....</i>		6	1,562
<i>Fire connections (private).</i>			
Carlisle street, west side, 293 feet north of north house line of Cumberland; for Thirteenth and Fifteenth Passenger Railway Co.....		4	13
Ninth street, east side, 248 feet south of south house line of Columbia avenue; for Mahlon Fulton.....		4	20
Total.....			33
<i>Supply connections private.</i>			
Broad street, west side, 239 feet north of north house line of Columbia avenue; for John F. Betz & Son.....		4	6
Pennsylvania avenue, north side, 142 feet east of east house line of Thirty third; for Eble & Herter.....		4	13
Twenty-ninth, east side, 20 feet 6 inches south of south house line of Parrish; for Bergdoll Brewing Co.....		4	19
Twenty-third, east side, 144 feet north of north house line of Columbia avenue, for swimming school; for Max Vieweged.....		4	15
Total.....			53
<i>Drains.</i>			
East Park reservoir, east side, from 17 feet south of Montgomery avenue, south		10	338
River road, in front of Spring Garden station.....		8	28
Spring Garden station, from turn table, east front of new engine house.....		4	5
Spring Garden station, from turn table, west front of old engine house.....		6	14
Spring Garden station, from turn table, southeast corner of coal shed.....		4	5
Spring Garden station, from spring, east front of old engine house.....		6	18
Spring Garden station, blow off from No. 11 boiler house..		6	12
Spring Garden station, from No. 9 and No. 10 boiler house		6	26
Spring Garden station, from No. 11 engine house (cellar)..		6	17
Spring Garden station, from spring in front of No 11 engine house northeast to inlet.....	10		102
Twenty-fourth and Thompson, south side, from 16 inch main		6	17
Twenty-fourth and Thompson, north side, from 8 inch main		6	9
Twenty-sixth and Parrish, north side, from 48 inch main..		6	14
Total.....			605

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe relaid.</i>			
Girard avenue, south side, from 26 feet west of west house line of Sixth, to 32 feet west of east house line of Eighth		6	915
Girard avenue, south side, from 10 feet west of east house line of Ninth, to 27 feet west of east house line of Tenth.		6	476
Green street, from 70 feet west of east house line of Twenty-fifth, west.....		22	30
		24	30
		25	9
North College avenue, two 16 inch mains, from 71 feet and 73 feet 2 inches east of west house line of Twenty-first, to 43 feet 5 inches and 52 feet 2 inches west of west house line of Twenty-second.....		16	1,297
Parrish street, intersection of Twenty-fourth.....		6	34
" " intersection of Twenty-sixth (gas-pipe).....		4	11
Poplar street, from 129 feet 6 inches west of west house line of Thirtieth, west.....		6	45
Total.....			2,847
<i>Fire hydrant connections relaid.....</i>		6	170
<i>Repairs, general.....</i>			
" ".....		4	15
" ".....		6	614
" ".....		8	7
" ".....		10	134
" ".....		12	44
" ".....		18	6
" ".....		20	10
" ".....		30	21
" ".....		36	4
" ".....		48	30
Total.....			885
<i>Pipe taken up.</i>			
North College avenue, between Twenty-first and Twenty-second.....		16	64
Parrish street, intersection of Twenty-fourth.....		6	17
Parrish street, intersection of Twenty-fourth.....		48	42
Poplar street, from 129 feet 6 inches west of west house line of Thirtieth, west.....		6	45
Spring Garden Station, on No. 8 distribution main, from 30 x 30 breeches pipe to 30 inch stop.....		30	31
Total.....			199

RECAPITULATION OF FOURTH DISTRICT.

Purposes for which used.	Size—Inches.														Totals in feet and pounds.		
	4	6	8	10	12	16	18	20	22	24	25	30	36	48			
New pipe, or feet added.	Service mains.....		17,652	3,098												20,750	
	Supply mains.....															2,257	
	Pumping mains.....														21	1,954	
	Supply main connections.....				9								83			70	162
	Pumping main connections.....															262	400
	Fire hydrant connections.....		1,562														1,562
	Fire connections (private).....	33															33
	Supply connections (private).....	53															53
	Drains.....	10	127	28	440												605
	Total.....	96	19,341	3,126	449								83	353	4,349	27,797	
	1,824	638,233	131,292	24,635								27,556	148,966	2,514,165	3,516,751		
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....	11	1,640				1,297			30	30	9				3,017	
	Repairs, general.....	15	614	7	134	44		6	10				21	4		30	
	Pipe taken up.....	131	90				64									42	
	Pipe raised.....		90							18						61	
	Pipe shifted.....								43							43	
	Total.....	160	2,424	7	134	44	1,361	6	53	48	30	9	52	4	136	4,478	
	3,010	80,322	291	7,370	3,168	149,710	840	8,427	12,000	9,300	2,880	17,264	1,688	79,560	375,863		
Total handled.....	256	21,775	3,133	583	44	1,361	6	53	48	30	9	135	357	4,485	32,275		
	4,861	718,575	131,586	32,055	3,168	149,710	840	8,427	12,000	9,300	2,880	44,820	150,654	2,623,725	3,892,614		
Pipe cut off and abandoned.....	2,020	65				1,222										3,307	

MANAYUNK DISTRICT.

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

Street.	Location.	Size in inches.	Distance in feet.
<i>Service Mains.</i>			
Bowman street, from centre of Thirty-fifth, northeast.....		6	233
Dupont street, from centre of Ridge avenue, northeast.....		6	839
Fowler street, from dead end, 315 feet northwest of northwest house line of Jefferson, northwest.....		6	24
Green lane, from 10 feet south of centre of Magnet, northeast.....		6	10
Hamilton street, from Church to Leverington avenue.....		6	303
Jefferson street, from dead end, 142 feet northeast of northeast house line of Linden to southwest curb line of Wood.....		6	164
Leverington avenue, from dead end, 20 feet southwest of centre of Hamilton, northeast.....		6	20
Leverington avenue, from dead end, 803 feet northeast of northeast house line of Ridge avenue, northeast.....		6	439
Magnet street, from northwest house line of Flint, to centre of Green lane.....		6	499
Mitchell street, from centre of Roxborough avenue northwest, to connect dead end.....		7	17
Ogle street, from dead end, 125 feet southeast of southeast house line of Prospect, northwest.....		6	137
Roxborough avenue, from southwest house line of Mitchell, northwest.....		6	25
Sumac street, from dead end, 13 feet southwest of centre of Freeland (or Wetherill), northeast to southwest house line of Vicaris.....		6	925
*Thirty-third street, from northwest curb line of Bowman, northwest.....		6	207
Thirty-fifth street, from dead end, 180 feet southeast of southeast house line of Queen lane, to northwest house line of Crawford.....		6	62
Wissahickon drive, from centre of Ridge avenue, northeast.....		6	44
Wissahickon dam, from southeast to northwest side of Creek.....		6	256
Wissahickon bridle path, from Centre of Ridge avenue, northeast.....		6	37
Total.....			4,241
<i>Bye-pass connections.</i>			
Ferry-road, southwest side of Ridge avenue, between 6-inch main on Ferry road and 12-inch main on Ridge avenue.....		4	2
		6	21

Street,	Location.	Size in inches.	Distance in feet.
<i>By-pass connections—Continued.</i>			
Rodman street, southwest side of Ridge avenue, between 4-inch main on Rodman and 12-inch main on Ridge avenue		4 6	15 6
Total			44
<i>Fire-hydrant Connections</i>		6	202

* This pipe is supplied by a 2-inch private pipe on Indian Queen lane.

Fire connections (private).

Hamilton street, northeast side, 21 feet southeast of southeast house line of Leverington avenue, for John Schofield.....	4	13
Main street, southwest side, 829 feet southeast of southeast house line of Shur's lane, for Richard Hey & Sons...	6	33
Main street, northeast side, 934 feet southeast of southeast house line of Shur's lane, for J. P. Holt.....	4	13
Main street, northeast side, 144 feet northwest of northwest house line of Green lane, for Chas. R. Simister..	4	21
Terrace street, southwest side, 175 feet southeast of southeast house line of Adams, for Ellen H. Lees.....	4	15
Total.....		95

Pipe relaid.

Ferry road, from 252 southwest of southwest house line of Ridge avenue, northeast.....	4	228
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Fire connections (private), relaid.

Leverington avenue, southeast side, 63 feet northeast of northeast house line of Mansion, for Robert Wildes' Sons.....	4	18
<i>Fire-hydrant connections, relaid</i>	6	277

Street.	Location.	Size in inches.	Distance in feet.
<i>Repairs general.</i>			
.....	4	20
.....	6	155
.....	12	9
.....	20	10
Total.....			194
<i>Pipe taken up.</i>			
Ridge avenue, from Wissahickon drive, northwest.....		6	36
<i>Fire-hydrant connections.</i>			
.....		6	9
.....		4	97
Total.....			106
<i>Pipe taken up, repairs.</i>			
.....		4	23
.....		6	10
.....		12	3
Total.....			36
<i>Pipe lowered.</i>			
Fairview avenue, from northeast house line of Cresson to centre of Thirty-fifth.....		6	580
Fowler street, from 132 feet northwest of northwest house line of Jefferson, northwest.....		6	192
James avenue, from 159 feet northeast of northeast house line of Ridge avenue, northeast.....		6	376
Ridge avenue, from centre of Rittenhouse, northwest.....		6	174
Sumac street, from 100 feet southwest of southwest curb line of Wetherill, northeast.....		6	100
Wood street, from 132 feet southeast of southeast house line of Grape, northwest.....		6	132
Total.....			1,554
<i>Pipe cut off and abandoned.</i>			
Fire-hydrant connections.....		4	8

RECAPITULATION OF MANAYUNK DISTRICT.

Purposes for which used.	Size—Inches.				Totals in feet and pounds.	
	4	6	12	20		
New pipe, or feet added.	Service mains.....	4,241			4,241	
	Bye-pass connections.....	17	27		44	
	Fire-hydrant connections.....		202		202	
	Fire connections (private).....	62	34		96	
	Total... { Feet.....	79	4,504		4,583	
{ Pounds.....	1,501	148,632		150,133		
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....	246	277		523	
	Repairs, general.....	29	155	9	10	194
	Pipe taken up.....	120	55	3		178
	Pipe lowered.....		1,554			1,554
	Total... { Feet.....	386	2,041	12	10	2,449
{ Pounds.....	7,334	67,353	864	1,590	77,141	
Total handled...	{ Feet.....	465	6,545	12	10	7,032
	{ Pounds.....	8,835	215,985	864	1,590	227,274
Pipe cut off and abandoned.....	8				8	

GERMANTOWN DISTRICT.

Comprising the Twenty-second and part of the Twenty-fifth and Twenty-eighth Wards.

Street.	Location.	Size in inches.	Distance in feet.
<i>Service mains.</i>			
Broad street, east side, from centre of Butler to 182 feet north of north house line of McFerran.....		6	822
Carpenter street, from southwest house line of Emlen, northeast.....		6	356
Carpenter street, from 440 feet northeast of southwest house line of Emlen, northeast.....		6	264
Chestnut Hill and Spring House turnpike, from dead end 176 feet southeast of southeast house line of Sunset avenue to Stenton avenue.....		6	457
Chew street, from Haines to 200 feet northwest of northwest house line of High.....		6	638
Erie avenue, from centre of Marshall, west.....		6	111
Emlen street, from 135 feet southeast of southeast house line of Frank, northeast to centre of Carpenter.....		6	753
Frank street, from northeast house line of Sherman to Green		6	572
Germantown avenue, northeast side over Reading Railroad Bridge (Nicetown).....		10	40
Germantown avenue, southwest side over Reading Railroad Bridge (Nicetown).....		10	56
Hansbury street, from Morris to Wayne.....		6	1,212
Lafayette, from Wayne, northeast.....		6	455
Levering street, from northeast house line of Mower to centre of Germantown avenue.....		6	618
Marshall street, from 23 feet north of south house line of Erie avenue, north.....		6	185
Morris street, from 315 feet southeast of southeast house line of School lane, northwest.....		6	342
Mount Pleasant avenue, from 1 foot 6 inches northeast of northeast house line of Germantown avenue, northeast		6	904
Musgrove, from Sharpnack to Horter.....		6	453
Narragansett place, from 188 feet 4 1/2 inches southwest of southwest house line of Hancock, northeast.....		6	210
Newbold street, from 250 feet south of south house line of Ruscomb, north.....		6	268
Ontario street, from 198 feet east of east house line of Tenth, west.....		6	223
Rounfort avenue, from Sprague to 4 feet 8 inches northeast of northeast house line of Ardleigh.....		6	214
Ruscomb street, from 7 feet 9 inches west of west property line of Germantown Railroad to centre of Newbold..		6	464
Sprague street, from Gowen to Rounfort avenue.....		6	829
Stenton avenue, from Chestnut Hill and Spring House turnpike, northwest.....		6	442

Street.	Location.	Size in inches.	Distance in feet.
<i>Service mains—Continued.</i>			
Sunset avenue, from 276 feet southwest of southwest house line of Twenty-eighth, northeast.....		6	280
Twentieth street, from 150 feet south of southwest house line of Ruscomb, north.....		6	175
Upsal street, from 1 foot 2 inches northeast of northeast house line of Green to centre of Jefferson.....		10	1,237
Westmoreland street, from Twentieth to Twenty-first.....		6	531
Wingohocking street, from 454 feet southeast of southeast house line of Mill, northwest.....		6	471
Wisteria street, from 20 feet southwest of northeast house line of Wakefield, northeast.....		6	224
Total.....			13,806
<hr/>			
<i>Fire hydrant connections.....</i>		6	458
<hr/>			
<i>Fire connections (private).</i>			
Mill street, northwest side, 100 feet southwest of southwest house line of Hancock, for Taylor Bros.....		4	18
Queen street, northwest side, 244 feet northeast of northeast house line of Green, for Watson & Robinson.....		4	21
Wayne street, northeast side, 4 feet southeast of southeast house line of Berkley, for J. J. Collins & Co.....		4	30
Total.....			69
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<i>Drains.</i>			
Armat street, northeast side of Wingohocking creek sewer		3	8
Armat street, southwest side of Wingohocking creek sewer		3	9
Mt. Airy Station, from engine house.....		4	115
Town Hall yard, from shed.....		4	128
Upsal street, 421 feet northeast of northeast house line of Green.....		4	3
Total.....			263
<hr/>			
<i>Pipe relaid.</i>			
Adams street, from 32 feet southeast of northwest house line of Tulpehocken, to 21 feet northwest of southeast house line of Washington avenue.....		6	432
Armat street, over Wingohocking creek sewer.....		6	32

Street.	Location.	Size in inches.	Distance in feet.
<i>Pipe relaid—Continued.</i>			
Germantown avenue, from 153 feet northwest of northwest house line of Nicetown lane over Reading R. R. bridge.....		6	60
McKean avenue, from southeast house line of Manheim, northwest		6	29
Mehl street, from Germantown avenue to Wakefield.....		6	911
Mill street, from 125 feet southwest of southwest house line of Ross, northeast.....		6	125
Total			1,589
<i>Fire-hydrant connections relaid.....</i>		6	77
<i>Relaid fire connections (private).</i>			
Miller street, southwest side, 337 feet southeast of southeast house line of Wister, for J. & B. Allen.....		4	9
<i>Repairs, general.....</i>		3	24
“ “		4	17
“ “		6	76
“ “		10	10
Total			127
<i>Pipe taken up.</i>			
Adams street, from 24 feet 6 inches southeast of northwest house line of Tulpehocken, southeast.....		4	8
Adams street, from 24 feet 6 inches southeast of northwest house line of Tulpehocken, northwest.....		3	305
Armat street, across Wingohocking creek sewer.....		4	21
Germantown avenue, from 153 feet northwest of northwest house line of Nicetown lane over Reading R. R. bridge.....		6	54
Mill street, from 125 feet southwest of southwest house line of Ross, northeast.....		6	125
Total			513
<i>Fire-hydrant connections taken up.....</i>		4	73

Street.	Location.	Size in inches.	Distance in feet.
<i>Lowered.</i>			
Rubicam avenue, from 481 feet southeast of southeast house line of Wister, northwest.....		6	115
Willow Grove avenue, from 80 feet northeast of northeast house line of Thirty-fifth street, northeast.....		6	324
Total			439
<i>Cut off and abandoned.</i>			
Adams street, from 280 feet northwest of northwest house line of Tulpehocken, northwest.....		3	125
Mehl street, from 18 feet 6 inches southwest of northeast house line of Germantown avenue, northeast.....		3	829
Mehl street, from 810 feet northeast of northeast house line of Germantown avenue, to Wakefield street.....		4	82
Total			1,036

RECAPITULATION OF GERMANTOWN DISTRICT.

Purposes for which used.	Size—Inches.				Totals in feet and pounds.	
	3	4	6	10		
New pipe or feet added.	Service mains.....			12,473	1,333	13,806
	Fire hydrant connections..			458		458
	Fire connections (private).....		69			69
	Drains	17	246			263
	Total.....	{ Feet	17	315	12,931	1,333	14,596
	{ Pounds.....	255	5,985	426,723	73,315	506,278
Pipe used, but adding nothing to feet in the ground.	Pipe relaid.....		9	1,666		1,675
	Repairs, general.....	24	17	76	10	127
	Pipe taken up.....	305	102	179		586
	Pipe lowered.....			439		439
	Total.....	{ Feet	329	128	2,360	10	2,827
	{ Pounds.....	4,935	2,432	77,880	550	85,797
Total handled.....	{ Feet	346	443	15,291	1,343	17,423
	{ Pounds.....	5,190	8,417	504,603	73,865	592,075
Pipe cut off and abandoned.....	954	82				1,036

RECAPITULATION OF WORK ON THE WATER PIPES.

12 W	Purposes for which used.	Size—Inches.														Totals in feet and pounds.	
		3 in.	4 in.	6 in.	8 in.	10 in.	12 in.	16 in.	18 in.	20 in.	22 in.	24 in.	25 in.	30 in.	36 in.		48 in.
New pipe, or feet added.	Service mains.....			70,338	3,921	1,369	3,338										78,966
	Supply mains.....								4,034				24,937			2,257	31,228
	Pumping mains.....														21	1,954	1,975
	Supply main connections.....			34		96	9							146	70		355
	Pumping main connections.....														262	138	400
	By-pass connections.....		17	27													44
	Fire hydrant connections.....			7,067													7,067
	Fire connections (private).....		757	146													903
	Supply connections (private).....		736	21													757
	Motor connections (private).....		72														72
Drains.....	17	256	282	28	440											1,023	
	Total.....	{ feet.....	17	1,38	77,915	3,949	1,905	3,347		4,034				25,083	353	4,349	122,790
		{ pounds.....	253	31,922	2,571,195	165,855	104,775	240,984		641,406				8,327,556	148,966	2,544,165	14,780,882
Pipe used, but adding nothing to feet in ground.	Pipe relaid.....		278	6,171			43	1,297			30	30	9				7,858
	Repairs, general.....	28	166	4,082	89	299	296	10	6	38				21	4	30	5,069
	Pipe taken up.....	1,257	1,795	818	5	27	18	64		4				51		42	4,081
	Pipe lowered.....			16,483													16,483
	Pipe raised.....			90							18						64
	Pipe shifted.....			392						43							435
		Total.....	{ feet.....	1,285	2,239	28,036	94	326	357	1,371	6	85	48	30	9	72	4	136
		{ pounds.....	19,275	42,541	925,188	3,948	17,930	25,704	150,810	840	13,515	12,000	9,300	2,880	23,904	1,688	79,560
	Total handled...	{ feet.....	1,302	4,077	105,951	4,043	2,231	3,704	1,371	6	4,119	48	30	9	25,155	357	4,485
		{ pounds.....	19,530	77,463	3,496,383	169,806	122,705	266,685	150,810	840	654,921	12,000	9,300	2,880	8,351,460	150,654	2,623,725
	Total pipe cut off and abandoned...		1,057	3,122	209		15	232	1,222								5,857

RECAPITULATION BY DISTRICTS.

DISTRICTS.		Size—Inches.														Totals.			
		3	4	6	8	10	12	16	18	20	22	24	25	30	36	48	Feet.	Pounds.	
New pipe or feet added.	First		701	16,022	545		1,623			582							19,473	771,329	
	Second		405	8,444			1,665										10,511	406,227	
	Third		242	16,673	278	123	59			3,452				25,009			45,827	9,426,264	
	Fourth		96	19,341	3,126	449								83	353	1,349	27,797	3,516,751	
	Manayunk		79	4,504													4,583	150,133	
	Germantown		17	315	12,931		1,333										14,595	566,278	
	Total	{ feet	17	1,838	77,915	3,949	1,905	3,347			4,031			25,083	353	4,349	122,790		
		{ pounds.	255	34,922	2,571,195	165,858	104,775	210,984			641,106			8,527,556	148,966	2,511,165		14,780,082	
Pipe used, but adding nothing to feet in the ground.	First		667	15,694	2	5	43			6							15,817	515,184	
	Second	956	438	4,944	32	49	58	10		12							6,499	197,037	
	Third		460	1,163	53	128	200			4				20			2,028	78,661	
	Fourth		160	2,434	7	134	44	1,361	6	53	48	30	9	52	4	136	4,478	375,863	
	Manayunk		386	2,041			12			10							2,449	77,141	
	Germantown	329	128	2,360		10											2,827	85,797	
	Total	{ feet	1,285	2,239	28,636	94	326	337	1,371	6	85	48	30	9	72	4	136	34,098	
		{ pounds.	19,275	42,541	925,188	3,948	17,939	25,704	159,810	840	13,515	12,090	9,300	2,880	23,904	1,688	79,560		1,329,083
Total handled		{ feet	1,302	4,077	105,951	4,043	2,231	3,701	1,371	6	4,119	48	30	9	25,155	357	4,485	156,888	
		{ pounds.	19,530	77,563	3,496,383	169,806	122,705	266,688	150,810	840	654,921	12,000	9,300	2,880	8,351,460	150,654	2,623,725		16,109,165
Pipe cut off and abandoned			1,057	3,122	209		15	232	1,222										5,857

NEW FIRE HYDRANTS.

FIRST DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Ash street, southwest corner of Tasker.....		1	6	18 ft.	6 in.				1
Broad street, northeast corner of Jackson.....		1	6	13 ft.					1
Broad street, northwest corner of McKean.....		26	6	19 ft.					1
Carlisle street, northeast corner of Morris.....		26	6	9 ft.				1	
Carpenter street, south side, west house line of Thirteenth.....		2	6	14 ft.	6 in.			1	
Carpenter street, northwest corner of Twenty-third.....		30	12	16 ft.	6 in.				1
Catharine street, southwest corner of Seventh.....		3	6	18 ft.					1
Catharine street, northeast corner of Webb.....		30	6	15 ft.	6 in.			1	
China street, south side, 52 feet east of east house line of Second.....		2	6	5 ft.	6 in.			1	
Christian street, north side, 53 feet east of east house line of Thirteenth.....		3	6	9 ft.	10 in.			1	
Ellsworth street, south side, west house line of Eighteenth.....		26	6	14 ft.	6 in.			1	
Federal street, southwest corner of Fourth.....		2	6	14 ft.	10 in.				1
Federal street, south side, 68 feet east of east house line of Fifth.....		2	6	14 ft.	8 in.			1	
Federal street, south side, west house line of Eighteenth.....		26	6	15 ft.				1	
Hicks street, east side, south house line of Tasker.....		26	6	8 ft.				1	

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Jackson street, south side, west house line of Twenty-eighth.....		26	6	19 ft.				1	
Long lane, southeast side, 106 feet southwest of west house line of Twenty-fifth.....		26	6	11 ft.				1	
Long lane, southeast side, 690 feet southwest of west house line of Twenty-fifth.....		26	6	11 ft.				1	
Long lane, southeast side, 1,279 feet 6 inches southwest of west house line of Twenty-fifth.....		26	6	10 ft.				1	
Mifflin street, south side, west house line of Broad.....		26	8	14 ft. 6 in.				1	
Mole street, west side, 153 feet north of north house line of McKean.....		26	6	8 ft. 6 in.				1	
Mole street, southwest corner of Tasker.....		26	6	10 ft. 10 in.					1
Moore street, northeast corner of Twenty-first.....		26	6	21 ft.					1
Morris street, north side, west house line of Broad.....		26	6	15 ft.				1	
Morris street, north side, 6 feet west of west house line of Fifteenth.....		26	6	14 ft.				1	
Morris street, north side, east house line of Sixteenth.....		26	6	14 ft.				1	
Morris street, north side, 207 feet east of east house line of Twenty-first.....		26	6	14 ft.				1	
Ninth street, northeast corner of Mifflin.....		1	6	17 ft. 6 in.					1
Ninth street, northwest corner of Dickinson.....		1	6	18 ft.					1
Ninth street, northeast corner of Reed.....		1	6	18 ft.					1
Ninth street, southeast corner of Ellsworth.....		26	6	14 ft. 6 in.					1

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Ninth street, southeast corner of Washington avenue.....		2	6	18 ft.	4 in.				1
Ninth street, southwest corner of Carpenter.....		2	6	16 ft.					1
Ninth street, southwest corner of Christian.....		3	6	17 ft.					1
Ninth street, west side, south house line of Catharine.....		3	6	14 ft.				1	
Ninth street, southeast corner of Fitzwater.....		3	6	17 ft.	6 in.				1
Ninth street, west side, south house line of Bainbridge.....		4	6	14 ft.	8 in.			1	
Peltz street, northeast side, 3 feet northwest of northwest house line of Gray's Ferry road.....		30	6	15 ft.	2 in.			1	
Peltz street, northeast side, southeast house line of Twenty-ninth.....		30	6	15 ft.	2 in.			1	
Peltz street, northeast side, 1 foot southeast of southeast house line of Schuylkill avenue.....		30	6	15 ft.	2 in.			1	
Pier No. 63, south wharves, 350 feet east of east house line of Ash.....		1	4			1			
Pier No. 63, south wharves, 608 feet 6 inches east of east house line of Ash.....		1	4			1			
Pierce street, south side, 269 feet west of west house line of Twentieth.....		26	6	9 ft.					
Reed street, south side, 34 feet east of east house line of Moyamensing avenue.....		2	6	14 ft.	8 in.			1	
Rye street, west side, south house line of Wyoming.....		1	6	5 ft.				1	
Sanderson street, north side, 109 feet east of east house line of Seventeenth.....		26	4	9 ft.	6 in.		1		
Seventh street, southwest corner of McKean.....		1	6	18 ft.	6 in.				1

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Seventh street, northeast corner of Dudley.....		1	6	16 ft. 8 in.					1
Seventh street, southeast corner of Millin.....		1	6	17 ft. 6 in.					1
Seventh street, southeast corner of Morris.....		1	6	17 ft. 6 in.					1
Seventh street, northeast corner of Tasker.....		1	6	17 ft. 9 in.					1
Seventh street, east side, 3 feet north of north house line of Dickinson.....		1	6	14 ft. 6 in.				1	
Seventh street, northwest corner of Reed.....		1	6	17 ft.					1
Seventh street, west side, south house line of Wharton.....		1	6	11 ft. 6 in.				1	
Seventh street, southeast corner of Federal.....		2	6	15 ft. 10 in.					1
Seventh street, northwest corner of Plover.....		2	6	15 ft. 6 in.					1
Seventh street, northwest corner of Washington avenue.....		2	6	17 ft. 6 in.					1
Seventh street, southeast corner of Fitzwater.....		3	6	15 ft. 10 in.					1
Seventh street, east side, south house line of Christian.....		2	6	9 ft. 4 in.				1	
Seventh street, southeast corner of Bainbridge.....		4	6	18 ft. 6 in.					1
Seventeenth street, northeast corner of Latona.....		26	6	15 ft.					1
Siegel street, north side, 133 feet 6 inches east of east house line of Sixth.....		1	6	7 ft. 6 in.				1	
South Marshall street, north side, 307 feet west of west house line of Broad.....		26	4	8 ft. 6 in.			1		

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Tasker street, southwest corner of Broad.....		26	6	18 ft.					1
Tasker street, north side, east house line of Fifteenth.....		26	6	15 ft.				1	
Tenth street, southeast corner of Ellsworth.....		26	6	14 ft. 6 in.					1
Twentieth street, northwest corner of Moore.....		26	6	21 ft.					1
Twentieth street, southeast corner of Alter.....		26	6	16 ft. 8 in.					1
Twenty-first street, west side, 70 feet north of north house line of Reed.....		26	6	15 ft.				1	
Twenty-first street, northeast corner of Wharton.....		26	6	21 ft. 6 in.					1
Twenty-first street, northeast corner of Oakford.....		26	6	20 ft.					1
Twenty-first street, east side, 2 feet north of north house line of Ellsworth.....		26	6	15 ft. 10 in.				1	
Twenty-first street, southwest corner of Fitzwater.....		30	6	18 ft.					1
Twenty-second street, southeast corner of Latona.....		26	12	19 ft.					1
Twenty-second street, southeast corner of Ellsworth.....		26	6	18 ft. 6 in.					1
Twenty-second street, northwest corner of Washington avenue.....		30	6	18 ft. 1 in.					1
Twenty-second street, southwest corner of Fitzwater.....		30	6	19 ft.					1
Twenty-third street, southeast corner of Ellsworth.....		26	6	14 ft. 6 in.					1
Thirty-second street, east side, south house line of Wharton.....		26	6	14 ft.				1	

NEW FIRE HYDRANTS—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTIONS.			STYLE.		
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Titan street, north side, 112 feet west of west house line of Twenty-first.....		26	6	8 ft.			1		
Titan street, southwest corner of Long lane.....		26	6	9 ft. 6 in.				1	
Watkins street, south side, 178 feet west of west house line of Eleventh		1	6	9 ft.		1			
Watkins street, north side, 7 feet east of east house line of Twenty-first.....		26	6	10 ft. 6 in.			1		
Welling street, east side, north house line of Bainbridge.....		30	6	9 ft.			1		
Total.....				1,200 ft. 7 in.	2	3	37	41	

New Fire Hydrants—Continued.

