DEPARTMENT FOR SUPPLYING THE CITY WITH WATER.

ANNUAL REPORT

OF THE

CHIEF ENGINEER OF THE WATER DEPARTMENT

OF THE

CITY OF PHILADELPHIA,

PRESENTED TO COUNCILS, JAN. 31,

1867.

PHILADELPHIA:
WILLIAM F. GEDDES, PRINTER, 320 CHESTNUT STREET.
1867.

COMMITTEE ON WATER WORKS.

1866.

HENRY W. GRAY, Chairman,
SAMUEL W. CATTELL,
CHAS. THOMSON JONES,
WILLIAM F. SMITH,
JOHN A. SHERMER,
C. E. KAMERLY, M. D.
JOSEPH T. VANKIRK,
JAMES H. BILLINGTON,
DANIEL P. RAY,
WILLIAM STOKES,
WALTER ALLISON,
THOMAS H. GILL.

OFFICERS.

Chief Engineer.

HENRY P. M. BIRKINBINE.

Register.

W. J. P. WHITE.

Chief Clerk.

W. J. HALLIDAY.

Permit Clerks.

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JESSE M. CHRISTOPHER,
ALBERT C. FETTER,
GEORGE R. KRICKBAUM.
ISAAC CRAMER,
SAMUEL W. CUMMINGS.
GEORGE S. MACAULEY.

Messenger.

GEORGE W. ECKERT.

Clerk at Engineer's Office,

EDWARD HATCH.

Draughtsman.

JOHN L. OGDEN.

Inspectors.

ALEXANDER MCCONNELL,
JOSEPH WIMER,
JAMES SEDDONS, JR.
WILLIAM JAMES,
W. W. LAMBERT,
JACOB L. WARNER,
WESLEY STEVENSON,
JOSHUA FLETCHER,
CHALKLEY ALBERTSON.

Purveyors.

First District,	E. B. COBB,	Office	615 Carpenter Street.
Second "	GEORGE W. MYERS, JR.	"	918 Cherry Street.
Third "	JOHN H. JEFFERIES,	"	1420 Frankford Road.
Fourth "	JACOB C. APPLE,	"	1324 Buttonwood Street.

Engineers at Works.

Fairmount Works,	JOHNSON HUGHES,		WILLIAM OSBORNE,
Schuylkill "	WILLIAM HODGES,		JOSHUA BARTLEY,
Delaware "	BENJAMIN F. NORMAN,		JOSEPH THOMPSON,
24th Ward "	JAMES BUCKLEY,		WILLIAM GEBLER,
Germantown "	WILLIAM WRIGHT,		JAMES DRINKWATER.

Superintendent City Shop.

JOHN CLOUD.

COMMITTEE ON WATER WORKS.

1867.

ALEXANDER L. HODGDON, Chairman,
SAMUEL W. CATTELL,
CHAS. THOMSON JONES,
C. E. KAMERLY, M.D.,
JOHN A. SHERMER,
W. F. SMITH,
WALTER ALLISON,
J. T. VANKIRK,
JAMES H. BILLINGTON,
THOMAS H. GILL,
A. W. HENSZEY,
W. A. SIMPSON.

Sub-Committees on Water Works.

ON LAYING SERVICE MAINS.

First District.

First, Second, Third, Fourth and Twenty-sixth Wards.

JOHN A. SHERMER, A. W. HENSZEY, C. E. KAMERLY, M. D.

Second District.

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

S. W. CATTELL, WALTER ALLISON, THOMAS H. GILL.

Third District.

Eleventh, Twelfth, Sixteenth, Seventeenth, Eighteenth, Nineteenth, Twenty-third and Twenty-fifth Wards.

JOSEPH T. VANKIRK, W. F. SMITH, A. L. HODGDON.

Fourth District.

Thirteenth, Fourteenth, Fifteenth, Twentieth, Twenty-first and Twenty-second Wards.

CHAS. THOMSON JONES, JAS. H. BILLINGTON, W. A. SIMPSON.

On Accounts.

JOSEPH T. VANKIRK,
W. A. SIMPSON,
A. W. HENSZEY,
C. E. KAMERLY, M. D.

On Extensions.

CHAS. THOMSON JONES,
SAMUEL W. CATTELL,
JOHN A. SHERMER,
THOMAS H. GILL.

On Works.

WALTER ALLISON,
JAMES H. BILLINGTON,
W. F. SMITH,
ALEXANDER L. HODGDON.

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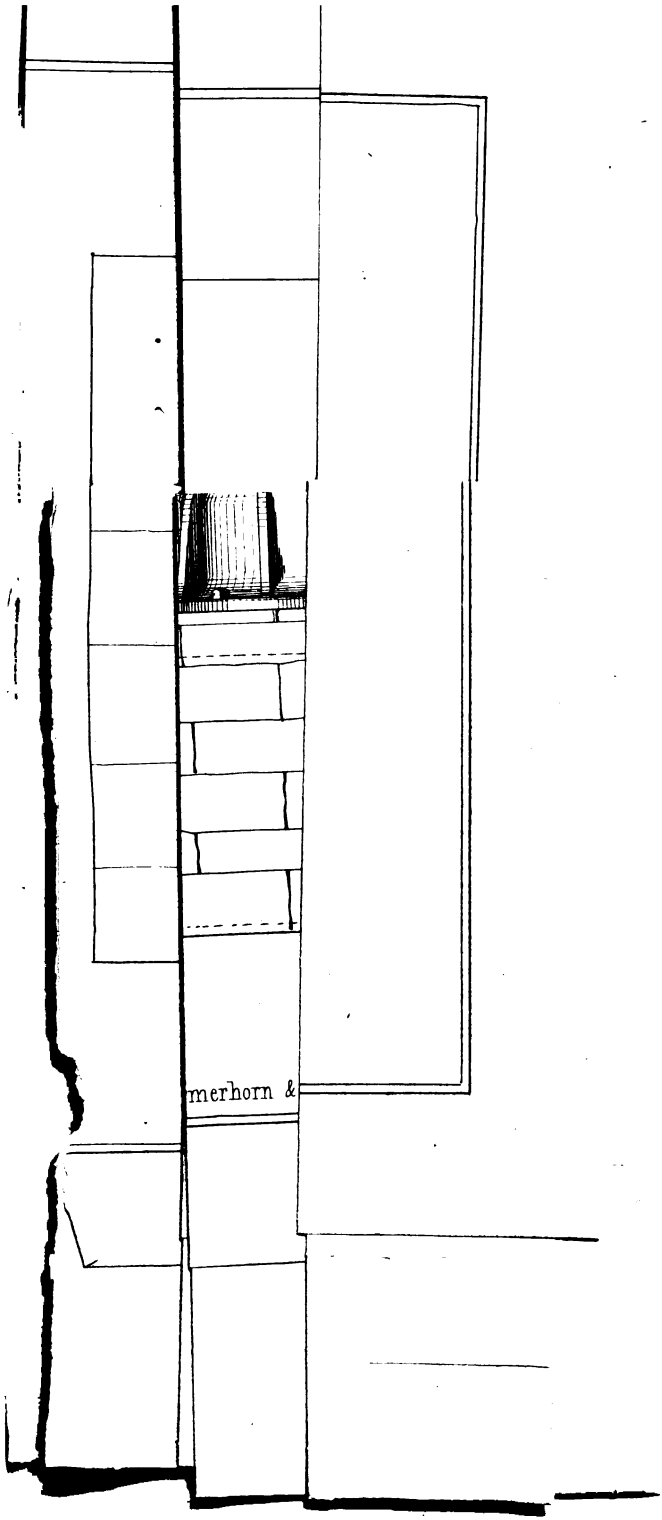

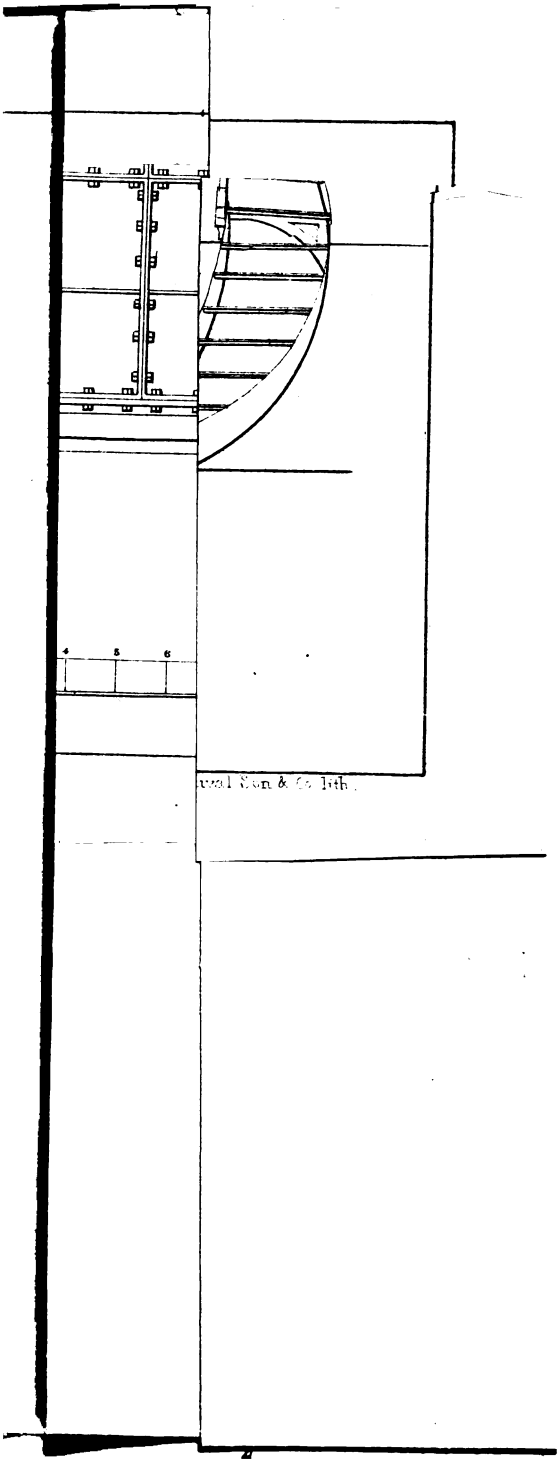
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ANNUAL REPORT

OF THE

CHIEF ENGINEER OF THE WATER DEPARTMENT,

FOR THE YEAR 1866:

PRESENTED TO COUNCILS, JANUARY 31, 1867.

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

Gentlemen:—

In presenting this, the seventh Annual Report, which I have had the honor of sending to Councils, it affords me pleasure to be able to state that at no time, since consolidation, has the condition of the Department been so satisfactory as at present.