SECOND DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Chestnut street, south side, 13 feet east of east house line of Fifty-sixth.....		27	8	22 ft. 6 in.	1				
Eighteenth street, west side, 42 feet 6 inches north of north curb line of Locust.....		8	12	12 ft. 5 in.			1		
Eighteenth street, northeast corner of Market.....		9	12	14 ft. 10 in.					1
Fifteenth street, west side, south house line of Race.....		10	20	19 ft. 7 in.			1		
Fifty-fourth street, west side, 2 feet south of south house line of Media.....		24	6	17 ft. 5 in.			1		
Filbert street, north side, 150 feet west of west house line of Seventeenth.....		9	6	13 ft. 10 in.		1			
Fortieth street, northwest corner of Woodland avenue.....		27	6	21 ft.					1
Fortieth street, southeast corner of Baltimore avenue.....		27	6	21 ft. 9 in.					1
Fortieth street, southwest corner of Spruce.....		27	10	19 ft. 11 in.					1
Forty-second street, west side, 251 feet southeast of southeast house line of Woodland avenue.....		27	6	13 ft.			1		
Forty-ninth street, northwest corner of Dohan.....		24	6	18 ft. 8 in.			1		
Front street, west side, 1 foot north of north house line of Elfreth.....		6	8	16 ft. 11 in.			1		
Green street, south side, 162 feet west of west house line of Fortieth.....		24	6	10 ft. 1 in.		1			
Hamilton street, northeast corner of Thirty-eighth.....		24	6	18 ft.					1
Haverford avenue, south side, 119 feet east of east house line of Sixty-seventh.....		21	12	24 ft.			1		
Haverford avenue, north side, 21 feet east of east house line of Sixty-eighth.....		21	12	20 ft. 2 in.					1

NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Haverford avenue, south side, 18 feet 6 inches east of east house line of Sixty-ninth.....		21	6	16 ft. 9 in.			1		
Haverford avenue, south side, 1 foot 6 inches east of east house line of Lansdown avenue.....		24	6	17 ft. 2 in.				1	
Lancaster avenue, northeast corner of Fortieth.....		21	6	17 ft. 4 in.			1		
Locust street, north side, opposite center of Nineteenth.....		8	6	15 ft.			1		
Locust street, north side, 7 feet west of west house line of Twentieth.....		8	6	15 ft.			1		
Locust street, south side, west house line of Twenty-first.....		8	6	14 ft. 3 in.			1		
Market street, northwest corner of Sixteenth.....		9	6	12 ft. 4 in.				1	
Market street, south side, 5 feet west of west house line of Eighteenth.....		9	6	7 ft. 4 in.			1		
Market street, northeast corner of Nineteenth.....		9	6	16 ft. 9 in.				1	
Nineteenth street, east side, opposite centre of Locust.....		8	6	15 ft. 3 in.			1		
Nineteenth street, northeast corner of Filbert.....		9	6	16 ft. 5 in.				1	
Ninth street, southwest corner of Lombard.....		7	6	19 ft. 7 in.				1	
Pine street, north side, 216 feet east of east house line of Third.....		5	6	14 ft. 7 in.			1		
Race street, north side, 20 feet west of west house line of Sixth.....		6	6	15 ft. 10 in.			1		
Sansom street, southwest corner of Twenty-third.....		8	6	10 ft. 8 in.				1	
Saybrook street, north side, 307 feet 6 inches west of west house line of Forty-ninth.....		27	6	16 ft.		1			
South street, south side, 22 feet west of west house line of Thirty-second.....		27	6	23 ft. 6 in.				1	

NEW FIRE HYDRANTS—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New No. 1.	New No. 2.	New No. 3.
Spruce street, southwest corner of Thirteenth.....		7	12		15 ft. 3 in.				1
Spruce street, southwest corner of Twenty-fourth.....		7	6		14 ft. 7 in.				1
Spruce street, northwest corner of Sycamore.....		8	12		14 ft. 7 in.			1	
Thirty-fifth street, southwest corner of Hamilton.....		24	8		19 ft. 4 in.				1
Thirty-eighth street, southeast corner of Spruce.....		27	6		19 ft. 11 in.				1
Thirty-eighth street, southeast corner of Locust.....		27	6		18 ft. 2 in.				1
Thirty-eighth street, northeast corner of Walnut.....		7	12		18 ft. 10 in.				1
Thirty-ninth street, southeast corner of Irving.....		27	6		21 ft. 10 in.			1	
Thirty ninth street, southeast corner of Spruce.....		27	6		20 ft. 9 in.				1
Twenty-second street, southwest corner of Locust.....		8	12		17 ft. 5 in.				1
Twenty-fourth street, northwest corner of Pine.....		7	6		14 ft. 8 in.			1	
Walnut street, south side, west house line of Fortieth.....		27	8		25 ft.			1	
Walnut street, southwest corner of Forty-first.....		27	8		23 ft. 7 in.				1
Wallace street, northeast corner of Fortieth.....		24	6		14 ft. 10 in.				1
West Logan square, east side, 9 feet north of north house line of Race.....		10	6		16 ft. 4 in.				1
West Logan square, east side, 15 feet south of south house line of Vine.....		10	6		14 ft. 4 in.				1
Totals.....					837 ft. 3 in.	2	2	21	24

New Fire Hydrants—Continued.

THIRD DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTIONS.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Allen street, southwest corner of Penn.....		23	6		16 ft. 5 in.				1
Amber street, east side, 158 feet south of south house line of Tioga.....		25	6		15 ft. 2 in.		1		
Blair street, southwest corner of Norris.....		19	6		11 ft. 11 in.				1
Bodine street, east side, 115 feet 8 inches south of south house line of York.....		19	6		7 ft. 9 in.		1		
Bordeaux street, east side, 132 feet south of north house line of North Bordeaux.....		19	6		8 ft. 3 in.		1		
Bristol avenue, north side, east house line of Fifth.....		25	30		7 ft. 8 in.	1			
Cambria street, southeast corner of Fifth.....		25	6		15 ft. 10 in.				1
Canal street, northwest corner of Fourth.....		16	6		12 ft. 10 in.				1
Cedar street, southwest corner of Townsend.....		31	6		16 ft. 5 in.				1
Church street, south side, 199 feet west of west house line of Paul.....		23	6		13 ft.		1		
Cumberland street, southwest corner of Howard.....		19	6		16 ft.				1
Diamond street, south side, east house line of Germantown avenue.....		19	6		4 ft. 4 in.			1	
East Susquehanna avenue, southwest side, north house line of Memphis.....		31	6		14 ft. 5 in.			1	
Emeline street, northwest side, 171 feet southwest of southwest house line of Somerset.....		25	6		8 ft. 2 in.		1		
Euston street, on dead end of 6-inch pipe, 221 feet east of east house line of Third.....		25	6				1		

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTIONS.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Fairhill street, east side, 223 feet north of north house line of Somerset.....		25	6	14 ft.			1		
Fairhill street, southwest corner of Cambria.....		25	6	16 ft. 9 in.					1
Fifth street, northeast corner of Girard avenue.....		17	6	19 ft.					1
Fifth street, east side, 241 feet north of north house line of Lehigh avenue.....		25	6	19 ft. 4 in.			1		
Fifth street, east side, 179 feet north of north house line of Eric avenue.....		25	30	16 ft.				1	
Fifth street, southeast corner of Butler.....		25	30	13 ft.					1
Fifth street, northeast corner of Pike.....		25	30	18 ft. 6 in.					1
Fifth street, east side, south house line of Luzerne.....		25	30	7 ft. 8 in.	1				
Foulkrod street, northeast side, southeast house line of Franklin.....		23	6	14 ft. 2 in.				1	
Frankford avenue, northwest corner of Girard avenue.....		18	10	20 ft.					1
Frankford avenue, east side, south house line of Vienna.....		18	10	17 ft.				1	
Frankford avenue, west side, 128 feet north of north house line of Norris.....		31	10	18 ft. 7 in.			1		
Frankford avenue, west side, 111 feet north of north house line of East Susquehanna avenue.....		31	10	18 ft. 9 in.				1	
Frankford avenue, east side, 391 feet south of Connecting Railroad.....		25	12	31 ft. 6 in.	1				
Frankford avenue, east side, 38 feet north of Connecting Railroad.....		25	12	33 ft. 6 in.				1	
Franklin street, southeast side, 65 feet 8 inches northeast of northeast house line of Church.....		23	6	13 ft. 10 in.			1		

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				1 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Germantown avenue, southwest corner of Norris.....		19	6		13 ft. 7 in.				1
Girard avenue, southeast side, southwest house line of East Susquehanna.....		18	20		15 ft. 2 in.			1	
Girard avenue, north corner of Vienna.....		18	20		46 ft.				1
Girard avenue, south corner of Vienna.....		18	20		45 ft.				1
Girard avenue, southeast side, southwest house line of Montgomery avenue.....		18	20		45 ft.			1	
Girard avenue, south corner of Eyre.....		18	20		47 ft.				1
Girard avenue, northwest side, southwest house line of Palmer.....		18	20		45 ft.			1	
Girard avenue, northwest side, 3 feet southwest of southwest house line of Palmer.....		18	20		45 ft.			1	
Girard avenue, east corner of Elm.....		18	20		49 ft.				1
Girard avenue, north corner of Hanover.....		18	20		45 ft.				1
Girard avenue, southeast side, northeast house line of Hanover.....		18	20		46 ft.			1	
Girard avenue, east corner of Savery.....		18	20		45 ft.				1
Girard avenue, southeast side, northeast house line of Marlborough.....		18	20		43 ft.			1	
Girard avenue, west corner of Marlborough.....		18	20		47 ft.				1
Girard avenue, northwest side, southwest house line of Crease.....		18	20		46 ft.			1	
Girard avenue, south corner of Crease.....		18	20		48 ft.				1

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Girard avenue, west corner of Shackamaxon.....		18	20	46 ft.	6 in.				1
Girard avenue, south side, west house line of Shackamaxon.....		18	20	45 ft.				1	
Girard avenue, south side, 10 feet 6 inches west of west house line of Frankford avenue.....		16	20	68 ft.				1	
Girard avenue, north corner of Leopard.....		17	20	33 ft.	3 in.				1
Girard avenue, south corner of Leopard.....		16	20	36 ft.	5 in.				1
Girard avenue, north side, east house line of Front.....		17	20	37 ft.				1	
Girard avenue, south side, 3 feet east of east curb line of O'Neill.....		16	12	11 ft.	6 in.			1	
Girard avenue, south side, east house line of Second.....		16	12	10 ft.				1	
Girard avenue, southeast corner of Third.....		16	12	8 ft.	10 in.				1
Girard avenue, south side, 48 feet east of east house line of Fourth.....		16	10	8 ft.	3 in.		1		
Girard avenue, south side, 3 feet east of east house line of Lawrence.....		16	10	7 ft.	7 in.			1	
Girard avenue, east house line of Fifth.....		16	10	8 ft.	6 in.			1	
Girard avenue, south side, 1 foot west of east house line of Sixth.....		16	10	8 ft.	4 in.			1	
Glenwood street, north side, 110 feet east of east house line of Fourth.....		25	6	18 ft	3 in.		1		
Green street, north side, 2 feet west of west house line of Beach.....		11	6	14 ft.	6 in.			1	
Hancock street, east side, 22 feet south of south house line of Susquehanna avenue.....		19	6	15 ft.	4 in.			1	

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Hancock street, southwest corner of York.....		19	6		14 ft. 10 in.				1
Hanover street, east corner of Moyer.....		18	6		14 ft. 6 in.				1
Howard street, northeast corner of Girard avenue.....		17	6		19 ft.				1
Howard street, southwest corner of Thompson.....		17	6		18 ft.				1
Howard street, west side, 162 feet north of north house line of Jefferson.....		17	4		14 ft.		1		
Howard street, west side, 19 feet south of south house line of Susquehanna avenue.....		19	6		14 ft.			1	
Howard street, east side, 3 feet south of south house line of Huntingdon.....		19	6		15 ft.			1	
Hull street, southeast corner of Frankford avenue.....		25	6		15 ft. 4 in.				1
Hutchinson street, west side, opposite Richfield.....		25	6		9 ft. 2 in.		1		
Indiana avenue, south side, 195 feet 6 inches east of east house line of Third.....		25	6		14 ft. 6 in.			1	
Jasper street, northeast corner of Cumberland.....		31	6		15 ft. 9 in.				1
Jefferson street, northeast corner of Howard.....		17	6		16 ft.				1
Kensington pike, southeast side, 325 feet southwest of southwest side of Wingohocking creek.....		25	30		22 ft. 3 in.				1
Kensington pike, northwest side, 137 feet northeast of northeast side of Wingohocking creek.....		25	30		11 ft. 9 in.			1	
Kensington pike, northeast corner of Olney road.....		25	12		13 ft. 8 in.				1
Kensington pike, southeast side, south of Wyoming.....		25	30		4 ft. 2 in.				1

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

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W

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Kensington pike, southeast side, south of Rockland.....		25	30	4 ft.	2 in.				1
Lawrence street, northwest corner of Brown.....		16	6	13 ft.					1
Lawrence street, west side, 250 feet north of north house line of Somerset.....		25	6	13 ft.	8 in.		1		
Lehigh avenue, southwest corner of Hope.....		19	6	9 ft.	7 in.				1
Lehigh avenue, southwest corner of Howard.....		19	6	10 ft.					1
Lehigh avenue, southeast corner of Hancock.....		19	36	58 ft.					1
Lehigh avenue, northeast corner of Second.....		25	6	18 ft.	3 in.				1
Lehigh avenue, southeast corner of Second.....		19	6	10 ft.	8 in.				1
Lehigh avenue, north side, east house line of American.....		25	6	8 ft.	6 in.			1	
Lehigh avenue, southwest corner of American.....		19	6	15 ft.	4 in.				1
Lehigh avenue, northeast corner of Third.....		25	6	9 ft.	7 in.				1
Lehigh avenue, southeast corner of Third.....		19	6	12 ft.	2 in.				1
Lehigh avenue, south side, west house line of Fourth.....		19	6	11 ft.	5 in.			1	
Lehigh avenue, northwest corner of Lawrence.....		25	6	12 ft.					1
Lehigh avenue, southeast corner of Orkney.....		19	6	10 ft.	10 in.			1	
Lehigh avenue, southwest corner of Fifth.....		19	6	11 ft.	2 in.			1	

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NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Lehigh avenue, northeast corner of Reese.....		25	6	.....	11 ft.				1
Lehigh avenue, southwest corner of Reese.....		19	6	.....	11 ft.			1	
Lehigh avenue, northeast corner of Fairhill.....		25	6	.....	11 ft. 7 in.				1
Lehigh avenue, southeast corner of Sixth.....		19	6	.....	10 ft. 8 in.				1
Leithgow street, southwest corner of George.....		16	6	.....	9 ft. 8 in.				1
Leithgow street, east side, south house line of Clearfield.....		25	6	.....	7 ft. 7 in.			1	
Lewellen street, north side, 154 feet west of west house line of Beach.....		16	6	.....	9 ft.		1		
Mascher street, southeast corner of Somerset.....		25	6	.....	16 ft. 8 in.				1
Montgomery avenue, east corner of Girard.....		18	10	.....	17 ft.				1
Mulberry street, southeast side, 283 feet northeast of northeast house line of Harrison.....		23	6	.....	14 ft. 2 in.		1		
Ninth street, west side, north house line of Lehigh avenue.....		25	6	.....	14 ft. 9 in.			1	
Ninth street, northwest corner of Silver.....		25	6	.....	9 ft.				1
Norris street, south side. 131 feet west of west house line of Cedar.....		18	6	.....	14 ft. 9 in.		1		
N. Bordeaux street, northeast corner of Marshall.....		19	6	.....	11 ft. 6 in.				1
Orchard street, east side, 77 feet 3 inches north of north house line of Rawle.....		12	4	.....	8 ft. 10 in.		1		
Orianna street, northwest corner of Lehigh avenue.....		25	6	.....	9 ft. 8 in.				1

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Palothorp street, east side, 225 feet south of south house line of Lehigh avenue.....		19	6	.....	9 ft. 2 in.	.....	1		
Philip street, southwest corner of Somerset.....		25	6	.....	13 ft.	.....			1
Randolph street, northeast corner of Girard.....		17	4	.....	13 ft. 2 in.	.....		1	
Reese street, west side, 238 feet north of north house line of Lehigh avenue.....		25	6	.....	10 ft. 7 in.	.....	1		
Reese street, east side, 126 feet south of south house line of Cambria.....		25	6	.....	11 ft. 8 in.	.....		
Reese street, west side, 48 feet north of north house line of Cambria.....		25	6	.....	11 ft.	.....	1		
Reese street, west side, north house line of Indiana.....		25	6	.....	10 ft. 10 in.	.....		1	
Ridge street, northeast side, opposite Johnson.....		23	6	.....	12 ft.	.....		1	
Russel street, southwest side, 417 southeast of southeast house line of Kensington avenue.....		25	6	.....	11 ft. 7 in.	.....	1		
Second street, west side, north corner of angle with Cadwallader.....		17	10	.....	22 ft.	.....		1	
Second street, east side, 140 feet north of north house line of Jefferson.....		17	6	.....	18 ft. 2 in.	.....	1		
Seppiva street, northeast corner of E. Susquehanna avenue.....		31	6	.....	19 ft. 9 in.	.....			1
Sergeant street, southwest side, southeast house line of Cedar.....		31	6	.....	15 ft.	.....		1	
Seventh street, southwest corner of Lehigh avenue.....		19	6	.....	15 ft. 3 in.	.....		1	
Sixth street, northeast corner of Brown.....		12	10	.....	11 ft. 5 in.	.....			1
Sixth street, northwest corner of Somerset.....		25	10&30	.....	13 ft. 2 in.	.....			1

NEW FIRE HYDRANTS—THIRD DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Sixth street, northwest corner of Cambria.....		25	10& 30	12 ft.	6 in.				1
Sixth street, northeast corner of Indiana.....		25	10& 30	13 ft.	3 in.				1
Sixth street, west side, north house line of Clearfield.....		25	10& 30	13 ft.	9 in.			1	
Sixth street, southwest corner of Venango.....		25	10& 30	22 ft.	9 in.				1
Sixth street, northwest corner of Tioga.....		25	10& 30	15 ft.					1
Sixth street, southwest corner of Erie.....		25	10& 30	21 ft.	6 in.				1
Somerset street, north side, 16 feet east of east house line of Trenton avenue.....		25	6	18 ft.				1	
Somerset street, north side, west house line of Trenton avenue.....		25	6	16 ft.	8 in.			1	
Somerset street, southwest corner of Front.....		19	6	16 ft.	10 in.				1
Somerset street, south side, 41 feet west of west house line of Howard.....		25	6	14 ft.	6 in.			1	
Somerset street, southwest corner of Hancock.....		25	6	18 ft.	10 in.				1
Somerset street, southeast corner of Second.....		25	6	18 ft.	3 in.				1
Somerset street, west house line of American.....		25	6	15 ft.	2 in.			1	
Somerset street, southeast corner of Orianna.....		25	6	17 ft.					1
Somerset street, southeast corner of Third.....		25	6	17 ft.					1
Somerset street, southeast corner of Lawrence.....		25	6	17 ft.	4 in.				1

NEW FIRE HYDRANTS—THIRD DISTRICT--Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Somerset street, southeast corner of Fifth.....		25	6	16 ft. 7 in.					1
Somerset street, northeast corner of Fairhill.....		25	6	17 ft. 5 in.					1
St. John street, east side, north house line of Poplar.....		16	6	13 ft.			1		
Third street, northeast corner of Cambria.....		25	6	15 ft.					1
Thompson street, northeast corner of East Susquehanna avenue.....		18	6	15 ft. 7 in.					1
Thompson street, southeast corner of Front.....		17	6	15 ft.					1
Thouron street, southeast corner of Coulston.....		19	6	11 ft.					1
Tyson street, southwest corner of Huntingdon.....		19	6	13 ft. 6 in.					1
Volkmar street, northwest side, 423 feet northeast of northeast house line of Hanover.....		18	4	8 ft.		1			
Weikle street, southeast side, 234 feet 9 inches southwest of southwest house line of Tioga.....		25	6	11 ft.		1			
Whitby avenue, on dead end of 6-inch pipe 232 feet 6 inches east of east house line of Third..		25	6			1			
Willey street, east corner of Ross.....		18	6	11 ft. 7 in.					1
Willey street, southeast side, 42 feet northeast of northeast house line of Hanover.....		18	6	14 ft. 10 in.		1			
Totals.....					2,308 ft. 5 in.	3	28	47	77

New Fire Hydrants—Continued.

FOURTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Alleghany avenue, northeast corner of Sixteenth.....		28	6		10 ft. 9 in.				1
Baltz street, northwest corner of Thirtieth.....		20	6		11 ft. 10 in.				1
Berks street, northeast corner of Eighteenth.....		28	6		15 ft.				1
Broad street, west side, north house line of Diamond.....		28	6		10 ft. 3 in.			1	
Broad street, east side, north house line of Diamond.....		28	6		8 ft. 4 in.			1	
Broad street, southeast corner of Susquehanna avenue.....		28	6		9 ft. 8 in.				1
Broad street, southwest corner of Susquehanna avenue.....		28	6		12 ft. 7 in.				1
Brown street, northeast corner of Seventh.....		13	6		16 ft. 1 in.			1	
Brown street, southeast corner of Twenty-third.....		15	6		16 ft. 6 in.				1
Bouvier street, northeast corner of Oxford.....		29	6		13 ft.				1
Bouvier street, west side, 144 feet south of south house line of Dauphin.....		28	6		8 ft. 6 in.		1		
Burns street, northwest corner of Brown.....		15	6		6 ft. 4 in.			1	
Buttonwood street, southeast corner of Marshall.....		13	6		19 ft. 9 in.				1
Callowhill street, northeast corner of Eighth.....		13	6		17 ft.				1
Cambridge street, southwest corner of Thirtieth.....		29	6		10 ft.				1

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Centennial avenue, southwest corner of Oxford.....		29	6		16 ft.				1
Charlsee street, north side, 119 feet 4 inches west of west house line of Gratz.....		28	6		6 ft. 11 in.		1		
Clearfield street, north side, west house line of Broad.....		28	6		14 ft.			1	
Colorado street, east side, 200 feet south of south house line of Dauphin.....		28	6		8 ft. 4 in.		1		
Columbia avenue, southeast corner of Darien.....		20	6		22 ft.			1	
Diamond street, northeast corner of Fifteenth.....		28	6		5 ft. 4 in.				1
Diamond street, southwest corner of Fifteenth.....		28	6		1 ft. 6 in.				1
Diamond street, northwest corner of Sixteenth.....		28	6		3 ft.			1	
Dover street, northeast corner of Thompson.....		29	6		9 ft. 6 in.				1
Edgely street, southwest corner of Sixteenth.....		28	6		12 ft. 6 in.				1
Eleventh street, southwest corner of Poplar.....		14	10		16 ft. 5 in.				1
Eleventh street, southeast corner of Girard avenue.....		20	6		15 ft. 4 in.				1
Fairmount avenue, south side, east house line of Twenty-fifth.....		15	30		13 ft. 6 in.			1	
Fifteenth street, southeast corner of Alleghany avenue.....		28	6		15 ft.				1
Garnet street, southeast corner of Oxford.....		29	6		9 ft. 6 in.				1
Green street, northeast corner of Seventeenth.....		15	6		18 ft. 6 in.				1

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Girard avenue, south side, 1 foot west of west house line of Franklin.....		20	12	.....	8 ft. 5 in.	.....	.....	1	.....
Girard avenue, northeast corner of Franklin.....		20	12	.....	24 ft. 5 in.	.....	.....	.....	1
Girard avenue, southeast corner of Percy.....		20	12	.....	5 ft. 7 in.	.....	.....	1	.....
Girard avenue, northwest corner of Tenth.....		20	12	.....	14 ft. 2 in.	.....	.....	.....	1
Girard avenue, northwest corner of Deacon.....		20	12	.....	13 ft. 7 in.	.....	.....	.....	1
Girard avenue, northeast corner of Warlock.....		20	12	.....	14 ft. 3 in.	.....	.....	.....	1
Girard avenue, northeast corner of Twelfth.....		20	12	.....	15 ft. 6 in.	.....	.....	.....	1
Girard avenue, north side, west house line of Thirteenth.....		20	12	.....	13 ft. 4 in.	.....	.....	1	.....
Girard avenue, northeast corner of Ontario.....		20	12	.....	23 ft. 10 in.	.....	.....	.....	1
Girard avenue, north side, west house line of Twenty-sixth.....		29	10	.....	33 ft. 6 in.	.....	.....	1	.....
Girard avenue, north side, east house line of Twenty-seventh.....		29	10	.....	33 ft. 4 in.	.....	.....	1	.....
Marshall street, northeast corner of Girard avenue.....		20	6	.....	15 ft. 4 in.	.....	.....	.....	1
Melon street, northeast corner of Ridge avenue.....		14	6	.....	14 ft.	.....	.....	.....	1
Mt. Vernon street, northwest corner of Broad.....		15	6	.....	14 ft.	.....	.....	.....	1
Mt. Vernon street, southwest corner of Fifteenth.....		15	6	.....	16 ft.	.....	.....	.....	1
Mt. Vernon street, southeast corner of Seventeenth.....		15	6	.....	12 ft.	.....	.....	.....	1

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Mt. Vernon street, northwest corner of Eighteenth.....		15	6		12 ft.				1
Mt. Vernon street, south side, 128 feet 8 inches east of east house line of Nineteenth.....		15	6		12 ft. 3 in.		1		
Mt. Vernon street, south side, 117 feet 6 inches west of west house line of Nineteenth.....		15	6		11 ft. 8 in.		1		
Mt. Vernon street, southwest corner of Twenty-first.....		15	6		15 ft. 6 in.				1
Mt. Vernon street, southeast corner of Twenty-second.....		15	6		15 ft.				1
Ninth street, west side, south house line of Columbia avenue.....		20	6		16 ft. 9 in.			1	
North College avenue, north side, 135 feet 9 inches west of west house line of Twenty-first.....		29	16		8 ft. 8 in.			1	
Oxford street, northeast corner of Darien.....		20	6		16 ft.			1	
Oxford street, southeast corner of Ninth.....		20	6		16 ft.				1
Oxford street, northeast corner of Fifteenth.....		20	6		16 ft.				1
Oxford street, southeast corner of Sydenham.....		29	6		15 ft. 6 in.				1
Oxford street, south side, east house line of Sixteenth.....		29	6		14 ft. 8 in.			1	
Oxford street, southeast corner of Wellington.....		29	6		15 ft. 6 in.				1
Oxford street, northwest corner of Seventeenth.....		29	6		16 ft.				1
Oxford street, southeast corner of Eighteenth.....		29	6		16 ft.				1
Oxford street, southeast corner of Nineteenth.....		29	6		15 ft. 6 in.				1

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Oxford street, north side, 162 feet east of east house line of Twentieth.....		29	6	14 ft.	6 in.			1	
Oxford street, south side, 248 feet west of west house line of Twentieth.....		29	6	14 ft.			1		
Oxford street, south side, west house line of Twenty-third.....		29	6	16 ft.				1	
Oxford street, north side, west house line of Twenty-fourth.....		29	6	14 ft.				1	
Oxford street, north side, west house line of Twenty-fifth.....		29	6	14 ft.	6 in.			1	
Oxford street, north side, west house line of Twenty-sixth.....		29	6	14 ft.				1	
Oxford street, southwest corner of Twenty-seventh.....		29	6	15 ft.	6 in.				1
Philadelphia street, southwest corner of Cumberland.....		28	6	13 ft.	6 in.				1
Poplar street, south side, east house line of Seventh.....		13	6	15 ft.				1	
Ridge avenue, southeast corner of Twenty-ninth.....		28	12	14 ft.				1	
Ringgold street, northeast corner of Brown.....		15	6	11 ft.	3 in.				1
Sedgeley avenue, northeast corner of Twenty-sixth.....		28	8	28 ft.	6 in.				1
Sedgeley avenue, southwest corner of Twenty-seventh.....		28	8	20 ft.	6 in.				1
Seventh street, northwest corner of Girard avenue.....		20	6	15 ft.	7 in.				1
Seventeenth street, northwest corner of Diamond.....		28	6	19 ft.	6 in.				1
Spring Garden Station, 37 feet 10 inches northeast of No. 9 and No. 10 Boiler House.....		29	4	38 ft.	4 in.			1	
Spring Garden Station, east corner of Storehouse.....		29	36	23 ft.	5 in.			1	
Sydenham street, west side, 2 feet 6 inches north of north house line of Columbia avenue.....		29	6	11 ft.	6 in.			1	

NEW FIRE HYDRANTS—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.				
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Taney street, southwest corner of Montgomery avenue.....		29	6	.....	12 ft. 6 in.	.....	.....	.....	.....	1
Taylor street, southeast corner of Berks.....		28	6	.....	10 ft. 6 in.	.....	.....	.....	.....	1
Thirteenth street, east side, 209 feet south of south house line of Columbia avenue.....		20	6	.....	15 ft.	.....	.....	.....	1	
Thirty-third street, west side, north house line of Pennsylvania avenue.....		29	36	.....	53 ft. 6 in.	.....	.....	.....	1	
Thirty-third street, west side, 148 feet 9 inches south of south house line of Master.....		29	6	.....	61 ft.	.....	.....	.....	.....	1
Thirty-third street, southwest corner of Master.....		29	6	.....	45 ft. 9 in.	.....	.....	.....	1	
Thompson street, southwest corner of Thirtieth.....		29	10	.....	15 ft. 7 in.	.....	.....	.....	.....	1
Tucker street, southwest corner of Twelfth.....		28	6	.....	8 ft. 6 in.	.....	.....	.....	.....	1
Twentieth street, east side, north house line of Oxford.....		29	6	.....	14 ft.	.....	.....	.....	1	
Twenty-fifth street, southeast corner of Wallace.....		15	6	.....	13 ft. 5 in.	.....	.....	.....	.....	1
Twenty-ninth street, northwest corner of Thompson.....		29	6	.....	23 ft.	.....	.....	.....	.....	1
Twenty-seventh street, southwest corner of Harold.....		28	6	.....	18 ft.	.....	.....	.....	.....	1
Twenty-sixth street, southwest corner of Hagert.....		28	6	.....	16 ft.	.....	.....	.....	.....	1
Twenty-third street, southeast corner of Wood.....		15	6	.....	15 ft. 6 in.	.....	.....	.....	.....	1
Van Pelt street, northwest corner of Susquehanna avenue.....		28	6	.....	16 ft. 6 in.	.....	.....	.....	.....	1
Wallace street, northeast corner of Fifteenth.....		15	6	.....	24 ft.	.....	.....	.....	.....	1
Warnock street, east side, 19 feet south of south house line of Susquehanna avenue.....		20	6	.....	8 ft. 6 in.	.....	.....	.....	1	
Totals.....					1,562 ft.		6	32		60

New Fire Hydrants—Continued.

MANAYUNK DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				4 in.	6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Dupont street, southeast side, 387 feet northeast of northeast house line of Ridge avenue.....		21	6	.....	14 ft. 10 in.	.....		1	
Dupont street, southeast side, 25 feet southwest of southwest house line of Selig.....		21	6	.....	14 ft. 10 in.	.....		1	
Hamilton street, southwest side, 180 feet southeast of southeast house line of Leverington ave.....		21	6	.....	13 ft.	.....		1	
Jefferson street, northwest side, 10 feet southwest of southwest house line of Wood.....		21	6	.....	14 ft. 6 in.	.....		1	
Leverington avenue, southeast side, 308 feet northeast of northeast house line of Selig.....		21	6	.....	14 ft. 10 in.	.....		1	
Magnet street, northeast side, 110 feet 6 inches southeast of southeast house line of Green lane.....		21	6	.....	11 ft.	.....		1	
Magnet street, northeast side, 1 foot 3 inches northwest of northwest house line of Flint.....		21	6	.....	11 ft.	.....	1		
Ogle street, northeast side, 13 feet southeast of southeast house line of Prospect.....		21	6	.....	11 ft. 6 in.	.....		1	
Queen lane, northwest side, 154 feet southwest of southwest house line of Thirty-fourth.....		28	6	.....	14 ft. 6 in.	.....		1	
Ridge avenue, northeast side, 104 feet southeast of southeast house line of Rector.....		21	6	.....	5 ft. 6 in.	.....			1
River road, southwest side, 303 feet northwest of northwest house line of Fountain.....		21	6	.....	13 ft. 3 in.	.....		1	
Sumac street, southeast side, 224 feet northeast of northeast house line of Freeland.....		21	6	.....	14 ft. 10 in.	.....		1	
Sumac street, northwest side, 502 feet northeast of northeast house line of Freeland.....		21	6	.....	14 ft. 10 in.	.....		1	
Sumac street, southeast side, 25 feet southwest of southwest house line of Vicaris.....		21	6	.....	14 ft. 10 in.	.....	1	1	
Thirty-fifth street, northeast side, 31 feet northwest of northwest house line of Crawford.....		28	6	.....	18 ft. 7 in.	.....		1	
Totals.....		2.1 ft. 10 in.	.....	2	12	1

New Fire Hydrants Set in 1887—Continued.

GERMANTOWN DISTRICT.