The income from the Works has been increased, and the expenses reduced, notwithstanding the enhanced prices of labor and materials, at the same time that the supply of water has been more satisfactory in quantity, and the distribution and the number of water takers largely increased.

These gratifying results are mainly due to the experience and efficiency of the various officers in the Department, many of them having for years filled the positions they now occupy. The value of their experience is shown in the steady improvement which the management of the Works exhibits from year to year.

Perhaps an apology is necessary for constantly urging upon Councils additions and improvements to the Works. But if you will call to mind the condition of the Department when I first became your engineer, in books, organization, revenue, machinery, and water supply; if you consider the fact that, notwithstanding the supply has been more than doubled, it is barely sufficient for the present wants of the City; also that it is defective in quality, and that there is a great lack of storage capacity; add to this, that there is no surplus of power or means of distribution, to meet increasing demands, or to draw upon in case of accident; and you will see abundant reasons for the persistency with which the whole matter has been urged upon your attention.

A careful examination of the additions made to the Works, will show that not one of them has proved a failure, and that the revenue, after deducting expenses, has returned a profit much above the interest of the outlay upon these permanent improvements. The revenue in 1857, was $425,426 11, and the expenditures $200,605 82, leaving a net profit of $224,820 29. The revenue this year is $670,220 13, and the expenses $278,160 17, leaving a profit, after paying all expenses, of $392,106 96.

The following is a summary of the operations of the year:

Income from all sources, - - - -	$670,220 13
Expenses of all kinds, - - - - -	278,160 17
Daily average supply of water (gallons), -	29,080,396
Number of feet of pipe laid, - - -	66,324
Number of fire-plugs set, - - - -	103
Number of stops inserted in mains, - -	154
Number of new attachments, - - -	2,140
Expenditures for extending the Works (paid from loan), - - - - - - -	$338,553 75

The details of the operations of the Department will be found under appropriate heads; with some remarks upon the Perkiomen, as a source of supply; also upon the extension of the Works, and the water of the Schuylkill.

THE PERKIOMEN PROJECT.

The rapid growth of our City demands an increased water supply, and a decided improvement in its quality, and it is to be regretted that you have not deemed it advisable to make the appropriations necessary to investigate the Perkiomen project. After carefully considering all objections urged against it, this plan still appears to merit a thorough examination and comparison with the other sources of supply, viz:—the Schuylkill and Delaware rivers.

It is not surprising that the project has not met with favor from the public generally. A little reflection will show that such has been the fate of all new projects of a public character; witness, the Fairmount Water Works, the introduction of gas, street railroads, &c. If there be merit in it, and the source of supply be, in any degree, as valuable as indicated by the Report I had the honor to present one year ago, careful surveys and estimates would enable you to judge more intelligently of it, and to form a correct decision on reliable *data*. The principal objections which have been raised are:

1st. The belief that there is not a sufficient volume of water in the stream to warrant the expense of bringing it into the City. It has been proved by Denys Papin, who printed a work on the origin of fountains, in 1674, that the rain and snow-water were sufficient to make the fountains and rivers run perpetually. Subsequent investigations have corroborated this fact. The old idea that fountains have their origin in a mysterious subterranean, arterial system fed by the sea, is now abandoned. The precipitation of vapor by rain, snow and dew, is now known to be the only source

from which all the water flowing in streams is supplied. This being the case, if the amount of rain-fall and the surface drained by a stream be known, its entire water capacity may be ascertained.

Kirkpatrick's reports of the rain-fall upon this City, give an average of 45.436 inches per annum, distributed in the seasons about as follows; Spring, 13 inches; Summer, 12 inches; Autumn, 11 inches; Winter, 10 inches. The mean of several observations recorded in Bludget's Climatology, gives a lower average of rain-fall upon the entire City. This average is affected by the difference in altitude of the various observers.

From the character of the country drained by the Perkiomen, the actual amount of precipitation will be found greater than that upon the City. Kirkpatrick's observations are, however, taken as a basis for these calculations. Rain-gauges were placed, and observations commenced in the Perkiomen district, near the site of the proposed lake, at the upper end of the basin, and at its eastern and western extremities, but as no appropriation was made, they were abandoned. The area drained by the Perkiomen is about two hundred and twenty square miles. This would give an annual downfall of water of 23,220,476,928 cubic feet, a daily average of 63,617,745 cubic feet. A portion of this water is evaporated; another portion is absorbed by vegetation. From the geological formation of the country, probably none escapes by infiltration through subterranean channels to other drainage areas. It is difficult to ascertain the precise amount of loss from the above causes.

In Humphrey's Physics and Hydraulics of the Mississippi river, the drainage of the small tributaries is given as ninety per cent. of the downfall, and from data collected in a table, page 280, the flow of small streams is given at .8 to .9 of the rain-fall.

By careful measurements taken for the supply of Belfast, Ireland,

with water, it was ascertained that sixty-four and one-third per cent. of the rain-fall could be utilized.

In the project for supplying London with water from the Cumberland lakes, it is estimated that eighty-two and a half per cent. can be utilized. In another plan for supplying that city from the Severn, eighty per cent. is estimated as available.

In the plan for supplying Dublin from the Dodder, sixty-six per cent. of the rain-fall is estimated as available.