Street,	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.			
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Airdrie street, north side, 31 feet west of west house line of Park avenue.....		25	6	13 ft. 6 in.		1		
Broad street, east side, 462 feet north of north house line of Butler.....		25	6	17 ft.			1	
Broad street, east side, 182 feet north of northwest house line of McFarren.....		25	6	17 ft.		1		
Chestnut Hill and Springhouse turnpike, s. w. side, 118 ft. n. w. of n. w. house line of Stenton ave.....		22	6	32 ft.	1			
Chew street, southwest side, 198 feet northwest of northwest house line of High.....		22	6	23 ft. 6 in.		1		
Carpenter street, northwest side, 654 feet northeast of northeast house line of Emlen.....		22	6	13 ft 1 in.		1		
Emlen street, southwest side, 276 feet 9 inches southeast of southeast house line of Carpenter.....		22	6	18 ft. 10 in.		1		
Frank street, northwest side, 1 foot northeast of northeast house line of Sherman.....		22	6	14 ft. 7 in.			1	
Hansbury street, northwest side, 329 feet northeast of northeast house line of Morris.....		22	6	16 ft. 6 in.		1		
Hansbury street, southeast side, 302 feet northeast of northeast house line of Pulaski ave.....		22	6	16 ft.		1		
Lafayette street, southeast side, 415 feet northeast of northeast house line of Wayne.....		22	6	14 ft. 3 in.		1		
Leverine street, northwest side, 13 feet northeast of northeast house line of Mower.....		22	6	5 ft. 7 in.		1		
Mehl street, northwest side, 255 feet 6 inches northeast of northeast house line of Germ'n ave.....		22	6	12 ft.		1		
Morris street, southwest side, 27 feet northwest of northwest house line of Winona.....		22	6	16 ft.		1		
Musgrove street, southwest side, 344 feet northwest of northwest house line of Sharpnack.....		22	6	16 ft. 6 in.		1		

NEW FIRE HYDRANTS—GERMANTOWN DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6 in.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Narragansett place, on dead end, 188 feet southwest of southwest house line of Hancock.....		22	6		1				
Newbold street, southwest side, 249 feet southeast of southeast house line of Ruscomb.....		22	6	13 ft. 3 in.		1			
Ontario street, north side, 173 feet east of east house line of Tenth.....		25	6	14 ft. 2 in.		1			
Ruscomb street, southwest corner of Twentieth.....		22	6	15 ft. 8 in.					1
Roumfort avenue, south corner of Ardleigh		22	6	18 ft. 6 in.					1
Sprague street, northeast side, 528 feet northwest of northwest house line of Germantown ave.....		22	6	15 ft. 6 in.		1			
Stenton avenue, southwest side, 60 feet northwest of northwest house line of Bell's Mill road.....		22	6	12 ft. 7 in.		1			
Sunset avenue, northwest side, 241 feet northeast of southwest house line of Twenty-eighth.....		22	6	17 ft.		1			
Upsal street, northwest side, 375 feet northeast of northeast house line of Green.....		22	10	21 ft. 11 in.			1		
Upsal street, northwest side, 439 feet southwest of southwest house line of Jefferson.....		22	10	25 ft. 5 in.			1		
Upsal street, southeast side, corner south of Jefferson.....		22	10	24 ft.					1
Westmoreland street, northwest corner of Twentieth.....		28	6	14 ft. 5 in.					1
Westmoreland street, northeast corner of Twenty-first.....		28	6	13 ft. 8 in.					1
Wingohocking street, southwest side, 454 feet southeast of southeast house line of Mill.....		22	6	6 ft. 3 in.		1			
Total				458 ft. 8 in.	2	18	4		5

FIRE HYDRANTS RENEWED.

FIRST DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.						
				6 in.	Removed.		Replaced by				
					Old.	No. 2.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Aman street, northwest corner of Dickinson.....		26	6		1		1				
Borden street, north side, 148 feet east of east house line of Fifth.....		1	4	8 ft. 4 in.	1			1			
Broad street, west side, 151 feet south of south house line of Dickinson.....		26	6	7 ft. 6 in.	1					1	
Carpenter street, north side, 88 feet east of east house line of Eighth.....		2	6	14 ft.	1					1	
Catharine street, south side, 36 feet east of east house line of Gray's Ferry road.....		30	6		1		1				
Catharine street, south side, 104 feet 4 inches west of west house line of Twentieth.....		30	6	15 ft.	1					1	
Catharine street, north side, 5 feet west of west house line of Tenth.....		3	6	14 ft.	1					1	
Catharine street, north side, 140 feet west of west house line of Eighth.....		3	6		1		1				
Christian street, south side, 2 feet west of west house line of Twentieth.....		30	6	20 ft.	1					1	
Christian street, south side, 11 feet east of east house line of Fifteenth.....		30	12	19 ft. 6 in.	1					1	
Christian street, north side, 257 feet east of east house line of Front.....		3	6	17 ft. 6 in.	1					1	
Clarion street, west side, 130 feet south of south house line of Federal.....		26	3	6 ft. 8 in.	1			1			
Clarion street, west side, 177 feet north of north house line of Federal.....		26	6	15 ft.	1					1	

FIRE HYDRANTS RENEWED—FIRST DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.						
					Removed.		Replaced by				
					6 in.	Old.	No. 2.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Dean street, west side, 153 feet south of south house line of Tasker.....		26	4	8 ft. 6 in.	1			1			
Eighteenth street, east side, 7 feet south of south house line of Christian.....		30	6	3 ft. 6 in.	1		1				
Eneu street, north side, 82 feet east of east house line of Eighth.....		2	6	8 ft. 6 in.	1					1	
Federal street, north side, 192 feet west of west house line of Twentieth.....		26	6	14 ft. 6 in.	1					1	
Fifteenth street, east side, 113 feet south of south house line of Federal.....		26	6	15 ft.	1					1	
Fitzwater street, south side, 103 feet west of west house line of Twentieth.....		30	6	14 ft. 6 in.	1					1	
Gray's Ferry road, north side, east house line of Twenty-ninth.....		26	6	18 ft.	1					1	
Guilford street, east side, 39 feet north of north house line of Bainbridge.....		4	6	11 ft. 6 in.	1					1	
Lancaster street, east side, 227 feet south of south house line of Reed.....		1	4	11 ft. 6 in.	1			1			
Latona street, south side, 64 feet east of east house line of Seventeenth.....		24	6	9 ft. 6 in.	1			1			
Long lane, northwest side, 106 feet southwest of south house line of Oakford.....		26	6	18 ft. 9 in.	1					1	
McClellan street, south side, 185 feet west of west house line of Sixth.....		1	6	.....	1		1				
Montrose street, south side, 18 feet east of east house line of Twentieth.....		30	4	10 ft. 6 in.	1			1			
Ninth street, west side, opposite Earp.....		1	4	12 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.	No. 2.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Pallas street, east side, 48 feet north of north house line of McKean.....		1	6	1		1					
Park street, north side, 7 feet west of west house line of Twenty-seventh.....		26	4	5 ft.	1			1			
Pemberton street, northwest corner of Twenty-second.....		30	6			1			1		
Seventh street, west side, opposite Hallowell.....		2	6	14 ft. 6 in.	1		1				
Tenth street, east side, 8 feet south of north house line of Reed.....		26	6	15 ft.	1					1	
Washington avenue, southeast corner of Twenty-third.....		26	6		1		1				
Washington avenue, south side, 3 feet east of east house line of Fifteenth.....		26	6	9 ft. 6 in.	1				1		
Watkins street, south side, 178 feet east of east house line of Moyamensing avenue.....		1	4	8 ft. 3 in.	1			1			
Totals.....				346 ft.	34	1	8	8	18	1	

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Fire Hydrants Renewed—Continued.

SECOND DISTRICT.

Street.	Location.	Ward.	Size of Main in Inches.	CONNECTION.				STYLE.						
				4 in.	6 in.	Removed.			Replaced by					
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.
Arch street, south side, 103 feet east of east house line of Seventeenth.....		9	6 12 ft.			1							1	
Arch street, south side, 200 feet east of east house line of Eighteenth.....		9	12 11 ft.	6 ft.		1					1			
Aspen street, south side, 153 feet 6 inches west of west house line of Forty-third.....		24	6			1				1				
Baltimore avenue, north side, east house line of Forty-ninth.....		27	6			1				1				
Barron street, southeast corner of Gaskill.....		5	6					1						1
Bennett street, south side, 98 feet east of east house line of Eighth.....		8	3			1				1				
Broad street, west side, 5 feet north of north house line of Filbert..		9	20						1					1
Broad street, west side, 5 feet north of north house line of Cherry.		10	6						1					1
Broad street, west side, north house line of Asylum.....		7	6 5 ft.			1				1				
Cherry street, north side, 200 feet west of west house line of Fifteenth.....		10	6 10 ft.	6 ft.		1					1			
Cherry street, south side, 179 feet west of west house line of Sixteenth.....		10	6 10 ft.	6 ft.		1					1			

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.												
				4 in.	6 in.	Removed.				Replaced by								
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.				
Cherry street, south side, 103 feet east of east house line of Twentieth.....		10	6			1					1							
Chestnut street, south side, 185 feet east of east house line of Seventeenth.....		8	16			1					1							
Chestnut street, south side, 12 feet west of west house line of Thirty-fourth.....		27	8			1					1							
Delaware avenue, Pier No. 24, east side, 89 feet south of south house line of Lombard.....		5	6			1					1							
Delaware avenue, southwest corner of Vine.....		6	6						1									1
Eleventh street, east side, south house line of Barley.....		7	10	14 ft.		1							1					
Fifth street, east side, 209 feet north of north house line of Race.....		6	10			1					1							
Fifteenth street, east side, 177 feet south of south house line of Locust.....		8	6	14 ft.	6 ft.	1						1						
Fifteenth street, west side, 6 feet north of north house line of Melloy.....		9	6			1					1							
Filbert street, north side, 155 feet 6 inches west of west house line of Fifteenth.....		9	6	15 ft.		1						1						
Fortieth street, east side, 23 feet north of north house line of Poplar.....		24	6			1					1							

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.				STYLE.									
				1 in.	6 in.	Removed.			Replaced by								
						Old.	No. 2.	No. 3.	No. 4.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.			
Forty-third street, east side, 27 feet south of south house line of Locust.....		27	6	12 ft.			1				1						
Forty-sixth street, southwest side, 146 feet southeast of southeast house line of Kingsessing avenue.....		27	8				1				1						
Franklin street, east side, 172 feet south of south house line of Vine.....		6	4	8 ft. 3 ft.			1					1					
Girard avenue, south side, 38 feet west of west house line of Fiftieth.....		24	6				1				1						
Hamilton street, north side, 116 feet west of west house line of Thirty-sixth.....		24	6	17 ft.			1					1					
Lancaster avenue, north side, 73 feet east of east house line of Fifty-second.....		24	6						1								1
Larkins street, west side, 83 feet north of north house line of South.....		5	6				1				1						
Lex street, east side, 115 feet north of north house line of Seneca.....		24					1				1						
Locust street, south side, 198 feet east of east house line of Eighteenth.....		8	6	13 ft. 8 in.			1										1
Locust street, north side, 303 feet 6 inches east of east house line of Fortieth.....		27	8	18 ft. 2 in.			1										1

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.									
				4 in.	6 in.	Removed.			Replaced by						
						Old. No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.		
Lombard street, south side, 14 feet west of west house line of Delaware avenue.....		5	6		8 ft. 6 in.	1							1		
Lombard street, south side, 103 feet 6 inches west of west house line of Twelfth.....		7	6		14 ft. 3 in.	1							1		
Market street, southeast corner of Second.....		6	6						1						1
Market street, southwest corner of Fifth.....		6	6					1							1
Market street, southwest corner of Sixth.....		6	6					1							1
Market street, northeast corner of Seventeenth.....		9	6		4 ft.	1									1
Market street, south side, 16 feet east of east house line of Thirty-third.....		27	10		18 ft. 3 in.	1									1
Market street, south side, 18 feet west of west house line of Thirty-sixth.....		27	10		19 ft. 3 in.	1									1
Market street, south side, 180 feet west of west curb line of Fifty-sixth.....		27	10			1			1						
Ninth street, west side, north house line of Rodman.....		7	6		13 ft. 4 in.	1									1
Ninth street, east side, 188 feet north of north house line of Spruce.....		8	6		7 ft.	1							1		
Ninth street, east side, 244 feet south of south house line of Walnut.....		8	6		7 ft.	1							1		

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.								
				4 in.	6 in.	Removed.				Replaced by				
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.
Ninth street, west side, 21 feet north of north house line of Chestnut		9	6					1						1
Ninth street, east side, 88 feet south of south house line of Sansom		8	6	10 ft.	6 in.	1						1		
Ninth street, east side, 96 feet north of north house line of Filbert		9	6	4 ft.		1			1					
Ninth street, east side, 244 feet south of south house line of Filbert		9	6			1			1					
Ninth street, east side, 210 feet north of north house line of Race		10	6	11 ft.		1				1				
Pier No. 22, 115 feet north of north house line of Lombard		5	6			1			1					
Pine street, south side, east house line of Quince		7	6			1			1					
Race street, southeast corner of Eighth		10	6					1						1
Race street, north side, 33 feet west of west house line of Thirty-fifth		24	6			1			1					
Robin street, south side, 160 feet east of east house line of Fortieth		27	6	9 ft.		1				1				
Second street, southwest corner of Union		5	6	15 ft.	11 in.	1						1		
Second street, southeast corner of Walnut		5	6					1						1
Sergeant street, northeast corner of Eleventh		10	6				1					1		

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location	Ward.	Size of Main in Inches.	CONNECTION.		STYLE.									
				4 in.	6 in.	Removed.				Replaced by					
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.	
Seventh street, west side, 55 feet north of north house line of St. Mary.....		7	6		13 ft. 6 in.	1					1				
Sixteenth street, west side, 199 feet north of north house line of Race.....		10	6		15 ft.	1					1				
Spruce street, north side, 349 feet 6 inches west of west house line of Thirty-ninth.....		27	8		22 ft. 9 in.	1						1			
Spruce street, south side, 80 feet west of west house line of Forty-third.....		27	8		3 ft.	1				1					
St. Marks place, 37 feet north of north house line of Locust.....		27	6			1				1					
Summer street, south side, 197 feet west of west house line of Sixteenth.....		10	4			1				1					
Tenth street, west side, 144 feet 6 inches north of north house line of Spruce.....		8	6		5 ft. 2 in.	1						1			
Tenth street, west side, 119 feet north of north house line of Locust.....		8	6		6 ft.	1						1			
Third street, west side, 300 feet north of north house line of Spruce.....		5	6			1				1					
Thirty-fifth street, west side, 965 feet south of south house line of Girard avenue.....		24	6		5 ft. 2 in.	1					1				
Thirty-ninth street, west side, 7 feet north of north house line of Sanson.....		27	6			1				1					

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.												
				4 in.	6 in.	Removed.			Replaced by									
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.				
Thirty-sixth street, east side, 49 feet north of north house line of Pine.....		27	6			1				1								
Thompson street, south side, 78 feet west of west house line of Forty-ninth.....		24	6			1												1
Tower street, north side, 249 feet east of east house line of Twenty-first.....		10	4			1				1								
Twentieth street, east side, 44 feet south of south house line of Rittenhouse.....		7	6	3 ft.		1				1								
Twenty-fourth street, east side, south house line of Factory.....		7	6	2 ft. 6 in.		1				1								
Twelfth street, east side, 105 feet north of north house line of Market.....		9	6	1 ft. 4 in.		1				1								
Walnut street, south side, east house line of Duponceau.....		8	12						1				1					
Walnut street, south side, 3 feet west of west house line of Ninth..		8	6			1												1
Walnut street, north side, 4 feet 6 inches east of east house line of Twelfth.....		8	12						1									1
Walnut street, north side, 9 feet east of east house line of Thirty-sixth.....		27	10	24 ft. 8 in.		1							1					

FIRE HYDRANTS RENEWED—SECOND DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.								
				4 in.	6 in.	Removed.				Replaced by				
						Old.	No. 2.	No. 3.	No. 5.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	New, No. 5.
Walnut street, south side, 9 feet west of west house line of Fortieth		27	8			1				1				
Westminster avenue, south side, 14 feet 6 inches east of east house line of Markoe.....		24	12			1				1				
Woodland avenue, south side, 111 feet east of east house line of Forty-seventh.....		24	6			1				1				
Totals.....				12	394 ft. 2 in.	67	1	5	8	35	14	17	7	8

Fire Hydrants Renewed—Continued.

THIRD 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.	New, No. 3.
Adam street, southeast side, 2 feet 6 inches southwest of southwest house line of Ruan		23	6	9 ft. 6 in.	1					1	
Allen street, northwest side, 200 feet northeast of northeast house line of Innes.....		18	6	4 ft. 2 in.	1			1			
Almond street, southeast side, 310 feet southwest of southwest house line of Norris.....		18	6	4 ft.	1			1			
Amber street, northwest side, 151 feet southwest of southwest house line of Lehigh.....		31	6	3 ft. 6 in.	1			1			
Bodine street, west side, 372 feet north of north house line of York.....		19	4		1		1				
Cambria street, southeast corner of Fourth.....		25	6	5 ft. 3 in.	1						1
Clearfield street, north side, 182 feet east of east house line of Emerald.....		25	6	5 ft. 2 in.	1			1			
Cumberland street, southwest side, 4 feet northwest of northwest house line of Cedar.....		31	6	19 ft.	1					1	
Day street, northeast side, 132 feet 4 inches northwest of northwest house line of Girard...		18	6	11 ft.	1			1			
Dickinson street, southwest side, 178 feet northwest of northwest house line of Cedar.....		31	6		1		1				
Dillwyn street, west side, 4 feet north of north house line of Wood.....		12	3	12 ft. 10 in.	1					1	
East Susquehanna street, southwest side, 26 feet northwest of northwest house line of Cedar		31	6	13 ft. 10 in.	1		1				
Edward or Penn street, northwest side, 30 feet 2 inches northeast of northeast house line of Adams.....		23	6	7 ft. 6 in.	1			1			

FIRE HYDRANTS RENEWED—THIRD DISTRICT—Continued.

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.	New, No. 3.	
Fifth street, east side, 119 feet south of south house line of Jefferson.....		17	6		1			1			
Fourth street, east side, 236 feet south of south house line of Somerset.....		25	6	16 ft. 6 in.	1					1	
Fox street, southwest side, 58 feet 7 inches southeast of southeast house line of Tulip.....		31	4	10 ft. 3 in.	1			1			
Franklin street, northwest side, 100 feet northeast of northeast house line of Orthodox....		23	6		1		1				
Front street, west side, 2 feet south of south house line of York.....		19	6	18 ft.	1					1	
Hancock street, west side, south house line of Girard.....		16	6	21 ft. 6 in.	1					1	
Howard street, west side, 222 feet 6 inches south of south house line of Master.....		17	6	14 ft. 7 in.	1			1			
Howard street, east side, 252 feet north of north house line of Norris.....		19	6	14 ft. 7 in.	1			1			
Josephine street, southeast side, 250 feet northeast of northeast house line of Church.....		23	6	3 ft. 7 in.	1			1			
Meadow street, northeast side, 3 feet southeast of southeast house line of Cherry.....		23	6		1		1				
Orchard street, east side, 264 feet north of north house line of Tacony.....		23	6		1		1				
Orkney street, west side, 169 feet south of south house line of Dauphin.....		19	6	5 ft. 8 in.	1			1			
Phillip street, west side, 222 feet south of south house line of Columbia avenue.....		17	4		1			1			
Poplar street, northwest corner of Rachel.....		16	10	10 ft. 3 in.	1					1	

FIRE HYDRANTS RENEWED—THIRD DISTRICT—Continued.

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.	New, No. 3.	
Sepviva street, north west side, 5 feet northeast of northeast house line of Dickinson.....		31	6	14 ft.	1						1
Siloam street, northwest side, 167 feet southwest of southwest house line of Norris.....		18	6	8 ft. 6 in.	1				1		
Sixth street, east side, 160 feet south of south house line of Montgomery avenue.....		19	6	3 ft. 6 in.	1				1		
Somerset street, southwest side, 80 feet northwest of northwest house line of Salmon.....		25	6	4 ft. 4 in.	1				1		
Tacony street, northwest side, 151 feet northeast of northeast house line of Orthodox.....		23	6		1		1				
Third street, northeast corner of Cambria.....		25	6			1					1
Unity street, southwest side, 3 feet southeast of southeast house line of Leiper.....		23	6		1		1				
York street, south side, 12 feet east of east house line of Bodine.....		19	6		1		1				
Total.....				241 ft.	34	1	9	16	8		2

Fire Hydrants Renewed—Continued.

FOURTH DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.						
				6 in.	Removed.			Replaced by				
					Old.	No. 2.	No. 3.	Old.	New, No. 1.	New, No. 2.	New, No. 3.	
Broad street, west side, 28 feet south of south house line of Brandywine.....		15	12	1				1				
Broad street, west side, south house line of Oxford.....		29	6	11 ft. 4 in.	1							1
Broad street, west side, south house line of Montgomery avenue.....		29	6	3 ft. 8 in.	1							1
Bouvier street, west side, 245 feet north of north house line of Jefferson.....		29	6	11 ft. 5 in.	1					1		
Callowhill street, south side, 10 feet west of west house line of Twenty-third.....		15	20	5 ft. 6 in.	1					1		
Carlisle street, east side, 248 feet north of north house line of Jefferson.....		29	6	11 ft. 6 in.	1							1
Cumberland street, north side, 162 feet west of west house line of Sixteenth.....		28	6	13 ft. 10 in.	1							1
Eighteenth street, east side, 18 feet 10 inches south of south house line of Button-wood.....		15	6		1				1			
Fairmount avenue, north side, 4 feet 6 inches west of west house line of Twenty-fourth.....		15	10	25 ft.	1							1
Girard avenue, south side, 11 feet east of east house line of Taney.....		29	10	9 ft. 6 in.	1							1
Montgomery avenue, north side, 8 feet west of west house line of Broad.....		28	6		1				1			
Mt. Vernon street, south side, 104 feet west of west house line of Twentieth.....		15	6	11 ft. 9 in.	1					1		
Ontario street, west side, 5 feet 3 inches north of south house line of Girard ave.....		20	6	11 ft. 6 in.	1							1

FIRE HYDRANTS RENEWED—FOURTH DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.					
				6 in.	Removed.			Replaced by			
					Old.	No. 2.	No. 3.	Old.	New, No. 1.	New, No. 2.	New, No. 3.
Perot street, north side, 50 feet 8 inches east of east house line of Twenty-fifth..		15	6	1			1				
Spring Garden street, west side, 61 feet west of west house line of Broad.....		15	10	7 ft. 6 in.	1					1	
Thirty-second street, northwest corner of Master.....		29	12	5 ft.	1					1	
Thirty-second street, northwest corner of Master.....		29	12	22 ft. 6 in.		1					1
Twenty-fifth street, southeast corner of Brown.....		15	6				1				1
Twenty-fifth street, northwest corner of Parrish.....		15	6				1				1
Twenty-fourth street, east side, 2 feet 10 inches south of south house line of Wallace.....		15	6	15 ft.	1					1	
Twenty-fourth street, east side, 2 feet 6 inches south of south house line of Fair- mount avenue.....		15	48	5 ft. 6 in.	1					1	
Twenty-second street, northeast corner of Stewart.....		29	20		1						1
Twenty-seventh street, west side, 273 feet 6 inches north of north house line of Montgomery avenue.....		28	6		1			1			
West street, west side, 149 feet south of south house line of Poplar.....		15	6		1				1		
Willington street, east side, 255 feet north of north house line of Montgomery avenue.....		28	6		1			1			
Total.....				170 ft. 6 in.	22	1	2	6	4	11	4

Fire Hydrants Renewed—Continued.

MANAYUNK DISTRICT.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.	STYLE.				
				6 in.	Old, removed.	Replaced by			
						Old.	New, No. 1.	New, No. 2.	New, No. 3.
Dawson street, southeast side, 52 feet northeast of northeast house line of Cresson.....		21	6	18 ft.	1			1	
Grape street, southeast side, 35 feet northeast of northeast house line of Main.....		21	6	13 ft. 6 in.	1			1	
James street, northwest side, 25 feet southwest of southwest house line of Cresson.....		28	6	16 ft. 6 in.	1			1	
Jefferson street, southeast side, 58 feet northeast of northeast house line of Mansion.....		21	6	14 ft. 6 in.	1			1	
Main street, northeast side, 98 feet southeast of southeast house line of Cotton.....		21	6	12 ft. 8 in.	1			1	
Main street, northeast side, 896 feet southeast of southeast house line of Shur's lane.....		21	6	6 ft. 6 in.	1				1
Main street, northeast side, 20 feet northwest of northwest house line of Shur's lane.....		21	6	14 ft.	1			1	
Mechanic street, southeast side, 130 feet northeast of northeast house line of Main.....		21	6	15 ft.	1			1	
Ridge avenue, northeast side, 506 feet northwest of northwest house line of Scott's lane...		28	6	13 ft. 6 in.	1				1
Ridge avenue, southwest side, 192 feet northwest of northwest house line of Ferry road...		28	12	.....	1			1	
Ridge avenue, southeast side, 123 feet southwest of southwest house line of Dawson.....		21	6	.....	1	1			
Ridge avenue, southeast side, 485 feet southwest of southwest house line of Righter.....		21	6	11 ft. 8 in.	1			1	
Ridge avenue, northeast side, 110 feet northwest of northwest house line of Rittenhouse..		21	6	7 ft 9 in.	1			1	
Ridge avenue, northeast side, 302 feet southeast of southeast house line of Fairthorn.....		21	6	12 ft. 9 in.	1			1	

FIRE HYDRANTS RENEWED—MANAYUNK DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.					
				6 in.	Old, removed.	Replaced by					
						Old.	New, No. 1.	New, No. 2.	New, No. 3.		
Ridge avenue, northeast side, 104 feet southeast of southeast house line of Paoli avenue...		21	6	13 ft. 10 in.	1		1				
Ridge avenue, southwest side, 365 feet southeast of southeast house line of Domino lane...		21	20	.....	1	1				
Ridge avenue, northeast side, 149 feet southwest of southwest house line of Shawmont ave.		21	10	.....	1	1				
Ridge avenue, northeast side, 149 feet southwest of southwest house line of Shawmont ave.		21	10	5 ft.	1		1				
School lane, southeast side, 253 feet northeast of Philadelphia & Reading Railroad.....		21	6	.....	1	1				
Seville street, northwest side, 18 feet northeast of northeast house line of Cresson.....		21	6	15 ft.	1			1			
Shur's lane, northwest side, 280 feet northeast of northeast house line of Cresson.....		21	6	16 ft.	1			1			
Shur's lane, northwest side, northeast house line of Pechin.....		21	6	14 ft. 6 in.	1			1			
Shur's lane, northwest side, 193 feet southwest of southwest house line of Ridge avenue...		21	6	15 ft. 6 in.	1			1			
Smick street, northeast side, 191 feet southeast of southeast house line of Fountain.....		21	6	17 ft.	1			1			
Terrace street, southwest side, 10 feet northwest of northwest house line of Adams.....		21	6	15 ft.	1			1			
Terrace street, southwest side, 199 feet northwest of northwest house line of Dawson.....		21	6	.....	1	1				
Winchester street, northeast side, 97 feet northwest of northwest house line of Ripka.....		21	4	9 ft. 3 in.	1		1				
Total.....						277 ft. 5 in.	27	5	3	17	2

Fire Hydrants Renewed—Continued.

GERMANTOWN DISTRICT.

15 W

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6 in.	Old.	Removed.		Replaced by	
						No. 3.	Old.	New, No. 1.	
Butler street, north side, 15 feet east of east house line of Thirteenth.....		25	6		1			1	
Chestnut Hill avenue, northwest side, 349 feet southwest of southwest house line of Springhouse: turnpike.....		22	6		1			1	
Germantown avenue, northeast side, 67 feet 6 inches northwest of northwest house line of Abing- ton avenue.....		22	6	10 ft. 9 in.	1				1
Germantown avenue, northeast side, 23 feet southeast of Wingohocking.....		22	6	7 ft. 6 in.	1				1
Germantown avenue, northeast side, 35 feet northwest of Nineteenth.....		25	6	12 ft.	1				1
Green street, northeast side, 580 feet southeast of southeast house line of Queen.....		22	4		1			1	
Haines street, southeast side, 538 feet southwest of southwest house line of Chew.....		22	4				1		1
High street, southeast side, 27 feet 6 inches northeast of northeast house line of Hancock.....		22	4	15 ft. 7 in.	1				1
Mehl street, southeast side, 578 feet northeast of northeast house line of Germantown avenue.....		22	4	12 ft.	1				1
Morton street, southwest side, 38 feet 8 inches southeast of Herman.....		22	4		1			1	
Spring-house turnpike, southwest side, 358 feet northwest of northwest house line of Summit ave....		22	4		1			1	
Summit avenue, northeast side, 177 feet southwest of Stenton avenue.....		22	4				1		1

FIRE HYDRANTS RENEWED—GERMANTOWN DISTRICT—Continued.

Street.	Location.	Ward.	Size of Main in inches.	CONNECTION.		STYLE.			
				6 in.		Removed.		Replaced by	
				Old.	No. 3.	Old.	New, No. 1.		
Twenty-second street, west side, 126 feet north of north house line of Pacific.....		28	6	18 ft. 10 in.	1	.....	.....	1	
Venango street, north side, 75 feet east of east house line of Twenty-second.....		28	6	.....	1	.....	1		
Wakefield street, northeast side, 14 feet 7 inches southeast of northwest house line of Mehl.....		22	6	.....	1	.....	1		
Walnut lane, northwest side, 17 feet southwest of southwest house line of Hancock.....		22	4	.....	1	.....	1		
Total.....				76 ft. 8 in.	14	2	8	8	

**RECAPITULATION OF FIRE HYDRANTS SET, RENEWED, AND
REMOVED.**

DISTRICTS.	STYLE.				Total.
	Old.	No. 1, 1-way.	No. 2, 2-way.	No. 3, 3-way.		No. 5, 5-way.
Set.					
First.....	2	3	37	41	83
Second.....	2	2	21	24	49
Third.....	3	28	47	77	155
Fourth.....		6	32	60	98
Manayunk.....		2	12	1	15
Germanatown.....	2	18	4	5	29
Totals.....	9	59	153	208	429
Renewed.					
First.....	9	8	18	3	38
Second.....	35	14	17	7	81
Third.....	9	16	8	2	35
Fourth.....	6	4	11	4	25
Manayunk.....	5	3	17	2	27
Germanatown.....	8	8			16
Totals.....	72	53	71	18	222
Removed.					
Total New Hydrants.....	81	112	224	226	651
Removed.					
First.....	33				33
Second.....	49			1	50
Third.....	58	1			59
Fourth.....	58			1	59
Manayunk.....	3				3
Germanatown.....					
Totals.....	201	1		2	204
Total added during 1887.....					225

FIRE HYDRANTS, BY PURVEYORS' DISTRICTS,
And the diameter of the pipes to which they are connected.

PURVEYORS' DISTRICTS.	SIZES OF PIPES IN INCHES.												Total.
	3	4	6	8	10	12	16	18	20	30	36	48	
First	55	244	887	27	35	17	4	.....	13	1	7	.....	1,290
Second	55	65	1,008	153	141	167	29	.....	23	19	3	8	1,671
Third.....	1	227	1,093	4	145	37	2	4	26	14	7	.....	1,560
Fourth.....	1	147	916	4	95	43	12	.....	8	14	3	9	1,252
Manayunk.....	.....	20	254	.....	10	6	3	.....	5	.....	.....	.....	298
Germantown.....	32	63	449	14	40	27	17	.....	2	.....	.....	.....	644
Totals.....	144	766	4,607	202	466	297	67	4	77	48	20	17	6,715

FIRE HYDRANTS BY WARDS,
And the Diameter of the Pipes to which they are connected.

WARDS.	SIZES OF PIPES IN INCHES.													Total.
	3	4	6	8	10	12	16	18	20	30	36	48		
First.....	5	102	219	3				1						330
Second.....	26	35	115	9	5	1	2		1					194
Third.....	9	6	72	9	15									111
Fourth.....	9	8	70	2	11					1				101
Fifth.....	4	9	64	36	31	9	1							154
Sixth.....	1		105	10	11		1		1	7				136
Seventh.....	11	5	105		8	17	14		1			3		164
Eighth.....	11	2	98		13	32	8		2			2		168
Ninth.....	4	4	92		16	11	5		4	5		2		143
Tenth.....	10	9	84	3	13	10			10	2		1		142
Eleventh.....		14	44	1	18									77
Twelfth.....		13	41		26	1	2							83
Thirteenth.....		18	74		15	6								113
Fourteenth.....		14	72		21	5	1			2				115
Fifteenth.....	1	44	182	1	29	5	2		5	3		9		281
Sixteenth.....		15	44		25	5			2					91
Seventeenth.....	1	20	59		9	2			2					93
Eighteenth.....		36	83		25				17					161
Nineteenth.....		64	216		9			4			2			295
Twentieth.....		45	162		5	16				2				230
Twenty-first.....		21	216		10	3	3		5					258
Twenty-second.....	32	63	352	14	38	18	17		2					536
Twenty-third.....		3	117			1			5					126
Twenty-fourth.....	14	21	330	21	26	50			5	5				472
Twenty-fifth.....		19	370	3	26	17				10	5			450
Twenty-sixth.....	3	60	275	4	2	11			8					363
Twenty-seventh.....		15	128	83	21	33					3			283
Twenty-eighth.....		1	342	2	2	26			3	3				379
Twenty-ninth.....		24	186	1	23	2	9			4	3			252
Thirtieth.....	3	34	135		2	5	1		4		7			191
Thirty-first.....		42	155		11	11				4				223
Totals.....	144	766	4,607	202	466	297	67	4	77	48	20	17		6,715

STATEMENT OF THE NUMBER OF FIRE HYDRANTS, BY DISTRICTS AND WARDS,
During 1887, and total previous thereto.

	FIRST DISTRICT.						SECOND DISTRICT.						THIRD DISTRICT.						FOURTH DISTRICT.				MANAYUNK.		GERMANTOWN.			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	23	25	31	Total.	13		14	15	20	28	29	Total.	21	28	Total.	22	25	28	Total.
Prior to 1887.....						1,240	.....						1,672	.....						1,464	.....				1,213	.....		286	.....			615	6,490		
During 1887.....	18	11	6	2	37	9	83	1	2	5	8	6	3	11	13	49	1	2	14	11	26	27	6	61	7	155	4	2	16	19	25	32	98	13	2	15	23	4	2	29	429
Totals.....						1,323	.....						1,721	.....						1,619	.....				1,311	.....		301	.....			644	6,919		
Taken out in 1887.....						33	.....						50	.....						59	.....				59	.....		3	.....			204			
Total in city.....						1,290	.....						1,671	.....						1,560	.....				1,252	.....		298	.....			644	6,715		

Number of attachments for fire purposes previously reported.....	305
First District	4
Second "	6
Third "	15
Fourth "	2
Manayunk District.....	5
Germantown "	3
Total.....	340

ATTACHMENTS, ETC., MADE BY THE PURVEYORS.

In accordance with permits issued by the { Registrar of the Water Department, prior to }
 { Receiver of Taxes, } subsequent to } April 1, 1887.

Arranged by Districts.

DISTRICTS.	NEW ATTACHMENTS.							SHUT OFF BY PERMIT.					WORK DONE WITHOUT PERMIT.				
	SIZE.							Repairs.	Re-drive.	Discontinue.	Transfer.	Totals.	DRAWN.				Drawn and Re-driven.
	½ inch.	¾ inch.	¾ inch.	1 inch.	1½ inch.	2 inch.	Totals.						Discontinued and abandoned.	Duplicate.	Delinquent.	Low.		Totals.
First	1,541	14	11	9	4	1,579	48	38	16	8	110	3			22	25	14
Second.....	899	61	37	36	1	1,053	90	40	83	4	217	34		2	44	80	16
Third	2,352	22	15	50		2,455	165	14	16	11	206	43	3	13	51	110	25
Fourth	2,243	194	46	28	1	2,523	224	55	24	1	304	3	2		68	73	28
Manayunk.....	249	1	5	6		264	11	9	2	3	25						17
Germantown.....	608	25	10	14		658	12	12	4	7	35	3			9	12	53
Totals.....	7,892	317	124	143	2	8,532	550	168	145	34	897	86	5	15	194	300	153

ACCOUNT OF NEW STOPS FOR 1887.

DISTRICTS.	WATER DEPARTMENT.		VINEY.			Total.	
	2-Way.	Butterfly,	2-Way.	3-Way.	4-Way.		5-Way.
First.....	78			7	5	19	109
Second.....	41			3	4	2	50
Third.....	170			8	1		179
Fourth.....	128	5		1		2	136
Manayunk.....	29						29
Germantown.....	41		2				43
Total.....	487	5	2	19	10	23	546

REPAIRS TO MAINS, STOPS, AND FIRE HYDRANTS, AND STOPS TAKEN OUT DURING 1887.

DISTRICTS.	Repairs to Mains.	STOPS.			FIRE HYDRANTS.		
		Repaired.	Renewed.	Taken out.	Repaired.	Renewed.	Taken out.
First.....	58	319	50	35	584	33	38
Second.....	92	144	25	6	261	50	81
Third.....	227	297	3	2	461	59	35
Fourth.....	238	320	8	7	660	59	25
Manayunk.....	9	512	7		451	3	27
Germantown.....	64	16	7		86		16
Total.....	688	1,608	100	50	2,503	204	222

NUMBER OF COMPLAINTS RECEIVED AND EXAMINED DURING 1886 AND 1887.

MONTHS.	Hydrants.		Service Pipes.		Wash Pavcs.		Spigots.		Water Closets.		Horse Troughs.		No. Leaks.		Total.	
	1886.	1887.	1886.	1887.	1886.	1887.	1886.	1887.	1886.	1887.	1886.	1887.	1886.	1887.	1886.	1887.
January.....	296	407	108	107	31	36	1	1	2		2	7	25	67	465	625
February.....	307	205	102	67	40	23	1		1		2	1	98	24	551	520
March.....	446	186	100	108	43	14	3		2				49	53	643	361
April.....	262	168	67	80	8	21						3	29	21	366	293
May.....	233	187	59	79	11	11	4	5					22	47	329	329
June.....	300	248	78	73	17	14		1			3		32	56	430	392
July.....	383	218	89	65	8	17	4	1			1		25	93	510	394
August.....	273	311	67	63	8	9		1	2			1	43	54	393	439
September.....	241	201	65	92	9	5		3				2	25	60	340	363
October.....	293	300	99	99	6	5	1	4	1			3	22	54	422	465
November.....	231	160	69	65	12	4	6	1	2	1		1	17	54	337	286
December.....	298	188	97	100	4	10	1	10	2	2		1	25	70	427	381
Total.....	3,563	2,779	1,000	998	197	169	21	27	12	3	8	19	412	653	5,213	4,648

NUMBER OF VALVES RAISED IN THE SEVERAL
DISTRICTS DURING THE YEAR 1887.

Also, in each year since 1873.

DISTRICTS.	6-inch Barton.	8-inch Barton.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	36-inch.	Total.
Second	11		10	3	8				2	2			36
Third.....			1	10	24		5	2				1	43
Fourth				3	29		5	1	2		1		41
Totals for 1887.....	11		11	16	61		10	3	4	2	1	1	120
“ “ 1886.....	12		13	18	57	1	3				1		105
“ “ 1885.....			11	24	97	1	9		2		1		145
“ “ 1884.....			7	13	71	1	4	2	1	3	6	1	109
“ “ 1883.....			4	27	88		8		1		1	1	130
“ “ 1882.....	1		14	25	58	1	5	1			1		106
“ “ 1881.....			15	44	90		5	7					161
“ “ 1880.....			7	23	47		8	1			1		87
“ “ 1879.....			9	16	60	1	3	2			1	1	93
“ “ 1878.....			27	22	100		3	1		1	1		155
“ “ 1877.....			12	6	50		1			1			70
“ “ 1876.....			3	17	49		3			1			73
“ “ 1875.....			17	55	120	4	12	2	4	1	2		217
“ “ 1874.....			13	32	111	6	6	3	3				174
Totals for 14 years..	23	1	163	338	1,059	15	80	22	15	9	16	4	1,745

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TABULAR STATEMENT OF WORK CONNECTED WITH THE DISTRIBUTION,

For the eight years 1880 to 1887, inclusive.

Years.	PIPE.										Additional stops.	Additional fire hydrants.	Fire hydrants in use.	Meters in use.	SERVICE ATTACHMENTS.							Total.
	Extensions.		Repairs and relays.		Total pipe handled.		Total amount in use.		Total amount handled.						1/4 in.	5/8 in.	3/4 in.	1 in.	1 1/2 in.	2 in.		
	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.	Feet.	Pounds.												
1880.....	23,085	844,946	9,557	262,826	32,042	1,107,772	3,927,623	192,816,906	4,164,768	290,136,708	138	70	5,358	34	2,687	118	49	89	.....	2,943	
1881.....	56,616	2,832,623	3,832	199,649	60,448	3,032,272	3,984,239	195,649,529	4,225,216	203,168,980	249	144	5,502	42	3,166	137	59	121	.....	3,483	
1882.....	56,860	5,396,165	7,740	484,092	64,600	5,880,257	4,011,099	201,045,694	4,289,816	249,019,237	312	120	5,622	45	3,169	110	76	129	.....	3,484	
1883.....	63,215	3,043,645	12,605	675,420	75,880	3,724,065	4,104,314	204,094,339	4,365,696	212,773,301	281	130	5,752	63	4,576	97	71	133	.....	4,877	
1884.....	*84,451	7,155,385	18,079	1,380,271	102,530	8,535,656	4,188,765	211,249,724	4,468,226	221,308,957	324	147	5,887	560	5,529	185	84	140	7	5,945	
1885.....	137,967	12,234,074	93,783	3,265,537	231,850	15,499,611	4,326,732	223,483,798	4,700,076	236,808,568	539	307	†6,195	305	6,734	254	121	160	16	7,285	
1886.....	136,831	18,238,457	121,210	4,883,826	258,011	23,122,283	4,453,563	241,722,255	4,958,117	259,930,851	736	295	6,490	234	7,482	258	104	133	32	8,009	
1887.....	122,790	14,780,082	34,098	1,329,083	156,888	16,109,165	4,586,353	256,502,337	5,115,005	276,040,016	546	429	6,715	253	7,892	317	124	143	2	54	8,532

* 589 feet of pipe omitted in 1854.

† One fire hydrant omitted 1885.

METERS.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					1/2 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.	6 in.			
1	McCahan, Wm. J. & Co., N. W. cor. Otsego and Morris streets.....		3 | 4 | '84.	Crown.....						1			1	263,420	
1	Rowley, E. H., N. E. cor. Otsego and Millin streets.....		3 | 31 | '84.	Crown.....				1					1	3,506,392	Not charged for by meter.
2	Allison, Patton & Jones, 1201 Washington avenue.....		2 | 20 | '81.	Crown.....					1				1	3,039,101	
2	Bartol, B. H., 1012 Passyunk avenue.....		2 | 19 | '84.	Crown.....					1				1	2,758,429	
2	Campbell & Elliott, 1035 South Twelfth street..		2 | 22 | '81.	Crown.....				1	1				2	8,720,101	4-inch attachment—no meter.
2	Heyl Bros., N. W. cor. Otsego and Washington avenue.....		4 | 5 | '83.	Crown.....					1				1	1,762,101	
2	Williams, John & Sons, S. W. cor. Twelfth and Carpenter streets.....		3 | 13 | '81.	Crown.....					2				2	4,671,297	Not charged for by meter.
4	Horstman, John F., 314 Stanley street.....		4 | 21 | '84.	Crown.....		1			1				2	3,258,542	Not charged for by meter.
4	Knight, E. C. & Co., Delaware avenue and Bainbridge street.....		1 | 9 | '84.	Worthington.....				1					1	1,409,232	
5	Bullitt Estate, N. E. cor. Fourth and Harmony streets.....		12 | 6 | '87.	Crown.....						1			1		No water consumed.
5	Guarantee Trust Company, 316 and 318 Chestnut street.....		10 | 10 | '85.	Crown.....						1			1	13,164	
5	Jayne Estate, 242 Carter's alley.....			Marsland.....				1					1	5,103,605	
6	Butcher's Sons, W., 146 and 148 North Front street.....		5 | 7 | '85.	Crown.....					1				1	948,262	
6	McCambridge & Co., 525 Cherry street.....		4 | 3 | '84.	Crown.....				1	1				2	1,471,173	Not charged for by meter.
7	Kershaw, R., 2030 Naudain street.....		3 | 3 | '84.	Crown.....				1	1				2	1,261,352	Not charged for by meter.
7	Thunder, H. G., 313 South Tenth street.....		11 | 4 | '87.	Crown.....				1					1		Private meter, no water cons'd,

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.			
8	Aldine Hotel, 1914 Chestnut street.....			Crown.....							2	2	6,325,886		
8	Continental Hotel, Ninth and Chestnut streets.		1 | 26 | '84..	Crown.....			3	2	1			6	10,465,993		
8	Lafayette Hotel, Broad and Sansom streets.....		2 | 17 | '83..	Crown.....						1		1	22,916,770		
8	Payne, J. A., 219 South Broad street.....		3 | 8 | '84..	Crown.....			1			1		2	2,350,313	One only charged for by meter.	
8	Times, Philadelphia, S. W. cor. Eighth and Chestnut streets.....		2 | 4 | '84..	Crown.....				1				1	1,476,967		
8	Press, Philadelphia, S. W. cor. Seventh and Chestnut streets.....		8 | 2 | '86..	Crown.....						1		1	178,218		
8	Underground Electric Light Co., 123 South Eleventh street.....		2 | 18 | '84..	Crown.....					1			1	3,053,177	Not charged for by meter.	
8	Wyeth, John & Bro., 1412 and 1414 Walnut street.....		3 | 7 | '84..	Crown.....			1					1	68,965		
9	Brush Electric Light Co., 2011 to 2037 Johnson street.....		8 | 15 | '84..	Crown.....		1					1	2	10,345,281		
9	Massey, Wm., N. W. cor. Tenth and Filbert streets.....		5 | 7 | '84..	Crown.....			1	3		2		6	18,071,905		
9	Reed, Wm., 1522 Arch street.....		12 | 1 | '87..	Crown.....					1			1		Private meter, no water cons'd.	
9	Wilbur, H. O. & Son, 1211 and 1213 Clover street.....		2 | 2 | '84..	Crown.....					1			1	726,876		
10	Cornelius & Sons, 811 Cherry street.....		1 | 27 | '84..	Crown.....			2		1	1		4	4,215,354	Not charged for by meter.	
10	Mellor & Rittenhouse, 218 North Twenty-second street.....		2 | 18 | '84..	Crown.....					2			2	22,699,870	Not charged for by meter.	
10	Philadelphia Gal. Works, 2124 Race street.....		2 | 16 | '84..	Crown.....		1			1			2	2,937,127	Not charged for by meter.	
10	Schell, J. E. & Son, S. E. cor. Tenth and Vine streets.....		2 | 18 | '84..	Crown.....			1	1				2	1,700,914		

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.			
11	Betz, John F. & Sons, 333 St. John street.....	3 | 6 | '84..	Crown.....					1	1			2	6,516,386		
11	Baum, Little & Co., 123 Margaretta street.....	1 | 14 | '84..	Crown.....					1				1	3,513,767	Not charged for by meter.	
11	Blume & Rieber, 700 North Front street.....	1 | 22 | '84..	Crown.....					2				2	2,694,228	Not charged for by meter.	
11	Bockius, C., 425 St. John street.....	1 | 16 | '84..	Crown.....					1				1	2,589,957	Not charged for by meter.	
11	Clark, Wm., 422 St. John street.....	1 | 25 | '81..	Crown.....					2				2	5,275,935	Not charged for by meter.	
11	Elton, A. & Co., 434 St. John street.....	1 | 16 | '84..	Crown.....		2			1				3	5,040,679	Not charged for by meter.	
11	Franklin, Wm., 317 North Third street.....	1 | 21 | '84..	Crown.....			1						1	168,217	Not charged for by meter.	
11	Felton, Wm. S. & Co., 431 St. John street.....	1 | 16 | '84..	Crown.....			1	1					2	2,410,497	Not charged for by meter.	
11	Fischer, F., 151 and 153 Willow street.....	1 | 12 | '84..	Crown.....			2						2	1,718,906	Not charged for by meter.	
11	Frank, J. & Son, 213 Willow street.....	1 | 24 | '84..	Crown.....			1						1	194,614	Not charged for by meter.	
11	Frank, G. & Son, 149 Willow street.....	1 | 4 | '81..	Crown.....			1						1	739,988	Not charged for by meter.	
11	Gundelfinger & Unkle, 143 and 145 Margaretta street.....	1 | 3 | '84..	Crown.....					1				1	2,225,667	Not charged for by meter.	
11	Glenn, Taylor & Co., 209 and 211 Willow street.	1 | 18 | '84..	Crown.....			1						1	663,005	Not charged for by meter.	
11	Horn, Wm. H. & Bro., 451 North Third street.	1 | 19 | '84..	Crown.....			2						2	2,111,394		
11	Matthews, M. C., 215 Willow street.....	1 | 25 | '84..	Crown.....					1				1	5,882,870	Not charged for by meter.	
11	Patterson, J. W. & Co., 131 Margaretta street...	1 | 21 | '84..	Crown.....						1			1	2,694,889	2-inch ferrule not on meter.	

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.							Total.	Quantity of water used. Gallons.	Remarks.	
					1/2 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.				6 in.
11	Pierson & Mitchell, 506 to 514 New Market street.....		1 | 18 | '84..	Crown.....				1					1	2,541,442	Not charged for by meter.
11	Sweatman & Co., New Market and Callowhill streets.....		1 | 26 | '81..	Crown.....		1		1	1				3	6,251,229	Not charged for by meter.
12	Amer, Wm. & Co., 478 to 446 North Third street.....		1 | 9 | '84..	Crown.....				1	1				2	8,562,894	Not charged for by meter.
12	Dungan, Hood & Co., 434 and 436 North Third street.....		1 | 22 | '81..	Crown.....			1	2	1				4	7,036,510	Not charged for by meter.
12	Hammond & Dwyer, 424 Dillwyn street.....		1 | 14 | '84..	Crown.....					1				1	952,495	Not charged for by meter.
12	Jackson, T., 814 Lawrence street.....		2 | 14 | '84..	Crown.....		1	1						2	1,217,205	1 private meter.
12	Martin, D. B., 424 North Third street.....		1 | 21 | '84..	Crown.....				1					1	50,684	Not charged for by meter.
12	Pierson, C. C. & Son, 426 North Third street .		1 | 5 | '81..	Crown.....		1			1				2	10,640,599	Not charged for by meter.
12	Taylor, N. G. & Co., N. W. cor. Dillwyn and Willow streets.....		1 | 11 | '84..	Crown.....		1	1						2	3,625,643	Not charged for by meter.
12	Wolters, Peter, 321 Fairmount avenue.....		5 | 15 | '84..	Crown.....				1					1	2,319,311	
13	Hance Bros. & White, 621 Callowhill street....		3 | 5 | '84..	Crown.....	1			1					2	1,358,956	
13	Magee, R., N. E. cor. Eighth and Vine streets.		5 | 5—'84..	Crown.....			2		1				3	4,515,167	
13	Miskey, Wm. F., 819 Wood street.....		7 | 3 | '85..	Crown.....				1					1	261,201	
14	Haines, Jones & Cadbury, 1136-40 Ridge avenue.....		2 | 7 | '81..	Positive.....		1							1	981,331	Private meter.
15	Bergdoll, L., Brewing Company, Twenty-ninth and Brown streets.....		5 | 5 | '84..	Crown.....				2			2		4	42,203,034	
15	Brooke, Benj., & Co., S. E. cor. Twenty-third and Hamilton streets.....		5 | 29 | '84..	Crown.....				1					1	1,661,088	Not charged for by meter;

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	Size.								Quantity of water used. Gallons.	Remarks.		
					$\frac{1}{2}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{2}$ in.	2 in.	3 in.	4 in.	6 in.			Total.	
15	Clough & Carson, 618 North Twenty-fourth street.....		5 | 28 | '84.	Crown.....			1		2					3	3,449,020	Not charged for by meter.
15	Veiweger, Max., S. W. cor. Broad and Brandywine streets.....		12 | 3 | '87.	Crown.....						1				1		No water consumed.
16	Allen Stewart Estate, 927 North Front street....		3 | 11 | '84.						4					4	5,548,948	Two private meters.
16	Adams & Keen, 934 St. John street.....		1 | 31 | '81.	Crown.....			1	1		2				4	14,268,007	Not charged for by meter.
16	Carey, Geo., 934 North Third street.....		5 | 13 | '84.	Crown.....						1				1	2,480,188	
16	Hummel, J., & Sons, 970 Canal street.....		1 | 3 | '84.	Crown.....						1				1	2,116,321	Not charged for by meter.
16	Hartley, Fink & Co., 1038 North Front street....		2 | 6 | '81.	Crown.....					2					2	1,732,592	Not charged for by meter.
16	McNeely & Co., Charlotte and Canal streets....		1 | 29 | '84.	Crown.....			1		3					4	17,716,514	Not charged for by meter.
16	Nevil, Jos., & Sons, 1014 St. John street.....		2 | 7 | '84.	Crown.....			1	1	2					4	5,498,211	Not charged for by meter.
16	Smith, E. A., & Bro., 929 North Third street....		2 | 4 | '84.	Crown.....			1		3	1				5	18,085,091	Not charged for by meter.
17	Schmidt, Chris., 109-21 Edward street.....		5 | 13 | '84.	Crown.....					1	2				3	12,721,250	
17	Warthman & Co., 35-37 Poplar street.....		2 | 5 | '84.	Crown.....						1				1	3,285,320	
17	Branson, Geo., 217 Jefferson street.....		3 | 15 | '84.	Crown.....						1				1	5,472,926	Not charged for by meter.
17	Delaney & Co., S. E. cor. Hancock and Jefferson streets.....		3 | 10 | '81.	Worthington.....			1							1	1,452,623	
17	Johnson, Jos., & Co., N. W. cor. Mascher and Jefferson streets.....		3 | 14 | '84.	Crown.....						1				1	3,595,674	Not charged for by meter.
17	Kitchman, Chas., 1230 Charlotte street.....		3 | 12 | '84.	Crown.....						1				1	2,281,863	Not charged for by meter.

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.			
17	Lafferty, Chas., & Son, 1526 Hancock street.....		3 | 17 | '84..	Crown.....				1					1	1,587,809	Not charged for by meter.
17	Long, Jas. & Co., S. W. cor. Palethorp and Oxford streets.....		3 | 8 | '84..	Crown.....		1		1	1				3	3,364,407	Not charged for by meter.
18	Eichler, A., 1530 Vienna street.....		2 | 16 | '84..	Crown.....					1				1	5,179,511	Not charged for by meter.
18	Hanifen, Jno., & Co., S. E. cor. Savery and Thompsou streets.....		2 | 28 | '84..	Crown.....				1					1	468,439	Not charged for by meter.
19	Crawford, Geo., 1710 Howard street.....		3 | 27 | '84..	Crown.....					1				1	2,979,987	Not charged for by meter.
19	Hogg & Metzger, Second and Hunjington streets.....		12 | 10 | '83..	Crown.....					1				1	4,899,736	
19	McKee, J. D., & Co., N. E. cor. Howard and Harrison streets.....		3 | 18 | '84..				1	1	1				3	4,296,894	Two-inch ferrule not on meter.
19	Western White Lead Works, 1833 Hancock street.....		3 | 28 | '84..	Crown.....					3				3	29,161,889	Not charged for by meter.
19	Weinman, T., & Sons, 1732 Howard street.....		3 | 18 | '84..	Crown.....			1	1					2	2,243,776	Not charged for by meter.
20	Beardwood, T., & Bro., 1640 North Sixth street.....		5 | 2 | '84..	Crown.....					1				1	7,888,752	
20	Glass, Chas., 1732 Mervine street.....		5 | 2 | '84..	Crown.....					1	1			2	8,365,332	Not charged for by meter.
20	Gindele, Geo., 1026 Girard avenue.....		5 | 3 | '84..	Crown.....		1		1					2	538,485	
20	Jewish Synagogue, 1701 North Seventh street..		5 | 16 | '87..	Crown.....					1				1	82,983	
20	Noelsh, Wm., 1860 North Eighth street.....		12 | 20 | '87..	Crown.....		1							1		Private meter, no water cons'd.
20	Sullivan, Jno. & Sons, 902 Montgomery avenue.....		8 | 8 | '84..	Crown.....					1				1	3,443,769	
20	Schimmel, J. O., N. E. cor. Eighth and Berks streets.....		3 | 25 | '84..	Worthington.....			1						1	1,465,601	

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.			
20	Wolters, Chas., N. W. cor. Eleventh and Oxford streets.....		3 | 22 | '84..	Crown.....					2				2	11,492,548	
20	Wilson, Dr., 1940 North Thirteenth street.....		10 | 20 | '86..	Crown.....	1								1		Not charged for by meter.
21	Campbell, J. A., River road.....		1 | 6 | '86..	Crown.....				1					1	379,565	
21	Ileft, J. D., & Son, Schur's lane and Main street.....		1 | 5 | '86..	Crown.....					1		1		2	3,128,165	
21	Powers & Weightman, School Lane Station.....		9 | 7 | '84..	Crown.....				1					1	2,234,253	
21	Pennsylvania Railroad Company, Roxborough Station.....		9 | 7 | '84..	Crown.....					1				1	1,421,535	
22	McCallum & Sloan, Wayne Junction.....			Crown.....					1				1	401,915	
23	Arsenal, United States, Bridesburg.....		2 | 6 | '84..	Crown.....							1		1	4,770,444	
23	Erdrich, A., Bridge above Harrison street.....		5 | 9 | '84..	Crown.....				1					1	1,651,823	
23	Fritsch, J., 4224 Edward street.....		7 | 1 | '84..	Crown.....				1					1	490,942	Not charged for by meter.
23	Grouh, J., 4228 Edward street.....		6 | 6 | '84..	Crown.....					1				1	2,736,137	
24	Abattoir, Thirtieth and Arch streets.....		5 | 18 | '81..	Crown.....							1		1	5,730,937	
24	Aman & Bro., 3721 Filbert street.....		3 | 5 | '84..	Crown.....				1					1	367,622	Not charged for by meter.
24	Pennsylvania Railroad Company, Spring Garden east of Thirty-first street.....		3 | 12 | '84..	Crown.....								1	1	16,101,373	
24	Pennsylvania Railroad Company, Thirty-second and Market streets.....		8 | 10 | '83..	Crown.....						1			1	5,931,415	
24	Pennsylvania Railroad Company, Belmont and Girard avenues.....		3 | 2 | '87..	Crown.....							1		1	5,070,490	

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					1/2 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.	6 in.			
24	Pensylvania Railroad Company, S. E. cor. Thirtieth and Race streets.....		7 | 8 | '87.	Crown.....							1		1	398,310	
25	Bridesburg Manufacturing Company, Richmond and Orchard street.....		4 | 10 | '81.	Crown.....			1	1					2	1,900,254	
25	Ennis, G. W., N. W. cor. Front and Lehigh avenue.....		3 | 8 | '84.	Worthington.....			1						1	3,657,193	Not charged for by meter.
25	Hernig, John, 2810 Frankford avenue.....		5 | 1 | '84.	Crown.....					1				1	2,735,458	Not charged for by meter.
25	Kramer, Otto, 2717 Germantown avenue.....		4 | 22 | '84.	Crown.....					1				1	7,298,345	Not charged for by meter.
25	Kagerman, E., 3102 Jasper street.....		10 | 20 | '87.	Crown.....					1				1	1,009,071	Not charged for by meter.
25	Philadelphia and Reading Railroad Company, Lehigh and Tulip street.....			Crown.....							1		1	35,569,195	
25	Philadelphia and Reading Railroad Company, Richmond and Lehigh avenue.....		7 | 11 | '87.	Crown.....						1			1	287,641	
25	Philadelphia Grain Elevator Company, William and Brabant streets.....		11 | 18 | '87.	Crown.....							1		1		No water consumed.
26	Bower, Henry, Twenty-ninth and Gray's Ferry Road.....			Crown.....							1		1	8,003,375	
26	Campbell, George W., Thirty-first and Reed streets.....		3 | 15 | '84.	Worthington.....			1						1	2,983,405	
26	Campbell, George W., S. E. cor. Twenty-first and Washington avenue.....		2 | 23 | '84.	Crown.....					1	1			2	6,543,157	
26	Continental Brewing Company, S. W. cor. Twenty-first and Washington avenue.....		2 | 25 | '84.	Crown.....				1					1	10,983,287	
27	Home of the Merciful Saviour, Forty-fourth and Baltimore avenue.....		3 | 26 | '86.	Crown.....					1				1	544,790	
27	University Athletic Association, S. W. cor. Thirty-sixth and Spruce streets.....		5 | 2 | '85.	Crown.....					1				1	129,717	
28	Keystone Horse Shoe Works, Seventeenth and Allegheny avenue.....			Crown.....					1				1	2,284,579	

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of Meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.			
28	Midvale Steel Works, Nicetown.....			Crown.....								1		16,613,304	
28	P. & R. R. Co., Nicetown Station.....			Crown.....						1				1,818,388	
28	P. & R. R. Co., 13th and Cumberland sts.....			Crown.....			1							693,515	
29	Baltz, J. & P., Brewing Co., N. W. cor. Thirty-first and Thompson streets.....		4 | 24 | '81..	Crown.....			1			1				30,976,535	
29	Bergner & Engle Brewing Co., Thirty-second and Thompson streets.....		5 | 10 | '84..	Crown.....				1	1	3		1		69,320,436	One only charged for by meter.
29	Eble & Hertz, N. E. cor. Thirty-third and Thompson streets.....		4 | 29 | '84..	Crown.....					2		1			33,364,136	
29	Flach, Henry, N. W. cor. 31st and Master sts...		8 | 19 | '84..	Crown.....						1				5,369,293	
29	Muller, Henry, N. E. cor. Thirty-first and Jefferson streets.....		4 | 24 | '84..	Crown.....					1	1				13,430,167	
29	P. & R. R. Co., 33d and Thompson streets...			Crown.....						1				7,131,658	
29	Poth, F. A. Brewing Co., N. W. cor. Thirty-first and Jefferson streets.....		3 | 13 | '84..	Crown.....						1				16,407,155	
29	Theiss, Charles, Thirty-second street, north of Thompson streets.....		4 | 29 | '84..	Worthington.....			1							1,616,644	Not charged for by meter.
29	Joly, Chas., 1415-17 N. Thirty-first street.....		4 | 24 | '84..	Crown.....					1					3,368,244	Not charged for by meter.
30	Rosengarten & Sons, S. W. cor. Seventeenth and Fitzwater streets.....		3 | 19 | '84..	Crown.....			2		2					7,528,211	Not charged for by meter.
31	Bromley, James & George D., N. W. cor. Adams and Jasper streets.....		4 | 7 | '84..	Crown.....		1			1	1				4,359,074	Not charged for by meter.
31	Bergess, J., N. E. cor. Amber and Bergess sts...		4 | 11 | '84..	Crown.....					2					6,368,374	Not charged for by meter.
31	Brophy, P., S. W. cor. Emerald and Taylor sts.		3 | 29 | '84..	Crown.....					1					2,274,256	Not charged for by meter.

METERS—Continued.