In the case of twelve towns in England supplied from limited drainage areas, given in my last Report, it was found that the average amount of the rain-fall utilized was .509, the amount varying in proportion to the capacity of the store reservoirs to impound the storm-water, some of them utilizing over sixty per cent. of the rain falling upon the surface drained.

In my estimate, only fifty per cent. is taken as the amount that can be utilized. This would make the available capacity of the Perkiomen an average of 238,566,540 gallons per day. The lowest recorded annual rain-fall in this City was in 1848, only thirty-five inches. This may be taken as the minimum. If fifty per cent. be utilized, it will give an available water supply from this source, of 183,997,438 gallons per day. We may, therefore, safely estimate on a daily average of 150,000,000 gallons as procurable from the Perkiomen drainage, above the proposed dam.

2d. It is objected to this stream, that it is subject to frequent freshets, and also to being greatly reduced in volume in seasons of drought; which is true of this as of all streams flowing through hilly or mountainous country. This, instead of being detrimental, is an advantage, for the water is of better quality than if it lingered in swamps or flowed sluggishly, and the oscillations in the amount of water discharged can be controlled by constructing impounding reservoirs, as it is proposed to do.

3d. It is thought that the water in the store reservoirs will become stagnant and unfit for use. As this store reservoir will be

a lake of 1500 acres, sixty-five feet in the deepest part, and not a shallow pond, this apprehension is groundless. On the contrary, the quality of the water will be improved by being impounded in a body of such magnitude. This will also insure limpid water at all times, as all sediment will have abundant time to deposit.

The project may be stated simply, as supplying the City with water by gravitation, from a lake fed by pure mountain streams.

4th. It is objected that $10,000,000 is too great a sum for the City to pay for a water supply. This appears to be a large sum of money, but the works contemplated will be of such magnitude as to furnish five times the amount of water now supplied to the City, and the first cost will be the only expense. It has been shown by the former Report, that there is no means by which so large a supply of water can be furnished at so low a price. If the aqueduct furnish but one-half the amount—75,000,000 gallons per day—it will be at a saving of $218,000 a year over any other means by which the City can secure that amount of water. And if it furnish but 50,000,000 gallons per day, an amount which will be required by the time such Works can be constructed, by no other means can the City procure even this amount of water at a cheaper rate, than by constructing the aqueduct, even at a cost of $10,000,000.

It has also been asserted that the Works will cost much more than this sum. Without actual surveys, plans and estimates, this cannot be proved to be erroneous. A little reflection, however, will satisfy any one acquainted with the nature of the country, and the value of work of this kind, that the sum named will be sufficient to do what is proposed; viz.:—to construct the dam, $500,000; land damages, $500,000; aqueduct, twenty-four miles, at $250,000 per mile, $6,000,000; store reservoir, $1,000,000; connecting mains, $1,000,000; contingencies, $1,000,000. This need not be a matter of supposition. Actual and reliable estimates can be readily furnished for your information.

These Works, if substituted for those now in existence, would

not be a burden to tax-payers at the present time; for if the cost of pumping be deducted from the expenses of this year, and if the interest on the value of real estate and machinery that could be disposed of, were added to the income from water, the entire interest on the cost of the Perkiomen Works would be met, without increasing the water rents, or in any way taxing property owners.

5th It has been objected that the water would be impaired by manufactories placed upon the stream above the dam. There is no probability of this. From the nature of the country drained, there is nothing to induce the location of industrial establishments. The water power is now fully occupied by mills, which produce no objectionable offal, and legislation can be readily secured to prevent the location of establishments that would injuriously affect the water.

To those unacquainted with the Perkiomen project, as presented with my last Annual Report, the following statement of its general features may be of interest:

To supply the City with water from the Perkiomen by constructing a lake or store reservoir between Swenksville and Zieglersville, in Montgomery county, a distance of twenty-six and a half miles from Broad and Market streets. The water in this reservoir to be sixty-five feet deep, and to cover an area of 1500 acres. The lake to have an available storage capacity of over 5,000,000,000 gallons. At this point, the estimated average daily flow of the Perkiomen is 240,000,000 gallons. Of this, it is proposed to take 150,000,000 gallons, and convey it by an aqueduct delivering the water into a reservoir in the northern part of the City, capable of storing 1,000,000,000 gallons. The surface of the water in the proposed reservoir to be seventy-five feet higher than that in the reservoirs at Fairmount. The water to be conveyed from this reservoir to the several centres of distribution in the City by large iron mains The permanent parts of the Works to be constructed with a capacity

of 150,000,000 gallons per day. The distributing mains and such parts of the Works as can be readily duplicated and enlarged, to have a capacity of 75,000,000 gallons per day, at first, and to be enlarged as the demands of the City increase.

The principal cities of the civilized world are now either enlarging their water works, or looking for an additional supply from new sources. The following statement of the present and proposed works of several cities, will enable you to form an idea of the merits of the Perkiomen scheme, as compared with those of Paris, London, and New York:

PARIS has a population of 1,600,000, and an average daily water supply of 32,563,000 gallons, or twenty gallons per inhabitant, furnished by aqueduct, by pumping, and by artesian wells. This supply is being enlarged from several sources, and when the new works projected and now in course of construction, are finished, the city will have a daily supply of 105,400,000 gallons, or sixty-six gallons per inhabitant.