Ward.	Occupant.	Location.	Date when set.	Name of Meter.	SIZE.								Total.	Quantity of water used. Gallons.	Remarks.
					½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.			
31	Emsley, Wm., & Bro., N. W. cor. Emerald and Adams street.....		4 | 3 | '81.	Crown.....					2				2	3,238,765	Not charged for by meter.
31	Glazier, J. J., & Bro., 119-35 Taylor street.....		3 | 31 | '84.	Crown.....					3				3	6,776,326	
31	Greenwood, Joseph, & Son, N. E. cor. Emerald and Huntingdon streets.....		3 | 29 | '84.	Crown.....					2				2	5,889,953	Not charged for by meter.
31	Kitchenman, James, S. E. cor. Jasper and Huntingdon streets.....		4 | 3 | '84.	Crown.....					1	1			2	17,262,179	Not charged for by meter.
31	Lorimers', Wm. H., Sons, 2430 Martha street.....		4 | 8 | '84.	Crown.....					1				1	4,200,812	1 ferrule not on meter.
31	Lorimers', Wm. H., Sons, 2431 Emerald street.....		4 | 11 | '84.	Crown.....					2				2	9,676,831	Not charged for by meter.
31	Remmey, R. C., N. E. cor. Cumberland and Commerce streets.....		4 | 12 | '84.	Union.....				1					1	355,726	Not charged for by meter.
31	Weisbrod & Hess, Frankford road and Adams street.....		5 | 7 | '84.	Crown.....						1			1	17,566,106	
Totals.....													253	887,026,955	

METERS DISMANTLED.

Ward.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Average quantity of water used. Gallons.	Remarks.	
					1/2 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.	6 in.			Total.
2	Campbell & Elliott, 1035 S. Twelfth street.....	2 | 22 | '84.	Crown.....				1	1					2	3,628,825	Water shut off.
7	Mitchell, N. C., 2417 to 21 South street.....	3 | 1 | '84.	Crown.....		1		1						2	2,978,162	Water shut off.
8	Lafayette Hotel, Broad and Sansom streets.....	2 | 17 | '83.	Crown.....				1						1	32,762	Water shut off.
11	Gundelfinger & Unkle, 143 and 45 Margretta st..	1 | 3 | '84.	Crown.....					1					1	610,555	Water shut off.
12	Betz, Jno. F., & Son, York avenue and Willow street.....	4 | 22 | '84.	Crown.....					1		1			2	19,078,263	Water shut off.
12	Gibbs, Chas. M., 822 and 24 Lawrence street.....	2 | 14 | '81.	Crown.....		1	1							2	1,751,203	
15	Eastern Penitentiary, Twenty-second street and Fairmount avenue.....	4 | 23 | '84.	Crown.....							1			1	23,852,448	4-inch attachment—no meter.
16	Miller, C. W., & Co., 171 to 79 Canal street.....	2 | 11 | '84.	Crown.....					2					2	7,886,802	
17	Dolan, Thomas, & Co., S. E. cor. Howard and Oxford streets.....	4 | 19 | '84.	Crown.....								2	1	3	121,131,561	
17	Lafferty, Charles, & Son, 1526 Hancock street.....	3 | 17 | '84.	Crown.....		1								1	121,609	Water shut off.
19	Clark & Keen, 1720 North Second street.....	3 | 30 | '84.	Crown.....							1			1	35,065,267	
19	Gay's, John, Sons, 2001 Howard street.....	3 | 22 | '84.	Crown.....					3					3	10,213,678	
19	Schollenberger & Sons, Mascher & Putnam sts..	2 | 29 | '81.	Crown.....		1			1	1				3	3,871,483	Water shut off.
19	Taylor, T., & Sons, S. E. cor. Howard street and Lehigh avenue.....	4 | 12 | '84.	Crown.....					1					1	6,227,354	

METERS DISMANTLED—Continued.

Wards.	Occupant.	Location.	Date when set.	Name of meter.	SIZE.								Total.	Average quantity of water used. Gallons.	Remarks.
					1/2 in.	3/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.	6 in.			
25	Ennis, G. W.,	N. W. corner Front street and Lehigh avenue.....	3 | 8 | '84.	Crown.....				1					1	2,290,637	
25	Martin, Jas., & Co.,	S. W. cor. Richmond and Tioga streets.....	4 | 10 | '84.	Crown.....			1	3	1				5	35,942,313	
26	Continental Brewing Co.,	S. W. cor. Twenty-first street and Washington avenue.....	2 | 25 | '84.	Crown.....		1							1	1,718,974	Water shut off.
27	Butler, William, & Co.,	Forty-fourth street and Woodland avenue.....	7 | 20 | '83.	Crown.....					1				1	12,503,056	Water shut off.
29	Rothacker & Sons,	Thirty-first street, south of Master street.....	4 | 23 | '84.	Crown.....						1			1	13,346,948	
31	Bromley, John, & Sons,	N. E. cor. Front and Jasper streets.....	4 | 12 | '84.	Crown.....					2				2	11,282,022	
	Total.....					5	2	7	14	3	4	1	36	313,538,922	

RECAPITULATION.

METERS IN USE.										METERS DISMANTLED,											
Style of Meter.	Size.									Total.	Style of Meter.	Size.									Total.
	½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	Total.			½ in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	Total.	
Crown.....	2	15	34	53	90	22	15	2	233	Crown.....	5	2	7	14	3	4	1	36	269		
Keystone.....		1							1	Keystone.....									1		
Union.....				4					4	Union.....									4		
Marsland.....				1					1	Marsland.....									1		
Worthington.....			7	2	1	3			13	Worthington.....									13		
Positive.....				1					1	Positive.....									1		
Totals.....	2	16	41	61	91	25	15	2	253	Totals.....	5	2	7	14	3	4	1	36	289		

MISCELLANEOUS WORK.

	EXAMINATIONS.					MISCELLANEOUS.							METERS TESTED.				STATEMENTS TAKEN.	
	Attachments.	Short supply.	Leaks.	Meters.	Total.	Boxes repaired.	Sidewalks repaired.	New boxes put in.	Fish traps set.	Service pipes repaired.	Drain pipes repaired.	Inlet connections repaired.	Total.	Crown.	Union.	Positive.		Total.
January.....	10	6	3	18	37													247
February.....	2	2		5	9					2			2	16			16	
March.....	22	5	4	17	48	3	3		3	3			12	8			8	318
April.....	37	4	3	38	82	3				57			60	3			3	801
May.....	41	12	10	10	73			5	4	21	1		31			1	1	
June.....	47	4	10	13	74	3	3	1	4				11	29	1		30	667
July.....	41	8	7	22	78	1	1	2	6	4			14					576
August.....	48	6	13	14	81	2	1		4	1			8					176
September.....	27	8	9	29	73			1	2	1			4	14			14	653
October.....	56	10	20	26	112	5	1		3	3			12					532
November.....	34	14	9	15	72			2	3	19	1		25					702
December.....	38	13	7	25	83			1	4				5					1,121
Totals.....	403	92	95	232	822	17	9	12	33	111	1	1	184	70	1	1	72	5,793

GENERAL SUMMARY OF METER OPERATIONS DURING 1887.

STYLE OF METER.	In stock January 1, 1887.					In use January 1, 1887.					Totals.	Set.	Renewed.		Removed.				In use December 31, 1887.					Repaired.		In stock December 31, 1887.																	
	Crown.	Keystone.	Equitable.	Union.	Worthington.	Total.	Crown.	Keystone.	Equitable.	Union.			Worthington.	Positive.	Total.	Crown.	Total.	Crown.	Equitable.	Union.	Worthington.	Positive.	Total.	Crown.	Worthington.	Positive.	Total.	Crown.	Keystone.	Equitable.	Union.	Worthington.	Positive.	Total.									
																																			Keystone.	Equitable.	Union.	Worthington.	Positive.	Total.	Crown.	Keystone.	Equitable.
½ inch.....	30	1	1	1	1	34	30	3	1	1	1	36	33	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	31								
¾ "	57	24	1	1	1	84	81	23	1	1	1	107	105	1	1	1	1	1	1	1	1	1	4	20	1	1	1	1	1	1	1	1	1	84									
1 "	94	1	16	1	1	113	111	40	1	9	1	162	162	15	15	19	1	2	1	23	36	7	43	16	5	1	21	97	2	18	1	118											
1½ "	36	4	19	1	1	59	56	6	1	2	1	66	125	1	12	12	9	2	11	60	4	1	2	1	68	15	1	16	32	4	21	57											
2 "	39	1	1	1	1	43	40	97	1	1	1	98	138	5	5	9	9	7	7	104	1	105	34	1	1	34	32	1	1	1	33												
3 "	20	1	1	1	1	24	22	1	1	1	1	25	45	2	2	2	2	1	1	25	3	28	14	1	15	17	1	1	1	1	17												
4 "	5	1	1	1	1	8	14	1	1	1	1	17	19	5	5	2	2	2	2	19	1	19	14	1	14	1	1	1	1	1	1												
6 "	1	1	1	1	1	5	3	1	1	1	1	6	4	1	1	1	1	1	3	1	3	1	1	3	1	1	1	1	1	1	1												
Totals...	282	28	1	19	17	347	258	1	1	6	1	15	2	284	631	14	14	40	40	43	1	2	2	1	49	269	1	4	1	13	1	289	97	6	1	104	270	28	2	21	19	1	341

REMARKS.

1—¾ inch Keystone meter in use—private
 2—1½ inch Worthington meters in use—private.
 1—¾ inch Crown meter in use—private.

1—1½ inch Crown meter in use—private.
 1—2 inch Crown meter in use—private.
 1—1 inch Crown meter injured by fire, condemned,

APPENDIX E.

REPORT

ON THE

Operations of the Construction and Repair Shop DURING 1887.

BUREAU OF WATER.

SHOP, TWELFTH AND REED STS.

Philadelphia, January 23, 1888.

JOHN L. OGDEN,
Chief Engineer.

SIR:—I respectfully submit herewith the Annual Report of the operations of the Construction and Repair Shop for the year ending December 31, 1887.

Respectfully,

W. F. COURTNEY,
Superintendent.

	MERCHANDISE.	DR.
To Stock on hand January 1, 1887.....		\$11,567 76
Bolts and nuts.....		898 31
Brass castings, 24,938½ lbs.....		2,819 41
Bricks and lime.....		765 65
Brass fittings.....		326 93
Chandlery.....		193 10
Coal, 367 tons.....		2,018 50
Galvanizing.....		243 68
Gum goods.....		805 91
Hardware.....		231 57

Hauling	123 60
Iron castings, 710,873 lbs.....	24,454 78
Lumber, 32,799 feet.....	1,081 95
Miscellaneous	278 19
Machinery	416 36
Oil and tallow.....	129 16
Paints, brushes, etc.....	49 84
Planing gate frames.....	50 00
Roofing.....	69 78
Steel, 4,167 lbs.....	246 30
Tickets, passenger railway.....	65 00
Wrought iron, 61,080 lbs.....	1,527 91
Wrought iron pipe fittings.....	10 64
Wages.....	33,305 21
	<hr/>
	\$81,679 54
	<hr/>

MERCHANDISE.

CR.

By supplies and repairs, First District.....	\$7,720 29	
" " " Second "	9,939 88	
" " " Third "	11,464 60	
" " " Fourth "	14,498 12	
" " " Fifth "	2,216 59	
" " " Sixth "	2,385 81	
	<hr/>	\$48,225 29

FAIRMOUNT PUMPING STATION.

By repairs to machinery.....	\$1,255 82	
" to buildings and grounds.....	94 61	
	<hr/>	1,350 43

SPRING GARDEN PUMPING STATION.

By repairs to machinery.....	\$1,649 59	
" to boilers.....	523 53	
" to buildings and grounds.....	250 25	
	<hr/>	2,423 37
By supplies to storehouse.....	8 58	
	<hr/>	8 58

BELMONT PUMPING STATION.

By repairs to machinery.....	\$215 70	
" to boilers.....	42 86	
" to buildings and grounds.....	17 66	
	<hr/>	276 22

ROXBOROUGH PUMPING STATION.

By repairs to machinery.....	\$288 79	
“ to boilers.....	157 07	
“ to buildings and repairs.....	1 86	
	<u> </u>	447 72

CHESTNUT HILL PUMPING STATION.

By repairs to machinery.....	\$31 47	
	<u> </u>	31 47

MT. AIRY PUMPING STATION.

By repairs to machinery.....	\$23 32	
	<u> </u>	23 32

FRANKFORD PUMPING STATION.

By repairs to machinery.....	\$204 63	
“ to boilers.....	54 65	
“ to buildings and grounds.....	3 92	
	<u> </u>	263 20

KENSINGTON PUMPING STATION.

By repairs to machinery.....	\$155 47	
“ to boilers.....	3 12	
“ to buildings and grounds.....	3 26	
	<u> </u>	161 85

MAIN OFFICE.

By supplies and repairs.....	\$24 82	
	<u> </u>	24 82

WATER METERS.

By supplies and repairs.....	\$213 78	
	<u> </u>	213 78

FIXED PATTERNS.

By supplies and repairs.....	\$1,051 23	
	<u> </u>	1,051 23

FERRULES.

By labor on corporation cocks....	\$48 28	
	<u> </u>	48 28

DISTRIBUTION.

By supplies and labor.....	\$512 96	
	<u> </u>	512 96

OLD METAL.

By sales.....	\$379 10	
	<u> </u>	379 10

INSPECTION AND SURVEYS.

By repairs.....	\$10 12	10 12
-----------------	---------	-------

GENERAL BUILDINGS AND GROUNDS.

East Park Reservoir supplies.....	\$3,330 53	
New shop (construction) labor and supplies.....	8,841 45	
	<u>12,171 98</u>	

MACHINERY.

By supplies and repairs.....	\$2,986 81	2,986 81
------------------------------	------------	----------

REPAIR SHOP.

By labor, supplies and repairs.....	\$1,576 40	1,576 40
-------------------------------------	------------	----------

\$72,185 93

Stock on hand January.....	11,965 26
----------------------------	-----------

Cr	\$84,151 19
----------	-------------

Dr.....	<u>81,679 54</u>
---------	------------------

Balance to Cr.....	\$2,471 65
--------------------	------------

INVENTORY, JANUARY 1, 1888.

9 6-inch stop cocks, at \$25 00.....	\$150 00	
12 8-inch " " 30 00.....	360 00	
2 10-inch " " 45 00.....	90 00	
11 12-inch " " 50 00.....	550 00	
4 20-inch " " 125 00.....	500 00	
6 30-inch " " 225 00.....	1,350 00	
	<u>\$3,000 00</u>	

8 4-inch O. S. stop screws, at \$1 50.....	\$12 00	
4 6-inch " " 2 50.....	10 00	
2 10-inch " " 4 50.....	9 00	
2 12-inch " " 5 00.....	10 00	
20 16-inch " " 6 50.....	130 00	
11 20-inch " " 8 25.....	90 75	
3 30-inch " " 10 25.....	30 75	
	<u>292 50</u>	

7 4-inch N. S. square-top stop screws, at \$2 25.....	\$15 75	
17 6-inch " " 2 50.....	42 50	
3 10-inch " " 4 50.....	13 50	
7 12-inch " " 5 00.....	35 00	

Combined Diagram
Showing
Expansion through the High and Low Pressure Cylinders
Engine No 6 Spring Garden
Poppet Valve - Adjustable Cut-Off

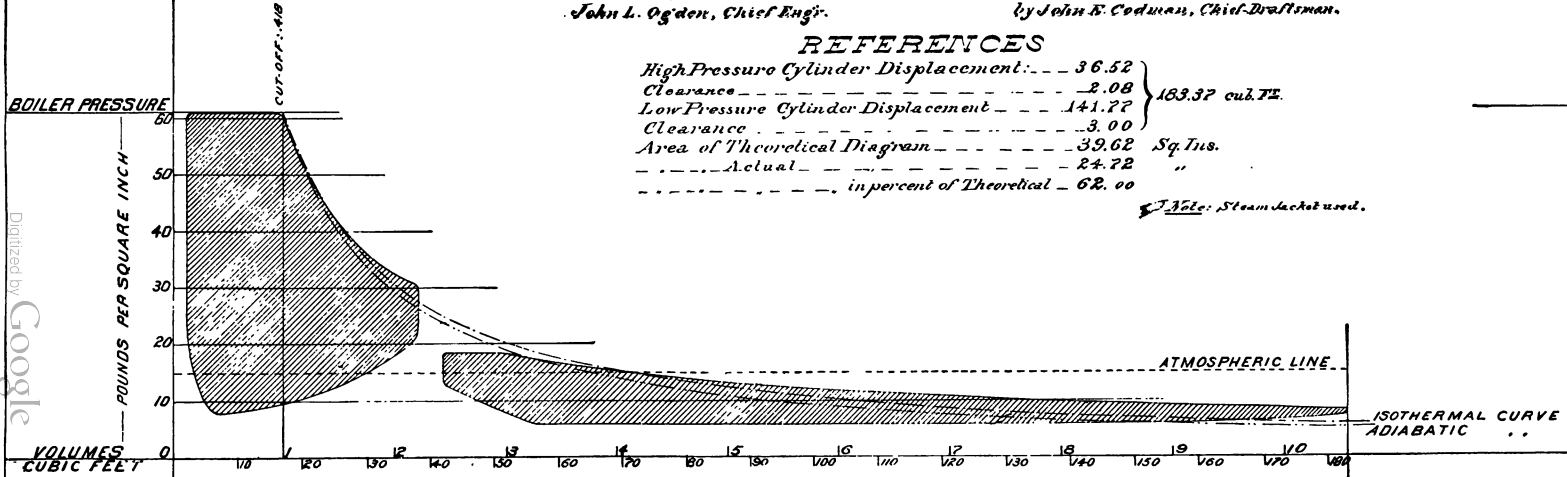
Dept of Public Works,
 Water Bureau,
 John L. Ogden, Chief Engr.

Indicator Card
 Taken Oct. 15th 1878
 by John B. Codman, Chief Draftsman.

REFERENCES

High Pressure Cylinder Displacement	--- 36.52	} 183.37 cu. ft.
Clearance	--- 2.08	
Low Pressure Cylinder Displacement	--- 141.77	} 183.37 cu. ft.
Clearance	--- 3.00	
Area of Theoretical Diagram	--- 39.62	Sq. Ins.
Actual	--- 24.72	"
-----	in percent of Theoretical	62.00

J. 366: Steam Jacket used.



A. M. D. 2.

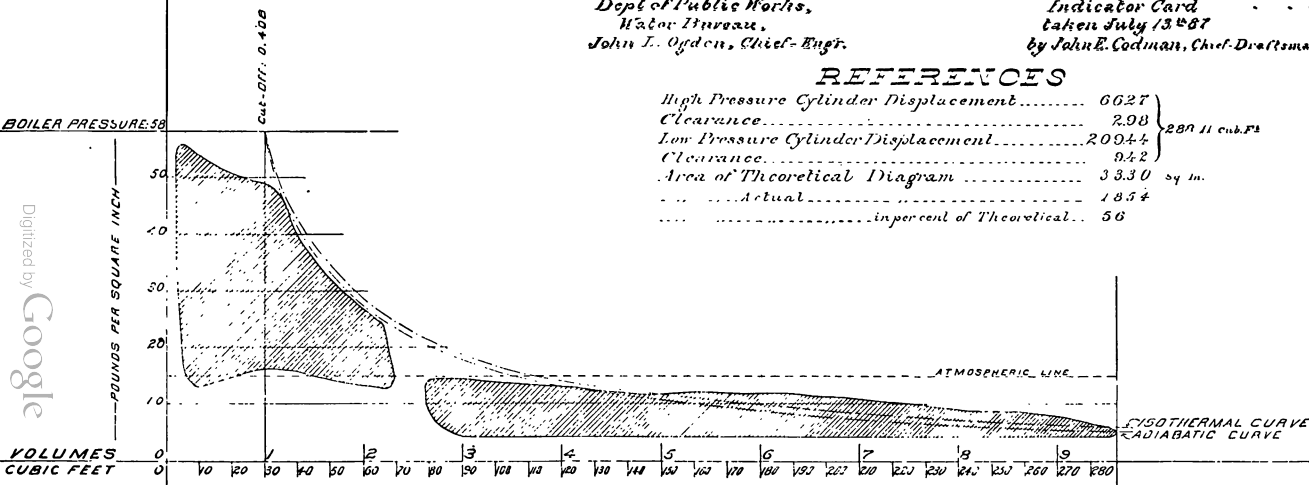
Combined Diagram
Showing
Expansion through the High and Low Pressure Cylinders
Engine N^o 7, Spring Garden
(Slide Valve - Link Cut-off)

Dept of Public Works,
 Water Bureau,
 John T. Ogden, Chief-Eng'r.

Indicator Card
 taken July 13th 1887
 by John E. Godman, Chief-Draftsman.

REFERENCES

High Pressure Cylinder Displacement.....	0627	} 280 11 cub. ft.
Clearance.....	2.98	
Low Pressure Cylinder Displacement.....	2094.4	}
Clearance.....	9.42	
Area of Theoretical Diagram.....	333.0 sq. in.	
..... Actual.....	185.4	
..... in percent of Theoretical.....	56	



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Combined Diagram

Showing

Expansion through the High and Low Pressure Cylinders

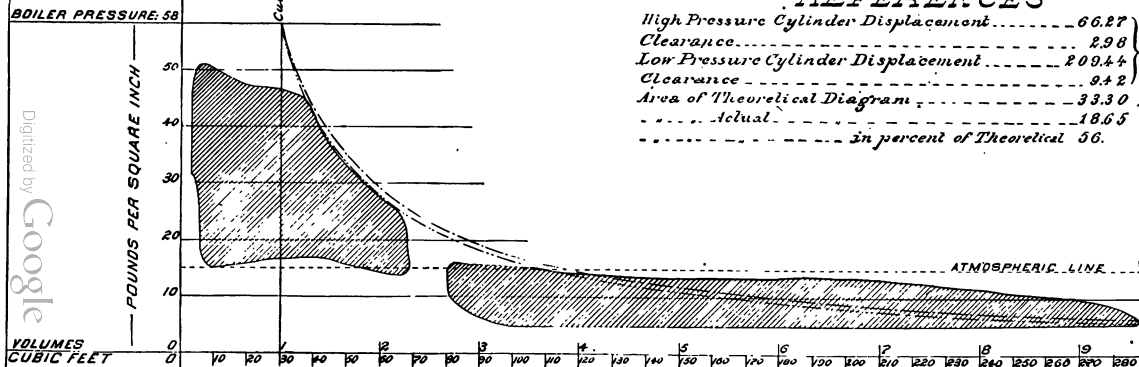
Engine N^o 7, Spring Garden.
(Slide Valve - Link Cut-Off)

*Dept of Public Works,
 Water Bureau
 John E. Ogden, Chief-Engr.*

*Indicator Card
 taken July 13th 87
 by John E. Codman, Chief-Draftsman.*

REFERENCES

<i>High Pressure Cylinder Displacement</i>	66.27	} 288.11 cub. feet
<i>Clearance</i>	2.98	
<i>Low Pressure Cylinder Displacement</i>	209.44	}
<i>Clearance</i>	9.42	
<i>Area of Theoretical Diagram</i>	333.0	Sq. Ins.
<i>Actual</i>	186.5	
.....	in percent of Theoretical 56.	



Note: Steam from Boiler admitted into Receiver.

Combined Diagram Showing Expansion through the High and Low Pressure Cylinders

*Engine N^o 10, Spring Garden,
(Pat. Off. Patented Feb. 14-88)*

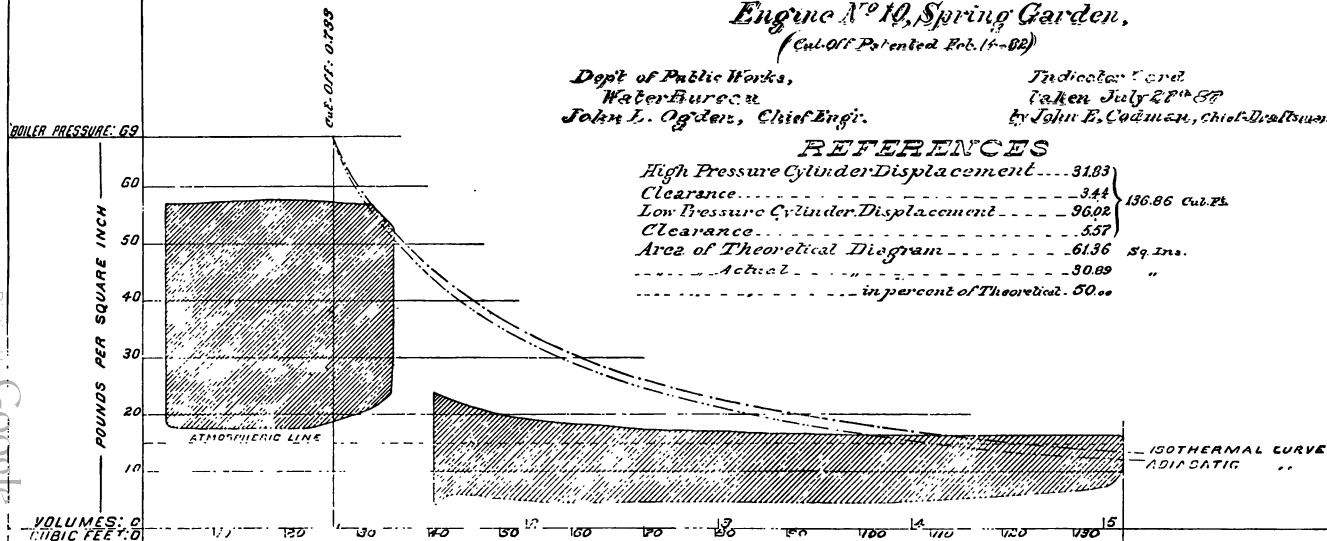
*Dept of Public Works,
Water Bureau
John L. Ogden, Chief Eng'r.*

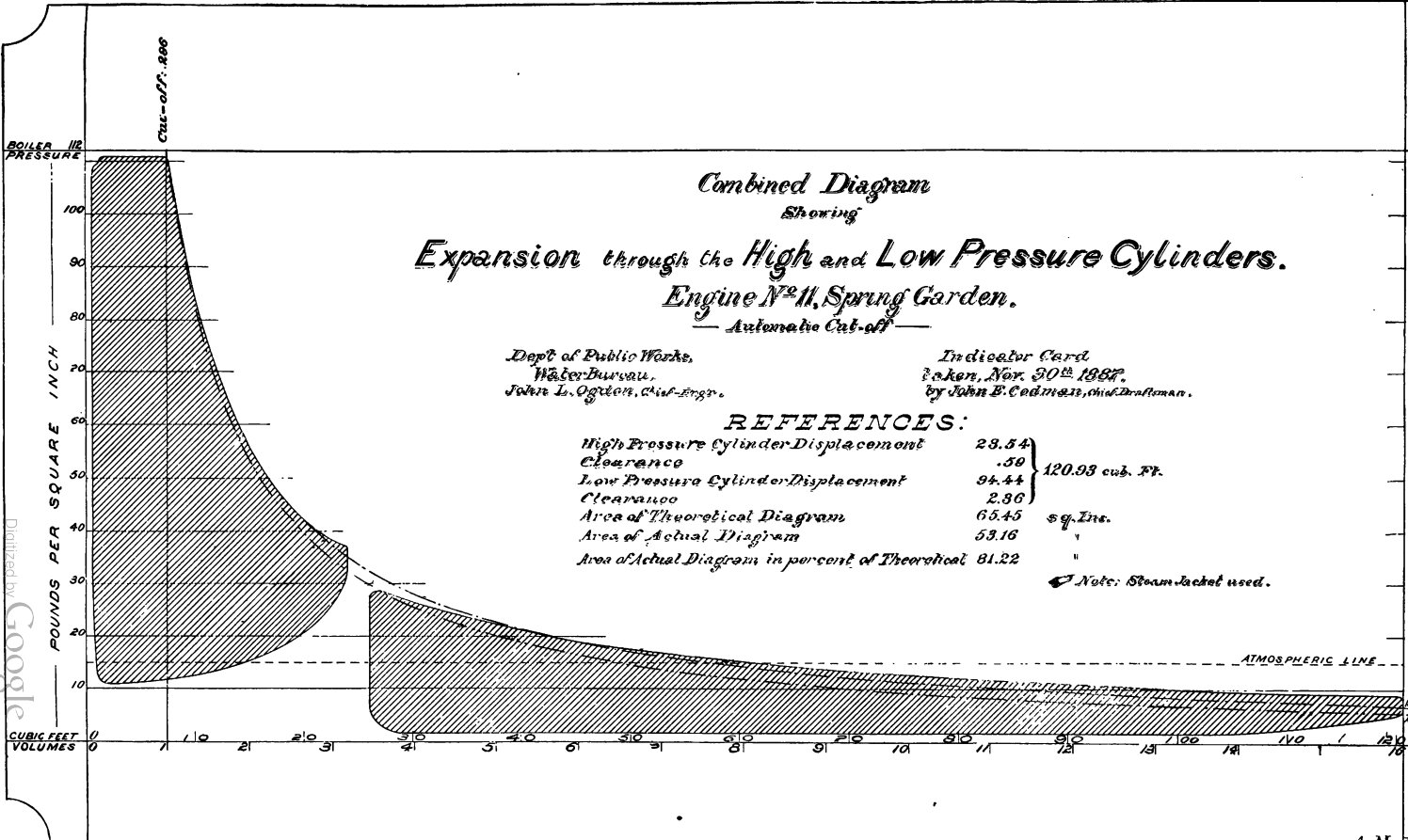
*Indicator Card
Taken July 27th 88
by John E. Codman, Chief Draftsman*

REFERENCES

<i>High Pressure Cylinder Displacement</i>	<i>3183</i>	}	<i>136.86</i> <i>Cu. Ft.</i>
<i>Clearance</i>	<i>344</i>		
<i>Low Pressure Cylinder Displacement</i>	<i>96.02</i>	}	<i>61.36</i> <i>Sq. Ins.</i>
<i>Clearance</i>	<i>557</i>		
<i>Area of Theoretical Diagram</i>	<i>61.36</i>		
<i>Actual</i>	<i>30.89</i>		

<i>in percent of Theoretical</i>		<i>50.00</i>	





Combined Diagram
Showing
Expansion through the High and Low Pressure Cylinders.

Engine N^o 11, Spring Garden.

Automatic Cut-off

*Dept of Public Works,
 Water Bureau,
 John L. Ogden, Chief Engr.*

*Indicator Card
 Taken, Nov. 30th 1887.
 by John B. Codman, Chief Draftsman.*

REFERENCES:

<i>High Pressure Cylinder Displacement</i>	<i>28.54</i>	} <i>120.93</i> cub. Ft.
<i>Clearance</i>	<i>.50</i>	
<i>Low Pressure Cylinder Displacement</i>	<i>94.44</i>	} <i>sq. Ins.</i>
<i>Clearance</i>	<i>2.86</i>	
<i>Area of Theoretical Diagram</i>	<i>65.45</i>	} "
<i>Area of Actual Diagram</i>	<i>53.16</i>	
<i>Area of Actual Diagram in percent of Theoretical</i>	<i>81.22</i>	

Note: Steam-jacket used.

ATMOSPHERIC LINE

*ISOTHERMAL CURVE
 ADIABATIC "*

Combined Diagram
Showing
Expansion through the High and Low Pressure Cylinders

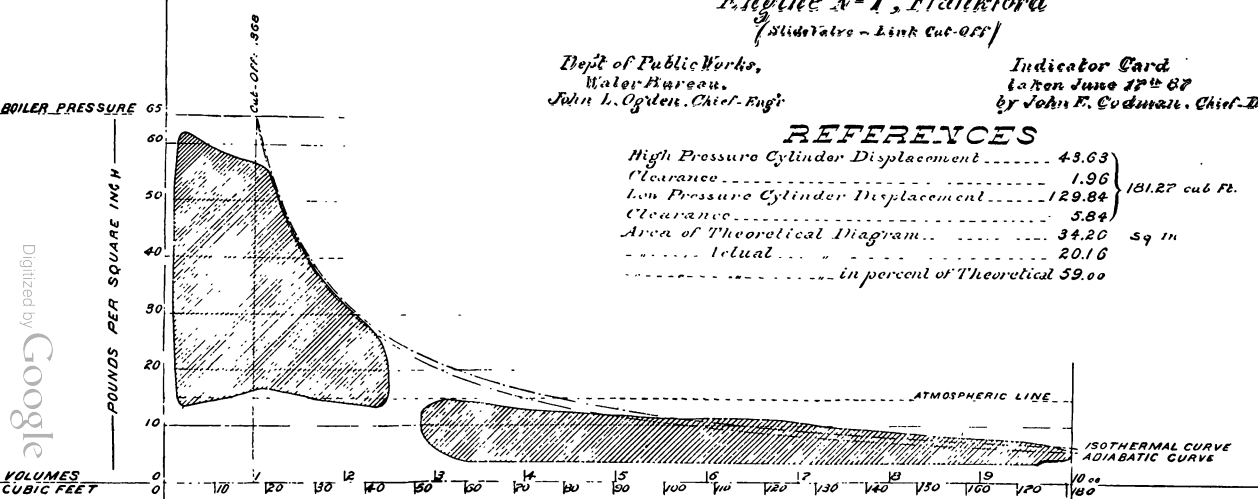
Engine N^o 1, Frankford
(Slide Valve - Link cut-off)

*Dept of Public Works,
 Water Bureau,
 John L. Ogden, Chief Eng'r*

*Indicator Card
 taken June 27th 07
 by John F. Cudman, Chief Draftsman*

REFERENCES

<i>High Pressure Cylinder Displacement</i>	43.63	}	181.27 cub ft.
<i>Clearance</i>	1.96		
<i>Low Pressure Cylinder Displacement</i>	129.84	}	59 in
<i>Clearance</i>	5.84		
<i>Area of Theoretical Diagram</i>	34.20		
<i>Actual</i>	20.16		
..... in percent of Theoretical			59.00



J. M. P. C.

BOILER PRESSURE 115

Exp. exp. 0.7601

Combined Diagram Showing Expansion through the High and Low Pressure Cylinders

Engine No. 2, Frankford.
(Curtiss Cut-off)

Dept. of Public Works,
Water Bureau,
John L. Ogden, Chief-Eng'r

Indicator Card
taken July 7th 87
by John E. Codman, Chief-Craftsman

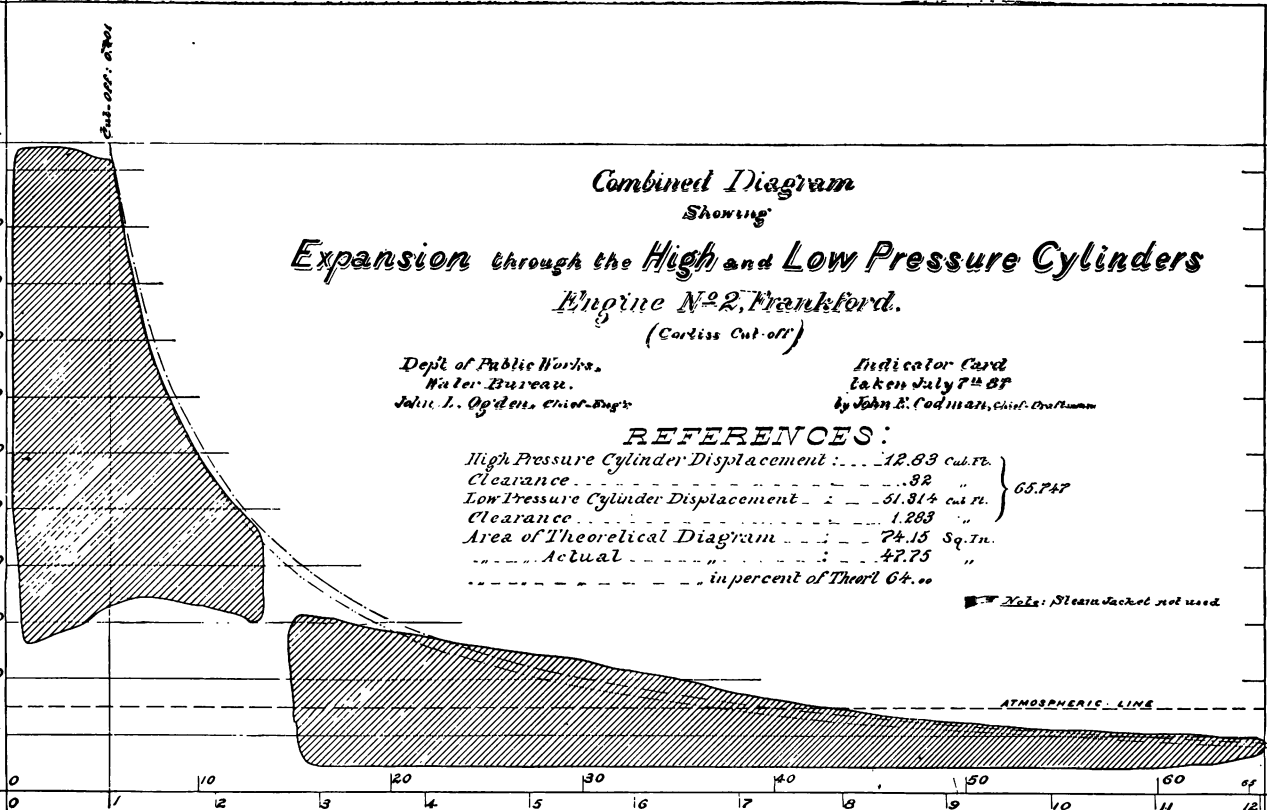
REFERENCES:

High Pressure Cylinder Displacement	12.83	cu. ft.	} 65.747
Clearance	.82	"	
Low Pressure Cylinder Displacement	51.814	cu. ft.	}
Clearance	1.283	"	
Area of Theoretical Diagram	74.15	Sq. In.	
Actual	47.75	"	
	in percent of Theorl		64.00

⊠ No. 2: Steam Jacket not used

POUNDS PER SQUARE INCH

CUBIC FEET
VOLUMES



ATMOSPHERIC LINE

ISOTHERMAL CURVE
ADIABATIC CURVE

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BOILER PRESSURE

Cut-off .888

POUNDS PER SQUARE INCH

105
95
85
75
65
55
45
35
25
15
10
5

Combined Diagram
 Showing
Expansion through the High and Low Pressure Cylinders
Engine No. 2, Frankford.
 (Carliss Cut-off)

Dept. of Public Works,
Water Bureau,
John E. Ogden, Chief-Engr.

Indicator Card
taken May 17th 1886
by John E. Coburn, Chief-Engineer.

REFERENCES

High Pressure Cylinder Displacement	12.83	cu. ft.	} 65.747
Clearance	.32	"	
Low Pressure Cylinder Displacement	51.314	"	}
Clearance	1.283	"	
Area of Theoretical Diagram	50.00	Sq. Ins.	
" Actual	34.01	"	
" " " "	in percent of Theorl 68.00		

✓ *Note: Steam Jacket used.*

ATMOSPHERIC LINE

ISOTHERMAL CURVE
ADIABATIC CURVE

CUBIC FEET
VOLUMES

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

A. J. De.

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BOILER PRESSURE 117

cut-off, abs

Combined Diagram
 Showing
Expansion through the High and Low Pressure Cylinders
Engine N^o 2, Frankford.
 (Corliss Cut-Off)

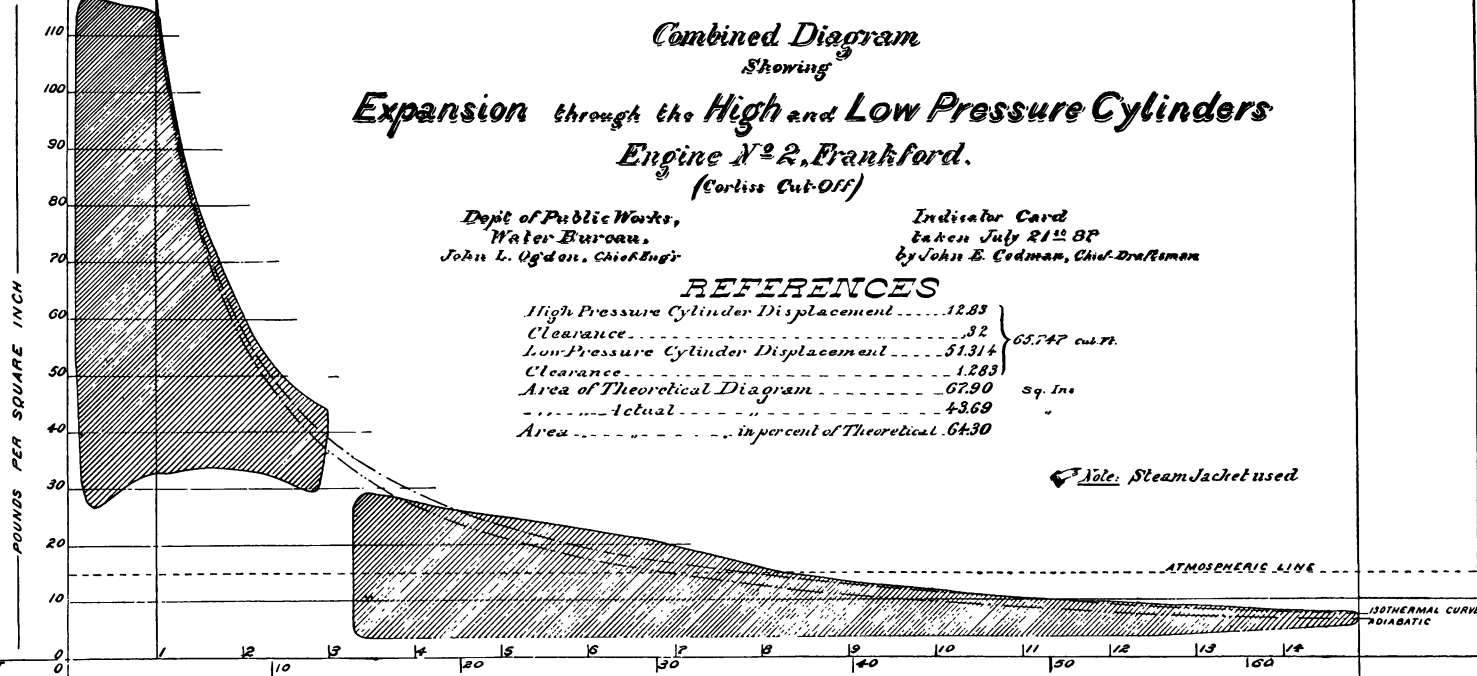
*Dept of Public Works,
 Water Bureau,
 John L. Ogdon, Chief Engr*

*Indicator Card
 taken July 21st 88
 by John E. Codman, Chief Draftsman*

REFERENCES

<i>High Pressure Cylinder Displacement</i>	12.83	} 65.747 cu ft.
<i>Clearance</i>.....	.32	
<i>Low Pressure Cylinder Displacement</i>	51.314	} 65.747 cu ft.
<i>Clearance</i>	1.283	
<i>Area of Theoretical Diagram</i>	67.90	Sq. Ins
<i>Actual</i>	43.69	
<i>Area</i>	<i>in percent of Theoretical. 64.30</i>	

Note: Steam Jacket used

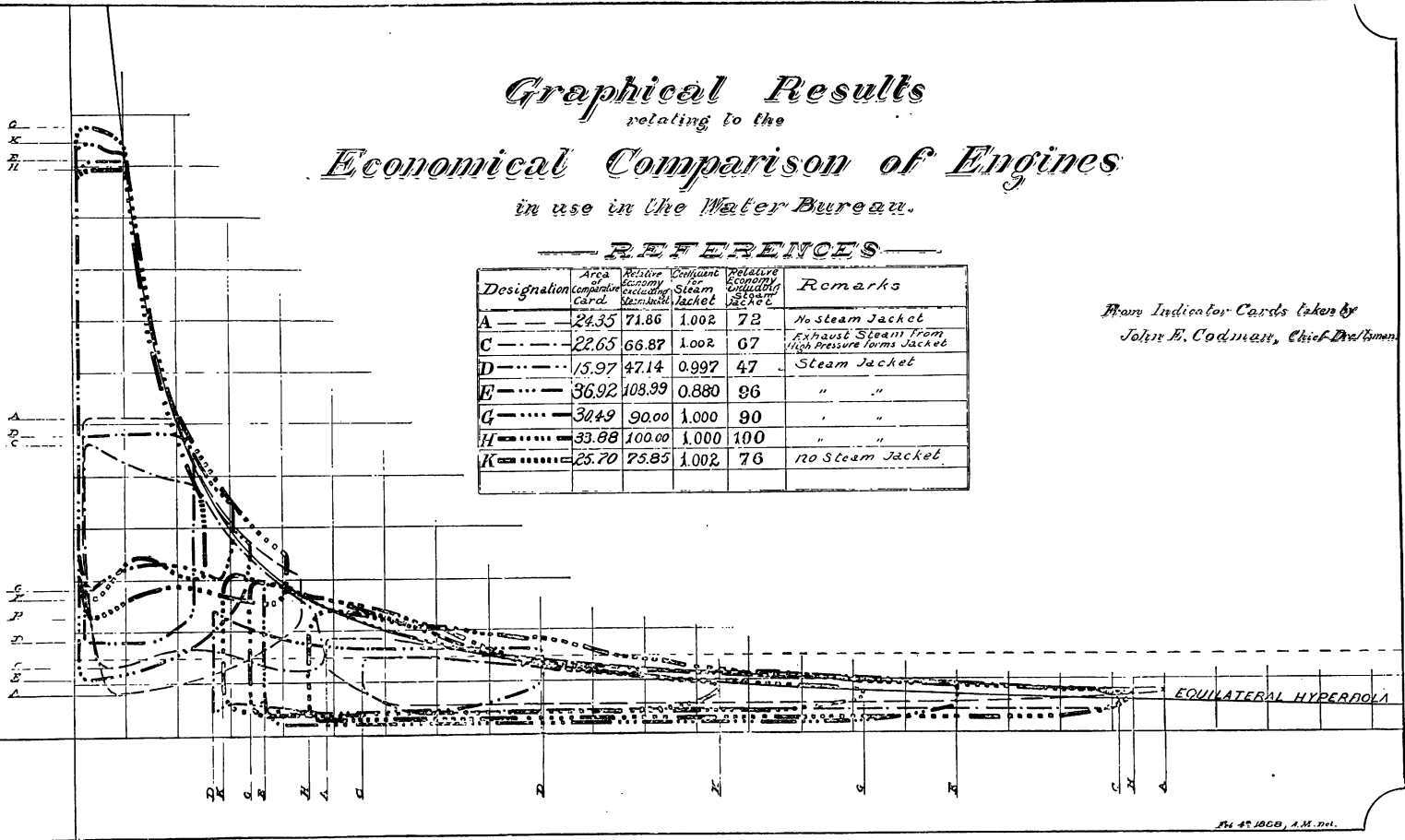


Graphical Results
relating to the
Economical Comparison of Engines
in use in the Water Bureau.

— REFERENCE —

Designation	Area of Comparative Card	Relative Economy excluding Jacket	Coefficient for Steam Jacket	Relative Economy including Jacket	Remarks
A	24.35	71.86	1.002	72	No steam Jacket
C	22.65	66.87	1.002	67	Exhaust Steam from High Pressure forms Jacket
D	15.97	47.14	0.997	47	Steam Jacket
E	36.92	108.99	0.880	96	" "
G	30.49	90.00	1.000	90	" "
H	33.88	100.00	1.000	100	" "
K	25.70	75.85	1.002	76	No Steam Jacket

*From Indicator Cards taken by
John E. Codman, Chief Draftsman*



4	16-inch N. S. square-top stop screws, at \$6 50.....	26 00	
2	20-inch " " " " 8 25.....	16 50	
4	30-inch " " " " 10 25.....	41 00	
2	36-inch " " " " 22 00.....	44 00	
10	Barton stop screws and bonnets " 8 00.....	80 00	
			314 25
30	3-inch socket screws, at \$1 50.....	\$45 00	
7	6-inch " " " 1 75.....	12 25	
27	8-inch " " " 2 00.....	54 00	
21	10-inch " " " 2 25.....	47 25	
23	12-inch " " " 2 50.....	57 50	
			\$216 00
14	4-inch spindles, at \$1 50.....	\$21 00	
18	6-inch " " " 1 75.....	31 50	
3	8-inch " " " 2 00.....	6 00	
5	10-inch " " " 2 25.....	11 25	
5	12-inch " " " 2 50.....	12 50	
			82 25
10	4-inch iron bands, at \$2 15.....	\$21 50	
31	6-inch " " " 2 90.....	89 90	
2	10-inch " " " 5 00.....	10 00	
5	12-inch " " " 7 50.....	37 50	
22	16-inch " " " 10 00.....	220 00	
18	20-inch " " " 10 50.....	189 00	
6	48-inch " " " 20 00.....	120 00	
			687 90
26	pair stop monkey legs, c. i., at \$1 50.....	\$39 00	
16	pair stop monkey legs, w. i., at 3 25.....	52 00	
10	cross heads and nuts, at \$2 50.....	25 00	
269	wood plugs, at 50 cts.....	134 50	
			250 50
11	No. 1 fire hydrants, at \$26 00.....	\$286 00	
21	No. 2 fire hydrants, at 33 00.....	693 00	
1	No. 3 fire hydrants, at 34 25.....	34 25	
46	4-inch O. S. plug nuts, at 25 cts.....	11 50	
17	6-inch valve rods, at \$1 75.....	29 75	
105	4-inch gum valves, at \$2 25.....	236 25	
114	6-inch gum valves, at 5 00.....	570 00	
175	lbs. gum joint rings, at 44 cts.....	77 00	
22	lbs. $\frac{3}{8}$ -inch sheet gum, at 44 cts.....	9 68	
			1,947 43

7	hydrant keys, at \$2 25.....	\$15 75	
7	hand caulking tools, at 50 cts.....	3 50	
7	handle caulking tools, at \$1 15.....	8 05	
11	handle gouge chisels, at 60 cts.....	6 60	
26	hand gouge chisels, at 50 cts.....	13 00	
41	flat chisels, at 35 cts.....	14 35	
8	cape chisels, at 35 cts.....	2 80	
100	hand diamond point chisels, at 35 cts.....	35 00	
17	handle diamond point chisels, at 90 cts.....	15 30	
13	pipe cutters, at 90 cts.....	11 70	
12	stub end straps, at \$8 00.....	96 00	
181	brass ferrule plugs, at 50 cts.....	90 50	
12	street keys, at \$5 25.....	63 00	
12	pair hook bolts, at 30 cts.....	3 60	
9	Large lead pots, at \$4 00.....	36 00	
		<hr/>	415 15
4	small lead pots, at \$1.35.....	5 40	
40	flushing nozzles, at \$1.70.....	68 00	
3	brass reducing caps, at \$2.25.....	6 75	
3	brass pressure caps, at \$1.75.....	5 25	
5½	doz. clevises, at 75 cts. per doz.....	3 94	
9	doz. stop and plug monkey keys, at 25 cts. per doz.....	2 25	
100	lbs. Babbitt metal, at 20 cts.....	20 00	
16	doz. S. hooks, at 75 cts. per doz.....	12 00	
9	gasket irons, at 60 cts.....	5 40	
13	caulking hammers, at \$1.00.....	13 00	
3	screw jacks, at \$9.00.....	27 00	
30	plug monkeys complete, at \$3.25.....	90 75	
6	crowheads and nuts, at \$4.50.....	27 00	
2	D. E. plug wrench, at \$1.75.....	3 50	
1	T. E. plug wrench, at \$2.25.....	2 25	
2	plug cap wrench, at \$2.00.....	4 00	
6	lead skimmers, at \$3.00.....	18 00	
25	tail clamps, at 37½.....	9 37	
20	eye bolts, at 37½.....	7 50	
		<hr/>	323 36
36	6-inch stop boxes (wood), at \$2 50.....	\$90 00	
10	12-inch stop boxes (wood), at \$2.50.....	25 00	
16	stop boxes, risers (wood), at 35 cts.....	5 60	
		<hr/>	120 60
	Finished parts stop cocks.....	\$77 00	
		<hr/>	77 00

Finished parts fire hydrants.....	\$60 80	
" " 30-inch rotary valves.....	562 44	
" " 3 screw jacks.....	44 67	
		<hr/> 667 91
Bolts and nuts.....	\$661 17	
13,704 feet lumber.....	175 72	
1,420 lbs. wrought-iron forging, at 10 cts.....	142 00	
15,916 lbs. " " bar at .02½ cts.....	397 90	
2,210 lbs. steel	286 88	
3,000 lbs. finished brass castings, at 20 cts.....	600 00	
3,650 lbs. unfinished brass castings, at 13 cts.....	474 50	
Hardware.....	122 93	
19,401 lbs. iron castings, at .03½ cts.....	679 03	
Pains, brushes, etc.....	2 96	
Oil and tallow	6 15	
Chandlery.....	7 17	
Brass fittings.....	14 00	
		<hr/> 3,570 41
		<hr/> <hr/> \$11,973 26

PURCHASED ARTICLES SUPPLIED TO THE PURVEYORS'
DISTRICTS, WORKS, ETC.

52 gallons headlight oil, at 11 cts.....	\$5 72
148 gum joint rings, at 45 cts.....	66 60
20 6-inch gum valves, at \$5 00.....	100 00
10 4-inch gum valves, at \$2 25.....	22 50
444 dozen bolts and nuts, at 60 cts.....	266 40
69 dozen rivets, at 6 cts.....	4 14
45 files, at 30 cts.....	13 50
422 gland bolts, at 10 cts.....	42 20
255 lbs. wrought iron, at 3 cts.....	7 65
300 feet lumber, at 3 cts.....	9 00
3½ dozen sledge handles, at 85 cts	2 77
12 dozen valve rod burrs, at 25 cts.....	3 00
	<hr/> \$543 48

Stop-cocks, Frames, and Covers, Fire Hydrants, etc., delivered from Department Construction and Repair Shop, during 1887, to Purveyors' Districts, Works, etc.

DISTRICTS.	STOP COCKS.								STOP SCREWS.						STOP.		
	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	36-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	36-inch.	Boxes.	Risers.
First.....	6	66			6							1				60	49
Second.....	*17	62	21	4	3	2	1		2			2	2			139	122
Third.....	16	95		7			1	4								115	
Fourth.....	6	120		14	5		1	1	3	1	1	1	1	3	1	123	
Fifth.....	8	34															
Sixth.....		33														13	72
Totals.....	53	410	21	25	14	2	3	5	5	1	1	4	3	3	1	450	243

* 8 delivered to Blockley Almshouse.

Stop-cocks, Frames, and Covers, etc.—*Continued.*

DISTRICTS.	IRON BANDS.						SOCKET SCREWS.				STOP.						
	4-inch.	6-inch.	8-inch.	10-inch.	20-inch.	30-inch.	4-inch.	6-inch.	10-inch.	12-inch.	Monkey Legs, C. I.	Monkey Legs, W. I.	Cross Heads and Nuts.	Nuts.	Spindles.	Spindle Keys.	Barton Bonnet and Stop Screw.
First.....		11	1								3						
Second.....	6	32			1		13	18		3	13	22	33	12	42	24	11
Third.....	6	54					24	20	6	1	18	12	9	23	58		
Fourth.....		12		6		58	20	18	6		20	12	19	36	1		3
Fifth.....		6															
Sixth.....		24															
Totals.....	12	139	1	6	1	58	57	56	12	4	54	46	61	71	101	24	14

List of Articles delivered to the Purveyors' Districts, Works,
etc.—*Continued.*

DISTRICTS.	FIRE HYDRANTS.				KEYS.		Wrenches.	Plug Valve Rods.	Plug Frost Rods.	S Hooks.	Clevises.	Plug & Stop Monkey Keys.	Plug Monkeys.	Gasket Irons.	Caulking Tools.	Crow Bars.
	1-Way.	2-Way.	3-Way.	Old Style.	Hydrant.	Street.										
First.....	17	59	40	.....	4	.....	1	.....	.....	252	106	46	.....	.....	4	.....
Second.....	21	41	31	.....	.....	.....	7	5	6	252	132	216	.....	6	.....	.....
Third.....	46	53	68	.....	2	.....	4	.....	.....	396	122	84	.....	7	4	.....
Fourth.....	19	63	70	.....	.....	.....	2	.....	5	288	72	98	2	3	12	1
Fifth.....	5	23	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sixth.....	26	5	2	.....	.....	.....	1	1	1	.....	.....	24	.....	6	6	.....
Distribution.....	1	.....	.....	2	.....	.....	36	.....	.....	.....	.....	.....	.....	.....	.....	.....
Works.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	4
Totals.....	135	244	214	2	6	1	52	6	12	1,188	432	468	2	22	26	5

List of Articles delivered to the Purveyors' Districts, Works,
etc.—*Continued.*

DISTRICTS.	CHISELS.					Plug Braces.	Hammers.	Frames and Covers.	Brass Ferrule Plugs.	Wood Plugs.	Lead Pots.	Hook Bolts.	Reducing Caps.	Pressure Caps.	Wedges.	Fish Traps.	Furnace Crates.	Screw Jacks.
	Diamond Points.	Flat.	Cape.	Cutter.	Gouge.													
First.....	.....	12	.....	.....	.....	1	105	108	96	1	4	.....	.....	23	.....	1	2
Second.....	60	.....	12	.....	.....	1	111	238	174	2	.....	2	.....	39	.....	.....	4
Third.....	12	.....	.....	.....	.....	1	100	72	90	2	23	1	.....	36	.....	.....	2
Fourth.....	72	.....	.....	36	.....	1	160	156	150	18	10	.....	.....	.....	.....	8	4
Fifth.....	.....	.....	.....	6	.....	1	.....	.....	24	.....	.....	2	.....	.....	.....	.....	.....
Sixth.....	.....	.....	.....	.....	.....	1	7	25	30	48	.....	1	.....	6	.....	.....	.....
Works.....	24	5	3	3	.....	13	.....	.....	.....	.....	.....	2	4	232	.....	.....	.....
Meters.....	.....	.....	.....	.....	.....	.....	25	.....	.....	.....	.....	.....	2	.....	35	.....	.....
Totals.....	72	108	5	57	3	6	20	466	604	582	23	37	8	6	336	35	9	12

ARTICLES MANUFACTURED DURING 1887.

49	4-inch stop cocks, at \$22 00.....	\$1,078 00	
405	6-inch " " 25 00.....	10,125 00	
33	8-inch " " 30 00.....	990 00	
21	10-inch " " 45 00.....	945 00	
20	12-inch " " 50 00.....	1,000 00	
7	20-inch " " 125 00.....	875 00	
11	30-inch " " 225 00.....	2,475 00	
3	36-inch " " 450 00.....	1,350 00	
		<hr/>	\$18,838 00
28	4-inch socket screws, at \$1 50.....	\$42 00	
38	6-inch " " 1 75.....	66 50	
16	8-inch " " 2 00.....	32 00	
33	10-inch " " 2 25.....	74 25	
5	12-inch " " 2 50.....	12 50	
		<hr/>	227 25
7	4-inch spindles, at \$1 50.....	\$10 50	
9	6-inch " " 1 75.....	15 75	
2	10-inch " " 2 00.....	4 00	
7	12-inch " " 2 50.....	17 50	
12	16-inch " " 3 00.....	36 00	
		<hr/>	83 75
19	4-inch bands (iron), at \$2 15.....	\$40 85	
165	6-inch " " " 2 90.....	478 50	
		<hr/>	519 35
1	8-inch iron band, at \$4 00.....	\$4 00	
8	10-inch " " 5 00.....	40 00	
2	12-inch " " 7 50.....	15 00	
17	16-inch " " 10 00.....	170 00	
19	20-inch " " 10 50.....	199 50	
6	48-inch " " 20 00.....	120 00	
		<hr/>	548 50
16	Barton stop screws and bonnets, at \$8 00.....	\$128 00	
		<hr/>	128 00
21	pair stop monkey legs, C. L., at \$1.50.....	\$31 50	
43	" " " W. L., at \$3.75.....	139 75	
65	cross-heads and nuts, at \$2.50.....	162 50	
640	wood plugs, at 50 cents.....	320 00	
568	brass plugs, at 50 cents.....	284 00	
466	frames and covers, 84,963 pounds, at 3 cents.....	2,548 89	
		<hr/>	3,486 64

4 16-inch N. S. square top stop screws, at \$6 50...	\$26 00	
3 20-inch " " " " 8 25...	24 75	
3 30-inch " " " " 10 25...	30 75	
1 36-inch " " " " 22 00...	22 00	
	<hr/>	103 50
6 large lead pots, at \$4 00.....	\$24 00	
7 small " " 1 35.....	9 45	
	<hr/>	33 45
143 No. 1 fire-hydrants, at \$26 00.....	\$3,692 00	
	<hr/>	3,692 00
250 No. 2 fire hydrants, at \$33 00.....	\$8,250 00	
215 No. 3 " " 34 25.....	7,363 75	
	<hr/>	15,613 75
115 dozen S. hooks, at 75 cents.....	\$86 25	
38 dozen clevises, at 75 cents.....	28 50	
21 dozen plug monkey keys, at 75 cents.....	15 75	
1½ dozen plug risers.....	25 50	
14 plug valve rods, at \$1.50.....	21 00	
39 pair hook bolts, at 30 cents.....	11 70	
32 plug monkeys, at \$3.25.....	104 00	
35 fish traps, at \$5.25.....	183 75	
6 brass reducing caps, at \$2.25.....	13 50	
6 brass pressure caps, at \$1.75.....	10 50	
5 crowbars, at \$1.15.....	5 75	
29 hand caulking tools, at 50 cents.....	14 50	
7 handle caulking tools, at \$1.15.....	8 05	
31 gasket irons, at 60 cents.....	18 60	
40 flat chisels, at 35 cents.....	14 00	
11 cape chisels, at 35 cents.....	3 85	
100 hand diamond-point chisels, at 35 cents.....	35 00	
89 handle " " at 90 cents.....	80 10	
47 pipe cutter chisels, at 90 cents.....	42 30	
7 hydrant keys, at \$2.25.....	15 75	
12 street keys, at \$5.25.....	63 00	
9 furnace grates, at \$6.75.....	60 75	
	<hr/>	862 10
33 caulking hammers, at \$1 00.....	33 00	
336 wedges, at 50 cts.....	168 00	
3 screw jacks, at \$9 00.....	27 00	
6 crow head screws, at \$4 50.....	27 00	
6 D. E. plug wrenches, at \$1 75.....	28 00	
36 T. E. plug wrenches, at \$2 25.....	81 00	
2 plug cap wrenches, at \$2 00.....	4 00	
6 lead skimmers, at \$3 00.....	18 00	
	<hr/>	386 00

486	6-inch stop boxes (wood), at \$2 50.....	1,215 00
10	12-inch " " " " 2 50.....	25 00
243	stop box risers (wood), at 35 cts.....	85 05
71	stop nuts, at 50 cents.....	35 50
2	doz. spindle keys, at 75 cts.....	1 50
6	plug braces, at \$6 75.....	40 50
		<hr/>
		1,402 55
		<hr/>
		\$45,924 84
		<hr/> <hr/>

APPENDIX F

REPORT OF JOHN E. CODMAN, CHIEF DRAUGHTSMAN.

BUREAU OF WATER,

January 20, 1888.

JOHN L. OGDEN,
Chief Engineer.