LONDON has a population of 3,200,000, and an average daily water supply, furnished by seven companies, of 108,500,000 gallons, or thirty-four gallons per inhabitant. The new works, to bring in the head waters of the Severn, will furnish, as it is proposed to construct them, 120,000,000 gallons per day, or thirty-seven and a half gallons per inhabitant, and, when the full capacity of the works is used, 220,000,000 gallons per day, or sixty-eight and three-quarter gallons per inhabitant. There is another project for supplying London from the lakes of Cumberland and Westmoreland, at a distance of 240 miles. By this scheme it is proposed to furnish 250,000,000 gallons per day, or seventy-eight gallons per inhabitant.

NEW YORK has a population of 800,000, and an average daily water supply by the Croton aqueduct, of 35,000,000 gallons, or forty-three and three-quarter gallons per inhabitant. When the

improvements now being made to these works are completed, 60,000,000 gallons per day will be furnished, or seventy-five gallons per inhabitant.

PHILADELPHIA has a population of 750,000, and an average daily water supply of 35,000,000 gallons, or forty-six and a half gallons per inhabitant, furnished by fifteen pumps propelled by water power, and ten by steam. The new Works proposed; viz:—bringing in water from the Perkiomen, will supply 75,000,000 gallons per day, or 100 gallons per inhabitant, and when the full capacity of the Works, as projected, is required, 150,000,000 gallons per day, or 200 gallons per inhabitant, will be furnished.

The supply of these four cities, when the projected new Works and the improvements in the old are completed, will be, per inhabitant:

Paris, an average of - - - -	66	gallons	per day.
London (from the Severn), - - -	68¾	"	"
London (from the north county lakes), -	78	"	"
New York, from present Works, - -	75	"	"
Philadelphia, from the Perkiomen, - -	200	"	"

The Department has made numerous surveys and examinations of the country around the City, in all directions, and has collected a large amount of *data* and information, looking to the future wants of our rapidly increasing City in reference to a water supply.

The old Works now in use are capable of being enlarged to almost any extent, and the amount of water procurable from the Schuylkill may be said to be inexhaustible, so far as a supply to the City is concerned. A large amount of capital has been invested in building the dam, paying damages, purchasing water rights, and erecting Works; yet, notwithstanding all these considerations, it may be advantageous to the City to abandon all of these, and look

to other sources for a water supply. But this should not be done without careful consideration and most satisfactory reasons.

The present means of furnishing water, except the Fairmount Works, are expensive; most of the steam pumping machinery being of the least effective kind, using large quantities of coal, and requiring extensive repairs.

In the appropriation asked for, in the Annual Estimate of the Department for 1867, there is an item of ten thousand dollars, for the purpose of laying before you a Report on the whole subject of the Sources of Supply, which it is proposed to make as exhaustive as possible, in order that you may adopt some comprehensive plan, in accordance with which all further extensions and new improvements may be made, and looking to an ample supply of pure and limpid water for some time to come.

CONDITION AND OPERATION OF THE WORKS.

FAIRMOUNT DAM.

The crib sunk in front of the dam for the purpose of protecting its foundation, in deep water, is now finished and made secure. During the progress of this work which was much delayed by the contractors, who finally abandoned it, making it necessary for the Department to finish it, parts of the crib were several times destroyed by freshet, greatly increasing the expense and delaying the completion of the work, but it is believed that it will now withstand any force that may be brought to bear upon it. The ice pier at the eastern end of the dam has also been rebuilt. The top log of the dam should be renewed, and the dam refilled where stones have been washed out. With these repairs, it will need no further attention for several years. The amount expended upon the repair

of the dam this year was $13,329 32, making the whole expense of this work $41,271 29.

FAIRMOUNT WORKS.

These Works have required a large amount of repairs during the year. This is accounted for by the great amount of water pumped, and by the dilapidated and worn condition of the old wheels and pumps. It is almost impossible to keep some of the old pumps in running order. The pump in connection with the turbine in the old mill-house has been improved, so that it can be run at a much greater speed; and, as a consequence, a larger amount of water elevated, with a saving of power, by allowing the wheel to be run at a velocity nearer to that required to procure the highest co-efficient of useful effect. The pump to wheel No. 1 has also been improved in efficiency, so that it is now run with apparently as little power, pumping into the Corinthian Avenue reservoir, as formerly, when discharging into those at Fairmount, which are twenty-five feet lower. This is the only one of the old pumps that can be used to pump into the Corinthian Avenue reservoir. One of the mortice bevel wheels, which is broken, is still in place. A new wheel has been prepared, turned and fitted, and is now at the Works, ready to take the place of the broken one, whenever it may fail. The defects of the gearing have been, to a considerable extent, remedied; but the wheels will never work to entire satisfaction until the bevel gearing is all replaced by properly proportioned wheels. The rebuilding of these Works should be commenced at once. By placing turbines and new pumps in the old mill-house, the capacity of the Works can be increased ten million gallons per day, except in seasons of drought, when, for a short time, there is not water enough to run all the wheels

It is to be regretted that in your appropriation of one million dollars loan for extending the Water Works, no provision was

made to do this work. It was the most important of the improvements suggested in my Report, upon which the loan was made.

The forty-eight inch main connecting these Works with the Corinthian Avenue Reservoir, has enabled the pumps in the New Mill House to be used to their full capacity, which, in favorable conditions of the tide, is 20,000,000 gallons per day. On the twenty-first of August, 21,380,300 gallons were pumped by the three new wheels and six pumps.