SIR:—The following report of work under my charge during the year 1887 is respectfully submitted:

Work in the draughting department can be classified as follows: Five drawings of designs not yet adopted, 46 drawings of new work, 1 drawing of repairs to machinery, 48 drawings of reports, maps, etc., 1 daily pumpage chart, 3 streamflow charts, and about 200 calculations of boiler and engine horse power forms for the Registrar's office.

Fourteen sheets of working drawings, standard size (B. sheet) on tracing vellum, have been received from the Holly Manufacturing Company, showing the engine erected by them, complete, and the various parts in detail.

A number of blue prints, showing locations of railroad tracks, electrical conduits, sewers, etc., have been received from various sources and placed on file.

Indicator cards have been taken during the year from the different types of engines in use in the Bureau of Water, and from the data obtained comparisons have been made of the relative economy, in steam and fuel, of each type. For these comparisons the indicator cards were accurately enlarged by scale.

The clearance and total displacement of steam cylinders were computed from drawings on file and from measurements obtained from the engines.

Reference is made to the diagrams of each engine accompanying this report, and designated by the number of engine as known at the several stations. The steam cut-off arrangement is also given and described by its proper name. The points of cut-off, release, compression and admission of steam are all indicated upon card. The volumes of steam are calculated and shown by scale in cubic feet. The vertical scale of 10 pounds per square inch is used on all the diagrams. The diagrams are placed to show the succession of work from the high pressure to the low pressure cylinders. By this arrangement the actual expansion of the steam was shown with the loss in the receiver, or steam passages between the high and low pressure cylinders; also the loss from the back pressure in both cylinders. The isothermal curve varies inversely to the volumes, and the adiabatic curve inversely to the

$\frac{1}{1.4} \sqrt{\text{volume}}$.

The theoretical diagram is contained between the isothermal curve and the asymptotes of pressure and volume. The area of the actual card is given in per cent of the theoretical, and may be considered as the relative work performed by each type of engine.

The data and the observed and calculated results are all given in the table of "Economical Comparison of Different Types of Engines in use in the Water Bureau." Columns 1, 2, 3, 4, 5, 6, and 7 give the locations, description, and other data required to understand the construction of the engines; columns 8, 9, and 10 show the indicated horse power; column 11 shows the indicated work at the time the card was taken in per cent of the work for which the engine was designed; column 12, the area of the actual diagram in per cent of the theoretical, or the actual work obtained from the expansion of the steam in both cylinders in per cent of the theoretical expansion, as shown by the isothermal curve; column 13, the total displacement of steam pistons in cubic feet, including clearances; columns 14, 15, and 16, the amount of steam consumed per stroke, per hour, and per indicated horse power per hour, respectively; column 17, the amount of combustible consumed per indicated horse power per hour, on a

basis of 10 pounds of steam, equivalent to 1 pound of combustible; column 18, the classification of engines according to economy in combustible.

Your attention is invited particularly to the practical results which a series of observations of this kind could produce in regard to the improvement of the plant, its care and practical operation. The results are, so far, only a small part of the work which can be accomplished and put into practical operation; but sufficient data is shown to prove that portions of the plant will give better results if worked at more than the nominal capacity, and others will do better if worked at less.

In order to improve the boiler plant a series of tests of boiler efficiency were made and reported last year. From the data obtained a boiler was designed to meet the requirements of the Bureau, which boiler, in practical operation, has realized all, and even more work and economy, than was expected.

I received instructions from you to act as the expert for the city on the trial test of the new twenty million gallon Gaskill engine erected during the past summer at Spring Garden Station. The trials for capacity and duty were both made at the same time, beginning at 8 A. M. November 29, and ending at 8 A. M. November 30. The results of the observations have been prepared and presented in a joint report, with Mr. F. W. Holly, expert for the Holly Manufacturing Company.

Respectfully,

JOHN E. CODMAN,
Chief Draughtsman.

Results of the Trials of Furnace-flue Tubular Boilers, at Spring Garden Pumping Station, to Determine Efficiency and Capacity of Gaskill Pumping Engine. Date of Trial, November 29 and 30, 1887. Duration of Trial, twenty-four hours.

DIMENSIONS AND PROPORTIONS.		
Type of boiler furnace-flue, tubular.....		
Number in use.....	No.....	5
Diameter of boiler.....	Feet.....	8 ft. 6 in.
Length of boiler.....	Feet.....	20 ft.
Numbers of furnaces.....	No.....	2
Type of furnaces, Fox's corrugated.....		
Diameter of furnace.....	Feet.....	3 ft. 6 in.
Length of furnace.....	Feet.....	7 ft. 6 in.
Number of tubes in each boiler.....	No.....	90
Diameter of tubes.....	Inches.....	4 in.
Length of tubes.....	Feet.....	10 ft.
Diameter of drum.....		
Length of drum.....		
Heating surface in one boiler.....	Square feet..	1,119.
<i>a</i> Heating surface of furnace (2).....	Square feet..	136.
<i>b</i> Back box.....		
<i>c</i> Combustion chamber.....	Square feet..	47.
<i>d</i> Tubes.....	Square feet..	936.
<i>e</i> Front of boiler.....		
<i>f</i> Side and back.....		
Total heating surface in five boilers.....	Square feet..	5,595.
Total tube cross section area in one boiler.....	Square feet..	8.
Ratio of tube cross section to grate surface.....		1 to 2¼
Height of stack.....	Feet.....	150.
Area of stack at base.....	Square feet..	25.
Grate surface, 3 ft. 6 in. wide; 6 ft. 0 in. long; 42 sq. ft. area..	Square feet..	42.
Water heating surface in five boilers.....	Square feet..	5,595.
Superheating surface in five boilers.....		
Ratio of water heating surface to grate surface.....		262½ to 1

Results of the Trials of two Furnace-flue Tubular Boilers—Continued.

AVERAGE PRESSURES.		
Steam pressure in boiler by gauge.....	Pounds.....	96.53
Absolute steam pressure	Pounds.....	111.58
Atmospheric pressure per barometer.....	Inches	30.655
Force of draught in inches of water.....	Inches	0.625
AVERAGE TEMPERATURES.		
Of external air.....	Degrees	35
Of fire room.....	Degrees	66
Of steam.....	Degrees	335.635
Of escaping gases.....	Degrees	555
Of feed water	Degrees	96.3
FUEL.		
Kind of coal—anthracite pea coal.....		
Total amount of coal consumed.....	Pounds.....	44014.
Moisture in coal.....	Per cent.....	6
Dry coal consumed.....	Pounds.....	41,373.16
Total refuse (dry waste in pounds).....	Pounds.....	10088.
Per cent. of refuse.....	Per cent.....	24.38
Total combustible (dry weight of coal, less refuse).....	Pounds.....	31,285.16
Dry coal consumed per hour.....	Pounds.....	1,723.88
Combustible consumed per hour.....	Pounds.....	1,303.55
RESULTS OF ANEMOMETER READINGS.		
Cubic feet of air per hour.....	Cubic feet.....	413,569.5
Cubic feet of air per hour, per square foot of grate.....	Cubic feet.....	1,969.37
Pounds of air per pound of coal.....	Pounds.....	18.35
Pounds of air per pound of combustible.....	Pounds.....	24.27
RESULTS OF CALORIMETRIC TESTS.		
Quality of steam, dry steam being taken as unity..		.965
Percentage of moisture in steam.....	Per cent.....	3½
No. of degrees superheated.....		
Factor of Evaporation.....		1.16

Results of the Trials of two Furnace-flue Tubular Boilers—*Continued.*

WATER.		
Total weight of water pumped into boiler and apparently evaporated.....	Pounds.....	286,982
Water actually evaporated, corrected for quality of steam and surface water.....	Pounds.....	279,578.47
Equivalent water evaporated into dry steam from and at 212° F.....	Pounds.....	323,888.5
Equivalent total heat derived from fuel in British Thermal Units.....	B. T. U.....	313,154,925.8
Percentage of heat lost by radiation, on a basis of 14500 B. T. U. per pound of combustible.....	Per cent.....	31
Equivalent water evaporated into dry steam from and at 212° F. per hour.....	Pounds.....	13,495.35
ECONOMIC EVAPORATION.		
Water actually evaporated per pound of dry coal from actual pressure and temperature.....	Pounds.....	6.75
Equivalent water evaporated per pound of dry coal from and at 212° F.....	Pounds.....	7.83
Equivalent water evaporated per pound of combustible from and at 212° F.....	Pounds.....	10.353
COMMERCIAL EVAPORATION.		
Equivalent water evaporated per pound of dry coal, with one-sixth refuse, at 70 pounds gauge pressure, from temperature of 100° F.=Item 63 ÷ 0.7249.....	Pounds.....	7.5
RATE OF COMBUSTION.		
Dry coal actually burned per square foot of grate surface per hour.....	Pounds.....	8.21
Consumption of dry coal per hour, coal assumed with one-sixth refuse.	Per square foot of grate surface....	Pounds..... 7.45
	Per square foot of water heating surface.....	Pounds..... 0.279
	Per square foot of least area for draught.....	Pounds..... 62.57
RATE OF EVAPORATION.		
Water evaporated from and at 212° F. per square foot of heating surface per hour.....	Pounds.....	2.41
Water evaporated per hour from temperature of 100° F. into steam of 70 lbs. gauge pressure=Item 60 × 0.8698.....	Per square foot of grate surface.	Pounds..... 55.9
	Per square foot of water heating surface.....	Pounds..... 2.09
	Per square foot of least area for draught.....	Pounds..... 469.53

Results of the Trials of two Furnace-flue Tubular Boilers—*Continued.*

COMMERCIAL HORSE-POWER.		
On a basis of thirty pounds of water per hour evaporated from temperature of 100° F. into steam of 70 pounds gauge pressure (=34½ lbs. from and at 212° F.).....	H. P.....	391
Horse power, builders' rating, at 10 square feet per horse-power for fire surface, 12 square feet on ⅔ surface of flue and drum, and 15 square feet on ⅔ surface of tubes.....	H. P.....	400
Per cent. developed above rating.....		
Per cent. developed below rating.....	Per cent.....	2¼

APPENDIX G.

REPORT OF AMASA ELY, ASSISTANT IN CHARGE OF HYDROGRAPHIC WORK.

BUREAU OF WATER,

January 12, 1888.

JOHN L. OGDEN,

Chief Engineer.

SIR:—The following report of progress during 1887, of the hydrographic work in connection with the investigations of sources for future water supply, is respectfully submitted:

The Perkiomen, Neshaminy and Tohickon creeks have been gauged throughout the entire year, at the gauging stations used during 1886. Rainfall observations have been continued at all stations established by the bureau. An additional station was established January 1, 1887, at Doylestown, Bucks County, in order to obtain a better idea of the average rainfall in the Big Neshaminy watershed. The reports of several volunteer rainfall observers are incomplete, the observations having been omitted a portion of the year. These reports have not been used in compiling Table 1.

During the year three new stream gauges were placed in position, and an additional gauge was put up at Stover's dam, on the Tohickon creek.

In October a new Stierle automatic steam gauge was placed in position upon the Tohickon gauge pier, to take the place of a Stevens' gauge, which had been in use for three years, and was very much out of repair. The change necessitated some slight alterations in the wood work of the pier.

The Stierle gauge gives much more satisfactory results than the Stevens' gauge, and there are several points of comparison in its favor.

In the Stierle gauge, the paper passes but once over the recording roller, and if the clock is regulated properly, a constant rate of motion is obtained, while in the Stevens' gauge, the recording roller is also the receiving roller, and as the paper is wound around it the diameter increases; and for every additional revolution about $\frac{4}{100}$ of an inch more paper is required. As the roller makes but one revolution in twenty-four hours, this would make only a slight difference in two or three days; but in a sheet covering a period of a month, there is considerable difference between the lengths of the first and last 24 hours.

In the Stierle gauge, the wheel carrying the float and the counterbalance weight has three slots cut in the flanges, into which fit small cross bars that are riveted to the float band. The motion from the float wheel to the recording pencil carrier is conveyed by an endless screw, to one end of which the wheel is clamped. The interior of the carrier covers three turns of the screw, and is filled with Babbitt metal. With this construction, no lost motion is observed, any change in the elevation of the water being recorded promptly and accurately, while in the Stevens' gauge, in which a rack and pinion is used, and nothing but the friction of the band over the float wheel depended upon to transmit the motion of the water, considerable lost motion is possible and has frequently been observed. The method of holding the pencils against the recording roller is much better in the Stierle than in the Stevens' gauge. In the latter the pressure applied is obtained from spiral springs, while in the former it is obtained by weight, the necessary amount of which is constantly maintained. Changes in temperature and the exposed position of the gauge necessarily affect the springs used in the Stevens' gauge, and they require frequent adjustment and renewal. A Stevens' gauge is still in use on the Perkiomen creek, and is in good working order, which is due, mainly, to the watchfulness and care of the observer. A Stierle gauge has been in use on the Neshaminy creek since March, 1886, and has always given excellent results.

The rainfall for the year is slightly above the average annual except in the Upper Schuylkill valley, where it is considerably

below the average (see Table 1). The average annual rainfall at the Pennsylvania Hospital, Philadelphia, for 63 years, is 44.51 inches, and the rainfall for 1887, 48.03 inches. The average rainfall at the U. S. Signal Service station, Philadelphia, for 16 years, is 40.35 inches, while the rainfall for the past year is 42.17 inches. At Moorestown, Burlington County, New Jersey, the average rainfall for the past 24 years is found to be 43.39 inches, and the rainfall for the year 1887 is 45.97 inches.

During the summer months a number of short, very heavy showers occurred. Two that were registered by the automatic rain gauge at the Bureau offices at Thirteenth and Spring Garden streets, Philadelphia, are worthy of special mention. The first occurred on July 23, and lasted fifty minutes. In that time 1.856 inches of rain fell, and in a period of thirteen minutes, 0.921 of an inch of rain was recorded as having fallen. This maximum rate is equivalent to a fall of 4.25 inches per hour. The Signal Service station, at Ninth and Chestnut streets, Philadelphia, reports 2.25 inches of rain for this storm, and gives its duration as just one hour.

The second storm occurred three days later, on July 26, and lasted 45 minutes. The amount of rain precipitated during this storm was 1.183 inches, and maximum fall was 0.615 of an inch in 7 minutes, or at the rate of 5.27 inches per hour. This storm is remarkable from the fact that at the Signal Service station, less than a mile distant, only 0.15 of an inch of rain fell.

Although, as previously stated, the rainfall is slightly above the average, the streamflow for the year is somewhat below the average annual. This is due to the following facts: the months of greatest precipitation were June, July and December. The percentage of rain reaching the streams during June and July is considerably below the annual percentage, the former being 20 and the latter 51. (see Table 7). The December precipitation included snow to the depth of 18 inches, and this was not melted and run into the streams until the storm of January 1, 1888.

The minimum daily streamflow occurred later than usual, and was considerably above the previously observed minimum flow.

Table 4 is given below, and shows a comparison of the observed minimum flow with the minimum flow of the year.

TABLE 4.
OBSERVED MINIMUM STREAM FLOW AND MINIMUM STREAM FLOW DURING 1887.

STREAM.	PREVIOUSLY OBSERVED MINIMUM FLOW.	MINIMUM FLOW, 1887.
	Cubic ft. per 24 hours.	Cubic ft. per 24 hours.
Perkiomen, at Frederick.....	653,184	1,931,040
Neshaminy, below Forks.....	108,864	1,101,600
Tohickon.....	17,280	638,496

Although a severe drought is reported in the Upper Schuylkill valley, none has been experienced in the Perkiomen and adjacent watersheds. The streamflow during the months in which the drought occurred, namely: October and November, is not large, but occasional light rains and the effect of the heavy summer storms upon the deep springs, maintained a very steady flow in all the streams.

TABLE 6.
AVERAGE ANNUAL YIELD OF SUNDRY STREAMS.

WATERSHED.	Area in miles.	Rainfall.	Average annual yield in galls.	Average daily yield in galls.	Average yield in cubic ft. per second, per sq. mile of drainage area.
Perkiomen, at Frederick, 4 years...	152.0	46.03	62,709,371,384	171,806,497	1.752
Neshaminy, below Forks, 4 years...	139.3	47.31	54,485,912,208	149,276,472	1.688
Tohickon, 4 years.....	102.2	48.40	51,810,693,993	141,947,107	2.141
Sudbury, Mass., 6 years.....	70.0	46.10	29,606,810,000	81,040,500	1.615
Croton, N. Y., 6 years.....	361.0	46.50	106,600,000,000	440,000,000	1.890

Table 6 contains the average annual rainfall and streamflow in the several watersheds under investigation, compared with

similar data obtained in the Sudbury and Croton watersheds. I have reduced the last column to a common basis of rainfall, and the following quantities represent the yield of the several watersheds in cubic feet per second per square mile of drainage area for each inch of rainfall :

Tohickon.....	0.044
Croton.....	0.041
Perkiomen, at Frederick.....	0.038
Neshaminy, below Forks.....	0.036
Sudbury.....	0.035

These figures may be called the relative "efficiency" of the various watersheds as they represent their relative water-supplying power from a given quantity of rain.

Table 7 contains certain statistics of the several watersheds, including the division of their areas into the principal surface characteristics, and the percentage of rain reaching the streams for each month. These percentages are deduced from observations extending over a period of four years, and, I believe, represent very closely the actual relation between the rainfall and the streamflow in these watersheds.

The Perkiomen watershed having the largest percentage of wooded area, gives the largest percentages of rain flowing off in the summer and fall months. The average percentage in this watershed from June to November, inclusive, is 22 1-3; while in the Tohickon it is 20 1-2, and in the Neshaminy only 12.

The following named persons have been engaged on the work during the entire year.

John G. Hilsman, rodman.

George W. Wood, rodman.

R. C. Stover, gauge observer.

E. F. Heavener, gauge observer.

George Lowder, gauge observer.

Dr. J. A. Roth, gauge observer.

H. L. Shull, gauge observer.

Thos. H. Walton, gauge observer.

The Bureau is indebted to the following-named persons who have kindly furnished rainfall records :

Mr. Thomas Meehan, Germantown, Philadelphia, Pa.

Mr. J. L. Heacock, Quakertown, Pa.

Sergeant L. M. Dey, U. S. Signal Service, Philadelphia.

Sergeant T. F. Townsend, State Weather Service, Philadelphia.

Mr. E. F. Smith, Chief Engineer of Canals, Reading, Pa.

Mr. Benjamin Shoemaker, Pennsylvania Hospital, Philadelphia.

Mr. Thos. J. Beans, Moorestown, N. J.

Dr. Chas. Moore, Pottstown, Pa.

Mr. B. B. Lehman, Lebanon, Pa.

Mr. Milnor Gillingham, Fallsington, Pa.

Mr. Malcolm McNeill, Princeton, N. J.

Prof. James W. Moore, M. D., Easton, Pa.

Dr. J. C. Green, West Chester, Pa.

The instruments in use on the hydrographic work, with the exception of the Buff and Berger meter, are in good condition. This meter had very hard and considerable usage last summer, and will require overhauling and the renewal of certain parts before it is in condition for use.

If the streamflow measurements be continued on the Tohockon creek, it will be necessary to repair the measuring weir at Point Pleasant. This weir is used to measure the low and moderately high flows, which measurements are referred to the automatic stream gauge. As the bed of the creek in the vicinity of the stream gauge has been observed to have changed slightly since our investigations began, we have not depended upon the original flow curve made for this gauge, but have taken new measurements and deduced new curves at intervals. The last measurements at the weir were made in the fall of 1886, and in order to have perfect confidence in the accuracy of the streamflow as calculated for the ensuing year, it will be necessary to have new measurements made during the period of low flow. Since the last were made the ice has damaged the weir to such an extent as to render it very leaky and entirely unfit for use.

Respectfully submitted,

AMASA ELY,

Assistant in Charge of Hydrographic Work.

TABLE 1.
 MONTHLY PRECIPITATION ON SUNDRY WATERSHEDS,
 COMPARED WITH U. S. SIGNAL SERVICE OBSERVATIONS
 AT
 PHILADELPHIA.

DATE, 1887.	PHILADELPHIA SERIES.						SCHUYLKILL SERIES.						PERKIOMEN SERIES.				DELAWARE SERIES.				TOHICKON AND NESHAMINY SERIES.																					
	U. S. SIG. SERVICE.		PHILA. WATER DEPARTMENT.		PENNSYLVANIA HOSPITAL.		GERMANTOWN.		LEBANON.		SCHUYLKILL HAVEN.		READING.		POTTSTOWN.		BROWERS.		SIESHOLTZVILLE.		FREDERICK.		EASTON.		MOORESTOWN.		WEST CHESTER.		OTTSVILLE.		QUAKERTOWN.		SMITH'S CORNER.		POINT PLEASANT.		DOYLESTOWN.		LANSDALE.		FORKS OF NESHAMINY.	
	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.	Precipitation, Inches.	Difference, Inches.	Precipitation, Inches.	Difference, Inches.				
January	3.23	+0.74	3.97	+0.30	3.53	+1.07	4.30	+0.20	3.43	-0.48	2.75	+1.01	4.24	+0.56	3.79	+0.82	4.05	+1.72	4.95	+0.92	4.15	+1.79	5.02	-0.31	2.92	+0.72	3.95	+1.40	4.63	+0.65	3.88	+0.77	4.00	+1.21	4.44	+1.59	4.82	+1.27	4.50	+1.36	4.59	
February	4.43	-0.04	4.39	+0.47	4.90	+0.49	4.92	+0.49	4.92	+0.30	4.73	+0.82	5.25	+1.07	5.55	+1.12	5.77	+1.34	5.50	+1.07	5.79	+1.36	5.32	+0.89	5.55	+1.12	6.58	+2.15	4.05	-0.38	5.01	+0.58	6.23	+1.80	5.34	+0.91	4.92	+0.49	4.90	+0.47		
March	2.59	+0.14	2.73	+0.59	3.18	+0.54	3.13	-0.81	1.78	-1.37	1.22	-0.54	2.05	+0.39	2.98	+0.11	3.27	+0.68	2.72	+0.13	3.34	+0.75	2.85	+0.26	3.66	+1.07	4.47	+1.88	2.08	-0.51	2.36	-0.23	3.35	+0.76	4.29	+1.70	2.86	+0.27	3.58	+0.99		
April	2.00	+0.29	2.29	+0.65	2.65	+0.91	2.91	-0.11	1.89	+0.09	2.09	+0.15	2.15	+0.49	2.49	+0.89	2.89	+1.31	3.31	+0.37	2.25	+0.25	2.42	+0.42	3.51	+1.51	2.92	+0.92	1.79	-0.21	2.40	+0.40	2.53	+0.53	3.09	+1.09	3.16	+1.16	3.28	+1.28		
May	0.62	-0.19	0.43	+0.08	0.70	+0.05	0.67	+1.60	2.22	+1.13	1.75	+2.13	2.75	+1.93	2.55	+2.28	2.90	+0.78	1.40	+1.69	3.86	+3.24	1.89	×1.27	4.06	+3.44	2.68	+2.06	2.99	+2.37	2.33	+1.71	2.37	+1.75	2.01	+1.39	2.75	+2.13	1.68	+1.06		
June	6.81	-0.38	6.43	+0.93	7.74	+0.61	7.42	-2.87	3.94	-3.27	3.54	-2.57	4.24	-2.23	4.58	-1.05	5.41	-1.40	6.33	-0.48	6.10	-0.71	6.19	-0.62	6.72	-0.09	6.08	-0.73	4.56	-2.25	6.28	-0.53	6.14	-0.67	7.22	+0.41	6.68	-0.13	7.91	+1.10		
July	7.14	+0.55	7.69	+0.29	7.43	+1.05	8.19	-3.25	3.89	-2.32	4.82	+0.76	7.90	+1.86	6.56	-0.58	10.36	+3.22	6.89	-0.25	11.28	+4.14	6.59	-0.55	11.27	+4.13	6.25	-0.89	9.25	+2.11	7.74	+0.60	9.30	+2.16	9.39	+2.25	7.52	+0.38	7.53	+0.39		
August	2.31	-0.19	2.12	+0.23	2.54	-0.05	2.26	+1.39	3.70	+2.81	5.12	+0.16	2.47	+0.14	2.45	+0.20	2.91	+0.60	2.61	+0.30	4.31	+2.00	3.17	+0.86	2.94	+0.63	5.25	+2.94	4.75	+2.44	5.32	+3.01	5.86	+3.55	3.41	+1.10	4.96	+2.65	3.15	+0.84		
September	4.92	-0.18	4.74	+0.42	5.34	-0.44	4.48	-1.85	3.07	-2.59	2.33	-1.58	3.34	-0.15	4.77	-1.20	3.61	-1.31	3.67	-1.25	3.24	-1.68	6.09	+1.17	5.67	+0.75	3.43	-1.49	3.52	-1.40	3.03	-1.89	3.44	-1.48	3.89	-1.03	3.99	-0.93	4.31	-0.61		
October	1.68	-0.03	1.65	+0.39	2.07	+0.10	1.78	-0.93	0.75	-1.04	0.64	-0.44	1.24	-0.28	1.40	-0.21	1.32	-0.36	1.57	-0.11	1.41	-0.27	1.93	+0.25	1.76	+0.08	1.83	+0.15	1.70	+0.02	2.07	+0.39	2.12	+0.44	1.98	+0.30	1.72	+0.04	2.02	+0.34		
November	1.38	-0.20	1.18	+0.22	1.60	+0.07	1.45	-0.34	1.04	-0.33	1.05	-0.07	1.31	+0.10	1.48	+0.25	1.70	+0.32	1.52	+0.14	1.55	+0.17	1.68	+0.30	2.13	+0.75	1.16	+0.18	1.56	+0.10	1.48	+0.10	1.47	+0.09	1.65	+0.27	1.46	+0.08	1.79	+0.41		
December	5.06	-0.06	5.00	+1.29	6.35	+1.42	6.48	-0.72	4.34	-0.20	4.86	-0.06	5.12	+1.44	4.58	-0.48	7.07	+2.01	6.23	+1.17	6.01	+0.95	4.92	-0.14	6.81	+1.75	7.33	+2.27	6.05	+0.99	6.09	+1.03	6.66	+1.60	6.76	+1.70	4.74	-0.32	6.87	+1.81		
Total	42.17	+0.45	42.62	+5.86	48.03	+5.82	47.99	-7.20	34.97	-7.27	34.90	-0.11	42.06	+5.32	44.32	×2.15	51.08	+8.91	45.87	+3.70	54.16	+11.99	45.97	+3.80	58.03	+15.86	52.61	+10.44	46.18	+4.01	48.11	+5.94	53.91	+11.74	53.85	+11.68	49.26	+7.09	51.61	+9.44		
Percentage	100	101	114	114	83	83	100	113	105	121	109	128	109	138	125	110	114	128	123	117	122	

TABLE 2.

RAIN-STORMS OF GREATEST INTENSITY AS RECORDED BY
AUTOMATIC GAUGES DURING 1887.

Station—BUREAU OF WATER, PHILADELPHIA.

DATE. 1887.	TOTAL FALL.		HEAVY FALL.		MAXIMUM FALL.		
	Amount, Inches.	Duration, Hrs. Min.	Amount, Inches.	Duration, Hrs. Min.	Amount, Inches.	Duration, Min.	Rate per Min. Inches.
February 18..	1.567	15 30	1.489	3 30	0.509	11	0.046
June 22-23....	3.156	33 05	2.973	10 54	0.243	5	0.049
July 23.....	1.870	0 50	1.856	0 44	0.921	13	0.071
July 24.....	1.500	6 00	1.462	2 14	0.251	5	0.050
July 26.....	1.183	0 45	1.156	0 33	0.615	7	0.088
August 22.....	1.148	4 30	1.000	2 38	0.170	4	0.043
Sept. 11-12....	2.819	21 00	2.656	10 05	0.128	5	0.026

Station—FREDERICK, MONTGOMERY COUNTY, PA.

DATE. 1887.	TOTAL FALL.		HEAVY FALL.		MAXIMUM FALL.		
	Amount, Inches.	Duration, Hrs. Min.	Amount, Inches.	Duration, Hrs. Min.	Amount, Inches.	Duration, Min.	Rate per Min. Inches.
January 13-14	1.213	14 00	1.126	4 26	0.427	12	0.036
June 22-23.....	2.595	17 35	2.509	9 07	0.365	5	0.073
July 5.....	2.248	12 30	2.187	5 58	0.216	4	0.054
July 30.....	0.794	0 25	0.786	0 16	0.765	12	0.064
August 23-24..	0.513	7 30	0.492	0 11	0.459	6	0.077

Station—FORKS OF NESHAMINY, BUCKS COUNTY, PA.

DATE. 1887.	TOTAL FALL.		HEAVY FALL.		MAXIMUM FALL.		
	Amount, Inches.	Duration, Hrs. Min.	Amount, Inches.	Duration, Hrs. Min.	Amount, Inches.	Duration, Min.	Rate per Min. Inches.
May 8.....	0.750	4 30	0.736	2 38	0.382	10	0.038
June 22.....	0.945	7 10	0.918	1 34	0.470	10	0.047
June 22-23....	3.339	33 30	3.125	12 39	1.402	82	0.017
July 23-24....	1.710	12 00	1.673	7 54	0.746	19	0.039
July 29.....	1.170	1 30	1.157	0 42	0.243	4	0.061
Sept. 11-12....	2.100	21 00	1.919	11 26	0.111	5	0.022

TABLE 5.—YIELD OF SUNDRY STREAMS FOR 1887.

1887.	PERKIMEN, AT FREDERICK.				NESHAMINY, BELOW FORKS.				TOTTUCKON.			
	Monthly yield.		Average daily yield.		Monthly yield.		Average daily yield.		Monthly yield.		Average daily yield.	
	Cubic feet.	Gallons.	Cubic feet.	Gallons.	Cubic feet.	Gallons.	Cubic feet.	Gallons.	Cubic feet.	Gallons.	Cubic feet.	Gallons.
January.....	1,401,500,448	338,168,196	45,200,692	338,168,196	1,312,331,784	42,333,380	316,653,682	42,333,380	1,203,630,624	38,826,794	290,424,419	
February.....	1,488,527,712	397,619,546	53,161,704	397,619,546	1,225,682,496	43,774,375	327,432,325	43,774,375	1,250,257,248	44,652,045	333,997,297	
March.....	1,063,707,552	256,662,340	34,313,147	256,662,340	1,016,984,160	32,803,941	245,388,439	32,803,941	914,712,480	29,506,854	220,711,268	
April.....	442,968,480	14,765,616	14,765,616	110,446,808	456,925,536	15,230,851	113,926,765	15,230,851	240,474,528	8,013,818	59,958,319	
May.....	257,163,552	8,295,598	8,295,598	62,051,073	218,622,240	7,052,330	52,751,428	7,052,330	224,508,672	7,242,215	54,171,768	
June.....	267,638,304	8,923,277	8,923,277	66,746,112	516,473,280	17,215,776	128,774,004	17,215,776	285,201,216	9,566,707	71,110,166	
July.....	729,843,264	23,543,331	23,543,331	176,104,116	604,721,376	19,507,141	145,918,415	19,507,141	389,218,176	12,555,425	93,914,579	
August.....	505,110,816	16,293,897	16,293,897	121,878,350	249,468,768	8,017,380	60,194,402	8,017,380	462,714,336	14,926,269	111,648,492	
September.....	213,829,632	7,127,654	7,127,654	53,314,852	131,219,136	4,373,971	32,717,303	4,373,971	98,619,582	3,287,318	24,589,139	
October.....	154,135,872	4,972,125	4,972,125	37,191,495	111,811,104	3,606,310	26,978,939	3,606,310	60,376,320	1,947,623	14,568,220	
November.....	140,844,960	4,694,832	4,694,832	35,117,343	82,081,320	2,736,144	20,466,357	2,736,144	61,731,936	2,057,781	15,391,833	
December.....	741,814,848	23,929,511	23,929,511	178,992,712	894,413,664	28,852,054	215,813,304	28,852,054	758,553,120	24,469,455	183,081,653	
Total.....	7,407,145,440	20,293,540	20,293,540	151,795,747	6,820,740,864	18,786,961	139,778,468	18,786,961	5,949,998,208	16,301,365	121,984,210	

TABLE 3.
PRECIPITATION AND STREAM FLOW IN SUNDRY WATERSHEDS.

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 ft. per second, per sq. 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 ft. per second, per sq. 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 ft. per second, per sq. mile of drainage area.
1886.																		
October	2.355	11	0.259	88,160,832	2,843,898	0.217	2.773	2	0.055	16,068,672	518,344	0.043	2.587	2	0.052	10,578,816	341,252	0.039
November.....	5.278	29	1.531	543,992,544	18,133,085	1.381	3.923	14	0.549	173,050,560	5,768,352	0.479	5.159	38	1.960	466,444,224	15,548,141	1.761
December.....	3.764	38	1.430	508,344,768	16,398,218	1.249	3.296	71	2.340	728,338,176	23,494,780	1.952	3.832	62	2.376	567,617,760	18,310,250	2.074
1887.																		
January.....	4.550	88	4.004	1,401,500,448	45,209,692	3.443	4.635	91	4.218	1,312,334,784	42,333,380	3.517	4.237	119	5.042	1,203,630,624	38,826,794	4.397
February.....	5.636	75	4.227	1,488,527,712	53,161,704	4.048	5.050	78	3.939	1,225,682,496	43,774,375	3.637	5.467	96	5.248	1,250,257,248	44,652,045	5.057
March.....	2.995	101	3.025	1,063,707,552	34,313,147	2.613	3.575	91	3.253	1,016,984,160	32,805,941	2.726	3.066	125	3.833	914,712,480	29,506,854	3.342
April.....	2.838	44	1.249	442,968,480	14,765,616	1.124	3.175	46	1.461	456,925,536	15,230,851	1.265	2.409	42	1.012	240,474,528	8,015,818	0.908
May.....	1.854	39	0.723	257,163,552	8,295,598	0.632	2.147	33	0.709	218,622,240	7,052,330	0.586	2.593	36	0.933	224,508,672	7,242,215	0.820
June.....	5.867	13	0.763	267,698,304	8,923,277	0.679	7.269	23	1.672	516,473,280	17,215,776	1.430	5.766	21	1.211	285,201,216	9,506,707	1.077
July.....	8.625	24	2.070	729,843,264	23,543,331	1.793	8.145	24	1.955	604,721,376	19,507,141	1.621	8.134	20	1.627	389,218,176	12,555,425	1.422
August.....	2.756	52	1.433	505,110,816	16,293,897	1.241	3.841	21	0.807	249,468,768	8,047,380	0.669	5.294	37	1.959	462,714,336	14,926,269	1.690
September.....	3.641	17	0.619	213,829,632	7,127,654	0.543	4.062	10	0.406	131,219,136	4,373,971	0.363	3.355	12	0.403	98,619,552	3,287,318	0.372
Total.....	50.160	43	21.569	7,510,847,904	20,577,665	1.567	51.891	41	21.275	649,889,184	18,218,374	1.514	51.899	49	25.431	6,113,977,632	16,750,624	1.897

TABLE 7.
COMPARATIVE STATISTICS OF SUNDRY WATERSHEDS.

WATERSHED.	Area in miles.	STATISTICS OF WATER- SHED IN PERCENT- AGES OF TOTAL AREA.				PERCENTAGE OF RAINFALL REACHING THE STREAM.												
		Wooded.	Cultivatd.	Flats.	Roads.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Annual.
Perkiomen, at Frederick.....	152.0	25	71	2	2	82	78	119	91	37	23	18	32	17	10	34	59	48
Neshaminy, below Forks.....	139.3	6	92	*0	2	95	96	110	89	31	15	14	15	6	2	19	70	46
Tohickon	102.2	24	72	2	2	116	123	130	101	31	28	21	17	9	8	40	52	59
Average.....						98	101	120	94	33	22	18	21	11	7	31	60	51

* $\frac{1}{4}$ of 1 per cent.

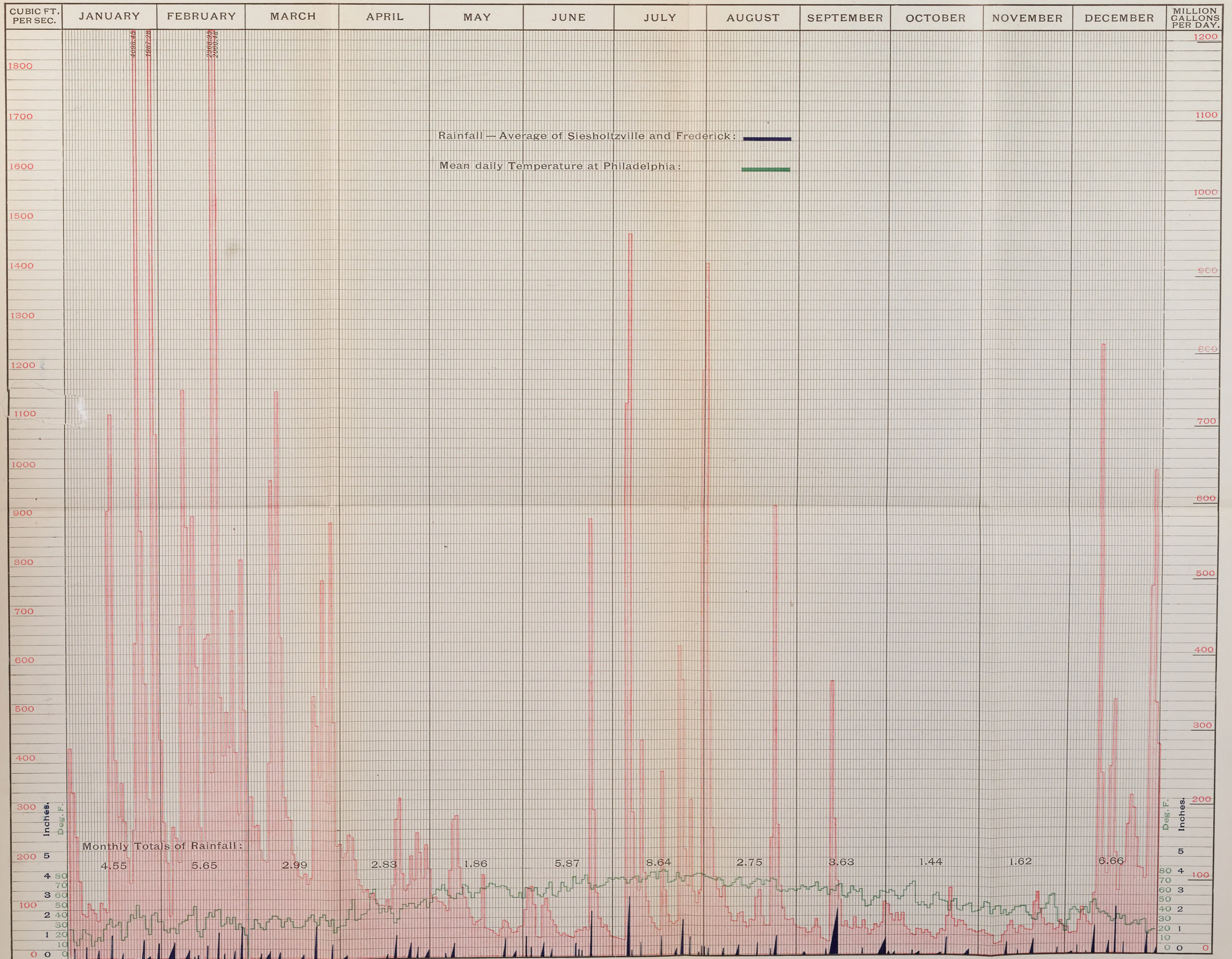
ECONOMICAL COMPARISON OF DIFFERENT TYPES OF ENGINES USED BY THE WATER BUREAU.

DATA.							CALCULATED RESULTS.												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Station.	Type of Engine.	No. of Engine.	Capacity of pump in million gallons per 24 hours.	Diameter of high-pressure cylinder in inches.	Diameter of low-pressure cylinder in inches.	Length of stroke in feet.	Indicated horse-power of high-pressure cylinder by card.	Indicated horse-power of low-pressure cylinder by card.	Total horse-power by card.	Work indicated by card in per cent. of designed work.	Area of actual diagram in per cent. of theoretical.	Total displacement of steam cylinder in cubic feet.	Pounds of steam per stroke.	Pounds of steam per hour.	Pounds of steam per indicated horse-power per hour.	Pounds of combustible per horse-power per hour based on lbs. of steam equivalent to 1 lb. of coal.	Classification of Engine according to economy in combustible.	Remarks.	
A.	Spring Garden.	Simpson Compound Rotary...	6	8	35	57	{ 5.2 8.0 }	148.43	87.14	235.54	116.	62.	183.37	2.51	3,912.48	16.61	1.66	72	
B.	Spring Garden.	Marine Compound Rotary.....	7	20	45	80	6	213.6	207.7	421.3	61.	56.	288.11	4.14	7,531.97	17.87	1.79	67	Steam from boiler admitted to receiver. Exhaust steam from high pressure forms jacket to both cylinders.
C.	Spring Garden.	Marine Compound Rotary.....	7	20	45	80	6	235.9	185.5	421.4	61.	56.	288.11	4.14	7,531.97	17.87	1.79	67	Steam from boiler not admitted to receiver. Exhaust steam from high pressure forms jacket to both cylinders.
D.	Spring Garden.	Worthington Duplex.....	10	15	38	66	4	236.46	226.76	463.22	80.	50.	273.72	4.35	11,680.	25.22	2.52	47	Steam admitted to jackets of both cylinders.
E.	Spring Garden.	Gaskill Compound Rotary.....	11	20	33	66	4	434.7	339.	772.7	101.	81.22	241.86	1.95	9,548.1	12.36	1.24	96	Steam admitted to jackets of both cylinders.
F.	Frankford.....	Marine Compound Rotary.....	1	10	40	69	5	224.6	148.1	372.7	100.	59.	181.27	2.68	6,420.	17.23	1.72	69	Exhaust steam from high-pressure cylinder forms jacket to both cylinders.
G.	Frankford	Corliss Compound Rotary.....	2	10	28	56	3	210.2	202.2	412.4	110.	64.30	65.75	1.18	5,252.52	13.08	1.31	90	Steam admitted to jacket of high-pressure cylinder. No jacket on low-pressure cylinder.
H.	Frankford.....	Corliss Compound Rotary.....	2	10	28	56	3	124.85	125.07	249.92	67.	68.	65.75	.86	2,886.24	11.89	1.19	100	Steam admitted to jacket of high-pressure cylinder. No jacket on low-pressure cylinder.
K.	Frankford	Corliss Compound Rotary.....	2	10	28	56	3	205.3	206.6	411.9	110.	64.	65.75	1.44	6,453.38	15.67	1.57	76	No steam admitted to jacket of high-pressure cylinder. No jacket on low-pressure cylinder.

STREAM FLOW

1887

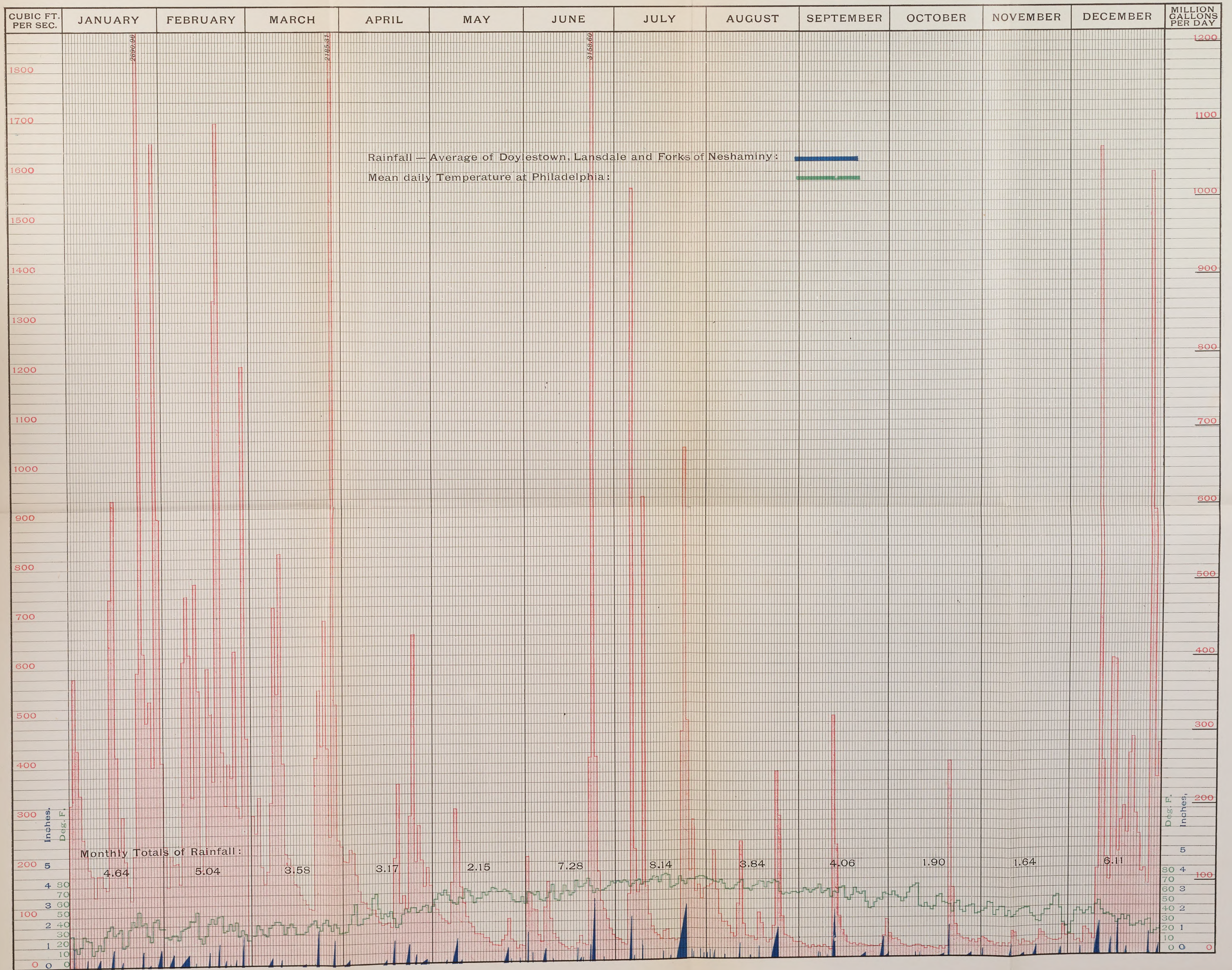
PERKIOMEN CREEK AT FREDERICK.



STREAM FLOW

1887

NESHAMINY CREEK BELOW FORKS.



STREAM FLOW

1887

TOHICKON CREEK.



APPENDIX H.

REPORT

ON THE

DUTY AND CAPACITY TEST

OF THE

GASKILL PUMPING ENGINE

AT THE

SPRING GARDEN PUMPING STATION.

Philadelphia, January 10, 1888.

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

SIR:—The following report on the duty and capacity tests of the twenty million gallon Gaskill engine, recently completed at the Spring Garden pumping station, is respectfully presented:

By the requirements of the contract a capacity and a duty test were to be made—the latter within two months after the engine shall have been put in operation. By mutual agreement both tests were made at the same time.

The duty required by the specifications was one hundred millions (100,000,000) of foot pounds, with a consumption of one hundred (100) pounds of coal on the basis of ten (10) pounds of water evaporated per pound of coal; the duty to be computed by the following formula:

$$\frac{P \times N \times H \times 100}{W} = \text{duty.}$$

In which P = pounds of water delivered per stroke, N = the number of strokes during trial, H = total fluid resistance including static and frictional heads measured to the surface of water in pump well, allowing one pound for friction through the pump and passages, and W = number of pounds of coal on the basis of ten pounds of water evaporated per pound of coal.

The duty guaranteed by the contractors was one hundred and ten millions (110,000,000) of foot pounds.

The trial of twenty-four hours duration began at 8 A. M. Tuesday, November 29, and terminated at 8 A. M. Wednesday, November 30, 1887.

METHOD OF CONDUCTING TEST.

It was agreed to take half-hourly observations from all the attachments on both boilers and engine. For this purpose one steam gauge on the engine was tested for reading steam pressure thereon; one steam gauge out of the five inspected was selected and tested for reading steam pressure on the boilers; one pressure gauge on the engine was tested for reading the water pressure: and the distance from centre of gauge to surface of water in forebay measured.

The coal consumed was weighed in the small cars used at the station, and after inspection was run into the boiler room. The firing was done by the regular men.

The water for the boilers was pumped into a wooden tank capable of holding about 2,700 pounds, weighed, and run thence into an iron tank of about 9,000 pounds capacity, from which an attachment was made to the pumps feeding the boilers. Both tanks were set on platform scales, which had been inspected and corrected.

In the agreement a clause, voluntarily made by the contractors, stipulated that the engine while on test should pump all feed water into the boilers, *and no allowance be made for steam so used*. For this purpose four plunger feed pumps were connected to a rocker arm attached to a trunnion on the walking beam centre. Two of these were regulated to pump water continuously into the boilers. In calculating the duty *no allowance has been made for this quantity of work*, aggregating during the twenty-four hours, sixty-six millions (66,000,000) foot pounds. In making a comparison of duty

tests with other engines it is only fair to state that this amount of work is commonly done by an extra donkey pump supplied with steam from another set of boilers kept running for this purpose, thus involving not only extra labor, but also coal and boiler capacity.

It was agreed to check the the water observations in the large tank at the end of each hour. For this purpose a gauge reading in inches from the bottom of the tank was so placed that the height of water could be plainly seen. At the beginning of the test the height of water was read on the gauge, and at the end of each hour the water was brought to the same point, and the quantity for the hour weighed out of the small tank and checked off by the observers. The specifications required that ten pounds of water should be considered as a pound of combustible, therefore particular attention was given to the accuracy of the observations on the amount of water weighed out to the boiler.

The high and low pressure cylinders are both steam jacketed with live steam from the boilers. In the ordinary running of the engines the condensed water resulting therefrom is carried through a coil heater and steam trap and pumped back into the boilers, increasing the temperature of the feed water to nearly 212° F.

On the trial this jacket water was cut out from the feed pumps and a steam trap so placed that the discharge from it could be collected in a barrel placed upon platform scales, weighed and checked every hour. In calculating the duty this jacket water has not been deducted from the amount actually pumped into the boilers and charged to the contractors, nor was it permitted to be *trapped* back into the boilers without being accounted for.

The specifications requiring the duty to be calculated from ten pounds of water equivalent to one pound of coal, made the engine and boilers two separate plants. The management of the boiler fires and all the attachments in the boiler room were under the direction of the Bureau of Water, but all observations were taken jointly.

The five boilers used in furnishing steam were made from designs and drawings prepared in the Bureau, and were calculated to carry one hundred pounds of steam pressure, and to furnish a sufficient supply of steam to enable the engine to fulfill the contract. On a preliminary trial it was found that

four boilers would furnish ample steam for the engine, but it was considered best to use the five, in order to maintain a constant steam pressure in cleaning fires.

It was agreed to clean the fires four times during the twenty-four hours, and weigh all ashes and clinkers dry. In order to bring the fires to the same condition when the trial ceased as they were in the beginning, directions were given to clean the fires in regular succession three hours before the trial began, cleaning two furnaces at one time in the several boilers, at intervals of one-half hour each, and covering a period of two hours, and securing clean fires one hour before the trial began—the same order following in the successive four cleanings, and beginning the last cleaning three hours before the end of the trial, thus leaving the fires as nearly as possible in the same condition as when the trial started.

For obtaining the temperature of the escaping gases a pyrometer was placed in the flue back of the boilers. The accuracy of the pyrometer was tested by taking a calorimetric observation with a known weight of iron and a given quantity of water of known temperature, and found to be correct within about 20° F. An attachment was made to the steam pipe to take calorimetric observations on the quality of the steam.

The coal used was rather an inferior quality of Schuylkill nut, containing about 25 per cent. of clinker and ash, besides being very wet. A sample of 370 pounds was taken and dried upon the boiler flue for twenty-four hours, and found to contain six per cent. of moisture—the evaporation of which is credited to the boilers, and is shown in the tabulated report of the results of the boiler trials.

The management of the engine during the trial was under the direction of the contractors exclusively. Two indicators were placed on the high pressure cylinders and two on the low, and indicator cards from both steam cylinders were taken simultaneously at intervals during the twenty-four hours. One of these cards has been enlarged and plotted to scale, and from it has been determined the quantity of steam used per hour, quantity of steam per horse power per hour, together with the volume of steam admitted to cylinders. The isothermal curve and the adiabatic curve are both traced on the diagram, and the area of the actual card in per cent. of the theoretical is given.

The specifications, section 12, make it optional with the Chief Engineer of the Bureau of Water whether the capacity shall be determined by weir measurement or by plunger displacement.

There being no pumping main nor weir available for that method of measurement, by your direction the capacity was determined by plunger displacement, and the duty and the capacity test were run at the same time. By partially closing an outside stop-valve the water gauge was made to indicate the required pressure, including static and frictional head.

•• CALCULATED DATA.

Volume of high pressure cylinder, including clearance in cubic feet.....	24.128
Volume of low pressure cylinder, including clearance in cubic feet.....	96.80
Total cubic feet in both cylinders, including clearance, cubic feet.....	120.93
Ratio of volume of low pressure cylinder to volume of high pressure cylinder.....	4.01
Cubic feet in one volume, calculated from indicator card.....	7.56
Ratio of expansion by pressure.....	12.44
Ratio of expansion by volumes.....	12.80
Area of theoretical card, square inches.....	65.45
Area of actual card, square inches.....	53.16
Area of actual in per cent. of theoretical.....	81.22
Indicated horse power.....	772.7
Pounds of steam per stroke.....	1.95
Pounds of steam per hour by card, including jacket.....	9,548.1
Pounds of steam per indicated horse power per hour by card, including jacket.....	12.36
Pounds of steam per indicated horse power per hour, from water actually weighed into boilers.....	14.94
Per cent of water accounted for by indicator card and jacket water.....	82.
Total amount of jacket water by actual weight during the 24 hours.....	26,276.
Jacket water per hour.....	1,095.

Eleven calorimetrical observations on the quality of steam were made during the test at intervals of about two hours each.

Weight of water heated, pounds.....	200.
Weight of steam condensed, pounds.....	10.06

Initial temperature, deg. F.....	57.39
Final temperature, deg. F.....	111.14
Elevation of heat of water by condensation of steam, deg. F.....	53.75
Absolute steam pressure, pounds.....	111.35
Latent heat units at observed pressure.....	878.95
Latent heat units of steam as found.....	848.974
Quality of steam.....	.0965
Percentage of water contained in steam.....	3.5

AVERAGES OF OBSERVED DATA.

Averages of the observed data during the 24 hours—complete table of which it is not necessary to give—are as follows:

STEAM PRESSURE.

November 29th, 8 A. M.: Boilers, Nos...	34,	35,	36,	37,	38,
Pressure by gauge,.....	98,	98,	98,	98,	98,
November 30th, 8 A. M.:					
Pressure by gauge,.....	97,	97,	97,	97,	97,
Average for 24 hours, 49 readings,.....	96.53,	96.53,	96.53,	96.53,	96.53.

WATER GAUGES—BOILERS.

Levels in inches of water in glass tube, 8 A. M., Nov. 29th:

Boilers Nos.....	34,	35,	36,	37,	38,
Levels, inches.....	8,	7½,	8½,	8,	7½,=39½.

Levels in inches of water in glass tube, 8 A. M., Nov. 30th:

Boilers Nos.....	34,	35,	36,	37,	38,
Levels, inches.....	7¾,	7½,	8½,	8,	7¾,=39.

TEMPERATURE OF FEED WATER.

The temperature of the feed water in the large tank was taken three times during each hour, but the distance from the feed pumps to the boilers was so great that a thermometer was placed in the feed pipe near the boilers, from which the temperature of the feed water entering boilers was taken.

	Nov, 29th. 8 A. M.	Nov. 30th. 8 A. M.	Average of 49 readings.
In tank.....	87,	97,	98.2.
In pipe before entering boilers.....	86,	96,	96.3.

TEMPERATURE OF ESCAPE GASES.

PYROMETER READINGS.

Nov. 29th, 8 A. M.	Nov. 30th, 8 A. M.	Average of 49 readings.
612° F.	650° F.	555° F.

TEMPERATURES.

Fire room, 8 A. M., November 29th.....	66° F.
Fire room, 8 A. M., November 30th.....	64° F.
Fire room, average of 49 readings.....	66° F.
Outside air, 8 A. M., November 29th.....	36° F.
Outside air, 8 A. M., November 30th.....	26° F.
Outside air, average of 49 readings.....	35° F.
Mean barometer readings, 24 hours, from Signal Service Bureau.....	30.655
Mean pressure, pounds.....	15.05

ANEMOMETER READINGS.

Velocity of air passing through fire grate per minute:

Average of 4 readings:

Boiler 34.....	235 feet,
Boiler 35.....	237 feet,
Boiler 36.....	220 feet,
Boiler 37.....	260 feet,
Boiler 38.....	225 feet.

Average of 20 readings:

235 feet.

COAL TO BOILERS.

Total pounds of coal weighed.....	44,014
Less 6 per cent. for moisture.....	2,641
Dry coal, pounds.....	41,373
Less 24.38 per cent. of waste.....	10,088
Total combustible, pounds.....	31,285
Evaporation of boilers per pound of combustible from and at 212° F., pounds.....	10.35
19 w	

The following order was of observed in cleaning fires :

Boilers 34 and 36, furnaces Nos. 1 and 2: Time, 5 A. M., 12 Noon,
5 P. M., 12 M., 5 A. M.

Boilers 34 and 37, furnaces Nos. 2 and 1: Time, 5.30 A. M., 12.30 P.
M., 5.30 P. M., 12.30 A. M., 5.30 A. M.

Boilers 35 and 37, furnaces Nos. 1 and 2: Time, 6 A. M., 1 P. M., 6 P.
M., 1 A. M., 6 A. M.

Boilers 35 and 38, furnaces Nos. 2 and 1: Time, 6.30 A. M., 1.30 P. M.,
6.30 P. M., 1.30 A. M., 5.30 A. M.

Boilers 36 and 38, furnaces Nos. 1 and 2: Time, 7 A. M., 2 P. M., 7 P.
M., 2 A. M., 7 A. M.

Ash clinker and unburnt coal were weighed back as follows:

November 29th, 2.15 P. M., pounds.....	2,850
November 29th, 7.10 P. M., pounds.....	2,265
November 30th, 2.15 A. M., pounds.....	3,139
November 30th, 7.15 A. M., pounds.....	1,834
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Total pounds.....	10,088

Percentage of non-combustible:

$$\frac{10,088 \times 100}{41,373.16} = 24.38$$

The records in the engine room consisted of readings from the engine counter; steam gauge on steam pipe; water pressure-gauge connected with the pumping main, and the vacuum gauge every half hour, with the following initial and final readings and averages:

Readings at 8 A. M., November 29th:

Steam gauge,	Water gauge,	Vacuum,
66.	71.5	27.

Readings at 8 A. M., November 30th:

Steam gauge,	Water gauge,	Vacuum,
95.	73.5	27.5

Average readings for 24 hours:

Steam gauge.	Water gauge.	Vacuum,
49 readings,	49 readings,	49 readings,
95.3	70.99	27.5

RESULTS FOR CAPACITY.

Counter on engine 8 A. M., November 29th.....	719,001
Counter on engine 8 A. M., November 30th.....	745,011
Revolutions of engine in 24 hours.....	26,010
Revolutions per hour.....	1,083.7
Revolutions per minute.....	18.063
Number of strokes in 24 hours.....	104,040.
Diameter of plungers, feet.....	3.00
Stroke of plungers, feet.....	4.00

From data obtained on previous tests of the same arrangement of pump-valves and plungers, it was agreed to allow 2 per cent. for slip or loss of action due to supposed imperfect filling of the pump chambers.

Area of 3 feet, diameter of plunger.....	7.0686 square feet
Less $\frac{1}{2}$ area of 6 inch, diameter of plunger rod...	.0981 " "
	<u>6.9705</u> " "
Cubic feet per stroke $6.9705 \times 4 =$	27.882 cubic feet.
Number of strokes in 24 hours =.....	104,040.
Number of cubic feet in 24 hours =	
	$104,040 \times 27.882 = 2,900,843.28$
Number of gallons in 24 hours =	
	$2,900,843.28 \times 7.48 = 21,698,307.7$
Less 2 per cent. for slip.....	<u>433,966.2</u>
Total capacity.....	<u>21,264,341.5</u>

During this time the engine made 18.063 revolutions per minute, or a piston speed of 144.5 feet per minute,

The contractors' guarantee was a delivery of 20,000,000 gallons, with a piston speed of 140 feet per minute, or $17\frac{1}{2}$ revolutions per minute. The capacity at the contractors' guarantee is as follows :

Number of strokes in 24 hours.....	100,800.
Cubic feet per stroke.....	27.882
Gallons per cubic foot.....	7.48
Number of gallons in 24 hours =	
	$27.882 \times 7.48 \times 100,800 = 21,022,848.$
Less 2 per cent. for slip...	<u>420,456.</u>
Total capacity.....	<u>20,602,392</u>
Which is about 3 per cent. in excess of guarantee.	
Capacity during test... ..	21,264,341
Which is over 6 per cent. above the guarantee.	

RESULTS FOR DUTY.

Engine counter at 8 A. M., November 29th.....	719,001.
Engine counter at 8 A. M., November 30th.....	745,011.
Revolutions in 24 hours.....	26,010.
Revolutions per hour.....	1,083.7
Revolutions per minute.....	18.063
Piston speed per minute during 24 hours, feet.....	144.5
Mean head by water pressure gauge. 49 readings, pounds.....	70.99
Mean head by water pressure gauge, feet.....	163.937
Mean distance from centre of water pressure gauge to level of water in forebay, feet.....	25.00
Contract allowance for friction of water passages in pumps...	2.3093
Total head in feet, as per printed specification — H —.....	191.246
Temperature of water in forebay.....	49° F.
Weight of 1 cubic foot of water at that temperature.....	62.41
Cubic feet of water displaced at one stroke of plunger.....	27.882
Pounds of water at one stroke — P —.....	1,740.116
Number of strokes in 24 hours — N —.....	104,040.
Total weight of water weighed to boilers.....	286,982.
Less 3½ per cent. for entrained water in steam.....	10,044.4
	<hr/>
W —.....	276,937.6

$$\text{Then } D = \frac{1740.116 \times 104,040 \times 191.246 \times 100}{27.693.76} =$$

= 125,022,730 foot pounds per 100 pounds of coal, or 15,022,730 in excess of guarantee; or nearly 14 per cent.

The contractors claim that the 2 per cent. for slip shall not be deducted from the duty obtained from the reading of the pressure gauge, for the reason that the pressure by gauge remains constant, and this difference, if any, is caused by the plunger forcing the water under the valves, and the work done by the pumps should be calculated from the pressure as given by the water gauge.

Deducting this 2 per cent. for slip, the duty becomes 122,522,276 foot pounds per 100 pounds of coal, or 12,522,276 foot pounds in excess of guarantee—or nearly 12 per cent.

Very respectfully,

JOHN E. CODMAN,

Expert for Philadelphia Water Bureau.

F. W. HOLLY,

Expert for the Holly Manufacturing Co.