The entire cost of the New Mill House, machinery, connection with the Old Works, and the forty-eight inch main to Corinthian Avenue Reservoir, was $237,528 12 as follows: for Mill House, $73,050 05; machinery, $67,975 98; connections to Old Works, $15,825 02; forty-eight inch main, $80,674 80.

All of the city, lying east of the Schuylkill, is now supplied by these Works, and as a consequence the running expenses of the Schuylkill and Delaware Works are saved. Except in case of accident or repairs at Fairmount, the water can all be pumped at this point, during six or seven months of the year. The Steam Works are required to make up deficiences in the seasons of greatest demand, and when there is not sufficient water to drive all the wheels at Fairmount. The saving in the running expenses by these arrangements will not be less than $30,000 for the next year, which will be the first year in which the full economical value of these improvements is experienced.

The total amount of water pumped, during the year, at Fairmount, was 7,721,817,582 gallons, (see Table No. 1,) being 637,801,942 gallons more than in 1865. The total cost of running the Works, was $15,541 54, a saving of $1,128 11 on the expenses of 1865; allowing for the additional amount of water pumped, a saving of $2,625 42, largely effected in oil, there being a saving in the amount used as well as in the cost of oil. Petroleum has been used instead of the more expensive animal oils. The value of this oil as a lubricator, as compared to animal oils, is as 585 is to 369;

No. 1. OPERATIONS OF THE FAIRMOUNT WORKS DURING THE YEAR 1866.

MONTH.	WATER.		OIL.		TALLOW.	
	Gallons of Water pumped during the Month.	Average number of Gallons pumped per Day.	Quarts of Oil used during the Month.	Duty in millions Gallons raised one foot high per Quart of Oil.	Pounds Tallow used during the Month.	Duty in million Gallons raised one foot high, per pound Tallow.
January	419,949,261	13,546,750	120	350	10	4,199
February	398,869,131	14,245,326	72	554	14	2,819
March	482,814,378	15,574,657	88	549	24	2,012
April	576,559,706	19,218,656	78	739	23	2,506
May	574,502,616	18,532,342	108	532	25	2,298
June	752,987,376	25,099,579	110	684	15	5,019
July	828,804,868	26,735,640	140	592	46	1,801
August	852,167,095	27,489,261	104	819	64	1,331
September	659,144,137	21,971,471	120	549	59	1,117
October	752,653,303	24,279,138	122	616	32	2,352
November	707,566,184	22,824,715	132	537	25½	2,774
December	715,799,527	23,090,307	108	606	24	2,982
Total	7,721,817,582	21,155,664	1,302	585	361½	2,136

that is, one quart of Petroleum raised 585 million gallons one foot high, when one quart of animal oil raised 369 million gallons the same height, representing a saving of 198 gallons of oil in the year at these Works.

In good stages of the river and tides, 30,000,000 gallons daily can be supplied to the city from these Works, and if they are remodeled as proposed, this can be increased to 40,000,000 gallons.

These Works have been kept in a most satisfactory condition, and have been much improved each year they have been in charge of the present engineers. The improvements in the working and appearance of the machinery are manifest to the most casual observer.

No. 2. COAL, TALLOW AND OIL ACCOUNT OF FAIRMOUNT WORKS, FOR 1866.

MONTH.	COAL.		TALLOW.		OIL for Machinery.	
	Amount of Coal received.	Amount of Coal consumed.	Amount of Tallow received.	Amount of Tallow consumed.	Amount of Oil received.	Amount of Oil consumed.
	Tons.	Tons.	Pounds.	Pounds.	Quarts.	Quarts.
Am't on hand Jan. 1,						
January				10	184	120
February	15			14		72
March	10			24	354	88
April	3			23		78
May				25		108
June				15	334	110
July			311	46		140
August				64		104
September				59		120
October	30			32	176	122
November	10		305	25½	840	132
December		53		24		108
Total	68	53	616	361½	1,888	1,302

RUNNING EXPENSES OF FAIRMOUNT WORKS.

Salaries of Engineers and Labor, . . .	$4,900	00
Gas for lighting, ...	1,572	30
68 Tons of coal for warming Works, at average price $6\frac{90}{10}$ per ton, ...	469	25
472 gallons of oil, at average price $80\frac{1}{2}$ cents,	379	96
616 pounds of tallow, " " $15\frac{17}{100}$ " .	93	46
Packing and small stores, ...	928	43
Repairs, ...	7,198	14
	$15,541	54
Interest on cost of Works and water power,	36,000	00
	$51,541	54
Cost of raising water into reservoir per million gallons, including interest on cost of Works,	$6	67
Not including interest on cost of Works, .	2	01
Cost of raising water per million gallons one foot high, including interest on cost of Works,		06
Not including interest on cost of Works, .		02

SCHUYLKILL WORKS.

The machinery at these Works is in good repair and will require but little attention during the year; unless some accident should happen. The weak parts of the machinery have been renewed and strengthened from time to time, so that a failure of the machinery is now of very rare occurrence.

The amount of water supplied from these Works was 1,057,386,058 gallons less than in 1865; this amount has been made up by the Fairmount Works.

While there has been a marked saving in coal, oil and tallow, and in every other expense, except wages, the cost of pumping at

these Works has not been so low as in previous years. This is accounted for by the fact that the permanent expenses have been the same, while the amount of water pumped has been less than one half that of 1865.

It will be seen by the coal accounts that there is now 1,656 tons of coal in the schute, 1,178 tons of which has been saved from the supply purchased for the year.

The management of the engines at these Works has been most satisfactory. The machinery has been improved in efficiency, and is now in a much better condition than when the present engineers first took charge of them.

It will not be necessary to run these Works more than eight months of the year, and to their full capacity not more than four months.

RUNNING EXPENSES OF SCHUYLKILL WORKS.

Salaries of engineers and fireman, . . .	$8,267 67
$2,214\frac{13}{20}$ tons of coal at average price of $5 28 per ton,	11,710 08
127 gallons of oil at average price, $72\frac{31}{100}$ cents,	91 90
978 pounds of tallow " " $11\frac{97}{100}$ cents,	116 16
Gas for lighting Works, ...	358 03
Packing and small stores, ...	700 00
Repairs, ...	2,827 34
	$24,071 18
Interest on cost of Works, ($150,000),	9,000 00
	$33,071 18

Cost of raising water in reservoir, per million gallons, including interest on cost of Works, . .	$34 92
Not including interest on cost of Works, . .	25 40
Cost of raising water, per million gallons, one foot high, including interest on cost of Works, . .	30
Not including interest on cost of Works, . .	13

No. 3. OPERATIONS OF THE SCHUYLKILL WORKS DURING THE YEAR 1866.

MONTHS.	WATER.		COAL.		OIL.		TALLOW.	
	Gallons of Water pumped during the Month.	Average number of Gallons pumped per Day.	Pounds of Coal consumed during the Month.	Duty in Gallons raised one foot high, per pound of Coal.	Quarts of Oil used during the Month.	Duty in millions Gallons raised one foot high, per quart of Oil.	Pounds Tallow used during the Month.	Duty in million Gallons raised one foot high, per pound Tallow.
January	98 409,324	3,177,720	248,416	45,551	24	472	57	199
February	89 307,450	3,189,552	265,328	38,789	36	285	83	124
March	106,276,992	3,428,290	259,728	47,058	23	531	59	207
April	93,402,156	3,113,405	246,624	43,550	26	413	78	137
May	145,630,766	4,697,766	332,080	54,813	28	650	71	256
June	99,960,640	3,332,021	236,992	48,530	24	479	51	225
July	84,790,640	2,735,881	170,576	57,155	12	812.5	33	293
August	*42,884,280	2,522,604	122,080	40,365	12	411	27	182
September	†34.790,760	4,970,108	74,032	53,935	10	400	21	190.5
October	72,242,160	4,515,135	194,208	42,768	16	519	60	138
November	79,957,260	3,997,863	150,528	61,076	17	540	39	235
December								
Total	947,652,428	3,484,016	2,300,592	48,368	228	477	579	188

August, *17 days' pumping; September, †7 days' pumping; October, 16 days' pumping; November, 20 days' pumping.
Average duty for the year, 40,145,440 pounds raised one foot high by the consumption of 100 lbs. of anthracite coal.

No. 4. COAL, TALLOW AND OIL ACCOUNT OF SCHUYLKILL WORKS, FOR 1866.

MONTHS.	COAL.					TALLOW.		OIL for Machinery.	
	Amount of Coal received.			Amount of Coal consumed.		Amount of Tallow received.	Am't Tallow consumed.	Amount of Oil received.	Amount of Oil consumed.
	Tons.	Cwt.	lbs.	Tons.	Cwt	lbs.	lbs.	Qts.	Qts.
Am't on hand Jan. 1,	480	8	17			198		224	
January	92	10		110	18	245	57		24
February	39	11		118	9		83	160	36
March				115	19	298	59	348	23
April	143	10		110	2		78		26
May	189	4		148	5		71		28
June	714	4		116	6		51		24
July	12	4		76	3		33		12
August	200			54	10	435	27		12
September	109	18		33	1		21		10
October				86	14		60		16
November	675	15		67	4		39		17
December	37	17							
Total	2,695	1	17	1,037	11	1,176	579	732	228

DELAWARE WORKS.

The machinery of these Works is in good condition, with the exception of the valve-house to pump No. 1. This has been cracked for several years, and its removal has at last become necessary; it is now being taken out, and a new one prepared. The engineers and hands in charge of the Works are putting everything in perfect order. Two new boilers have been placed in the Works, and paid for out of the item of Repairs. This improvement has not only added materially to the efficiency of the engines,

but has also effected a saving in coal, by allowing a more perfect combustion of fuel. The Works have been more than doubled in capacity, by the addition of these boilers and the stand-pipe. In July a daily average of 6,067,012 gallons was furnished by them.

In the estimates for next year, provision is made for running these Works six months, but if no accident occurs to the Works on the Schuylkill, they will only be run in seasons of greatest demand, or when the water is low in the Schuylkill. Without entering into a discussion on the quality of the water supplied by these Works, it is evident that a majority of the citizens object to the use of water taken from the Delaware at the point where the Works are located. The Board of Health have reported it unfit for culinary purposes or for drinking, and attribute the prevalence of the cholera to a greater extent in portions of this district than in other parts of the city, to the quality of the water furnished; but as the larger part of the district remained healthy, and in the small portion which suffered there were abundant local causes for the prevalence of the disease, the conclusion of the Board of Health may not be correct. The water furnished by the Works in its worst condition, was far less noxious than that taken from shallow wells fed by surface water, used by many in this district.

No pumping will hereafter be done at these Works, except in case of necessity; but without additional pumping machinery on the Schuylkill, it will be necessary to use them at times. No water has been pumped by them since the 10th of October. They will continue to be kept in repair and in charge of an engineer and two watchmen.

The district supplied by these Works is one of the most important in the city, on account of the large amount of water furnished to manufactories; the revenue derived from this source will enable the city to incur considerable expense in order to furnish a full and satisfactory supply.

No. 5. OPERATIONS OF THE DELAWARE WORKS DURING THE YEAR 1866.

MONTHS.	WATER.		COAL.		OIL.		TALLOW.	
	Gallons of Water pumped during the Month.	Average number of Gallons pumped per Day.	Pounds of Coal consumed during the Month.	Duty in Gallons raised one foot high, per pound of Coal.	Quarts of Oil used during the Month.	Duty in millions Gallons raised one foot high, per quart of Oil.	Pounds Tallow used during the Month.	Duty in million Gallons raised one foot high, per pound Tallow.
January	87,735,810	2,830,187	449,798	21,594	10	982	54	183
February	76,935,540	2,747,698	371,185	23,206	6	1.436	44	196
March	101,199,200	3,264,490	602,220	18,816	13	872	34	333
April	109,008,800	3,633,627	627,517	19,454	14	872	35	349
May	133,790,320	4,315,817	635,101	23,587	23	651	44	341
June	142,925,810	4,764,193	647,210	24,752	23	696	46	348
July	188,077,400	6,067,012	822,452	25,536	36	585	52	405
August	176,001,530	5,677,468	864,005	22,736	33	597	58	339
September	163,682,320	5,456,077	809,526	22,624	33	555	60	305.5
October	*92,484,290	4,624,214	414,860	28,964	23	450	39	265
November								
December								
Total	1,271,841,020	4,835,897	6,243,874	22,814	214	665.6	466	305.6

* Pumped 20 days. Average duty for the year, 18,935.625 pounds raised one foot high by consumption of 100 lbs. of Coal

No. 6. COAL, TALLOW AND OIL ACCOUNT OF DELAWARE WORKS, FOR 1866.

MONTHS.	COAL.						TALLOW.		OIL for Machinery.	
	Amount of Coal received.		Amount of Coal consumed.				Amount of Tallow received.	Amount of Tallow consumed.	Amount of Oil received.	Amount of Oil consumed.
	Tons.	Cwt.	Tons	Cwt.	Qr.	lbs.	lbs.	lbs.	Qts.	Qts.
Am't on hand Jan. 1,	400						200		160	
January	16		200	16	0	6	206	54	158	10
February			165	14	8	2		44		6
March	188		267	1	3	18		34		13
April	314		280	0	1	3	224	35		14
May	292	12	283	1	0	6		44		23
June	300		288	1	3	13		46		23
July	531		367	0	1	9		52		36
August	440		385	1	1	20	207	58		33
September	50		361	0	3	4		60		33
October	652	12	185	0	1	18		39	176	23
November			6					4		4
December			20					4		6
Total	3,184	4	2808	10	0	14	837	474	494	224

RUNNING EXPENSES OF DELAWARE WORKS.

Salaries of engineers, firemen, &c.,	$6,790 08
2,774 4-20 tons of coal at average price,	16,974 33
83½ gallons of oil at average price, 68 cents,	56 80
637 pounds of tallow " 18 "	117 66
Oil and gas for lighting works,	263 42
Packing and small stores,	800 00
Repairs,	7,152 81
	$32,155 10
Interest on cost of works, ($150,000,)	9,000 00
	$41,155 10

Cost of raising water into reservoir, per million gallons, including interest on cost of works, -	32 38
Not including interest on cost of works, - -	25 29
Cost of raising water per million gallons, one foot high, including interest on cost of works, -	28 8-10 cents.
Not including interest on cost of works, -	22 "

TWENTY-FOURTH WARD WORKS.

The machinery in these Works, having for years been constantly overworked, requires extensive repairs. The operation of the Works has been very satisfactory, and a saving has been effected in coal, oil, tallow and repairs, exhibiting a larger proportional saving than in any other Works, the amount being $7,201 11. These engines are the most effective in the Department, raising with a pound of coal, 59,823 gallons one foot high. In the Schuylkill Works one pound of coal will raise 48,368 gallons; at the Germantown Works it will raise 25,436 gallons, and at the Delaware Works, but 22,814 gallons.

The amount of water furnished by these Works has been 70,742,020 gallons greater than in 1865. A better management is exhibited each successive year since they have been in charge of the present engineers. Notwithstanding there is no reservoir, a constant supply has been maintained, except a few nights and eight hours of one day.

A conduit has been constructed across the mud-flat in front of these Works, and the water is now taken from the deepest part of the river. This conduit is six feet wide, four feet six inches deep, and four hundred and seventeen feet long. No special appropriation was made for the work. The proposal submitted you, of forming a subsiding reservoir where this mud-flat now is, failed to meet your approbation.

The water from the inlet was entirely unfit for use, and the case being one of pressing necessity, the work was done without direct

authority from Councils, and paid for out of the appropriation for keeping buildings and grounds in order; it cost $1,620 63. I would again urge upon you the subsiding reservoir recommended for these works. The water would be much improved in quality by such an arrangement. This, with the new engine now being constructed, and the reservoir at Landsdown, will make these Works complete and sufficient for many years. The operation of these Works is shown by table No. 7.

RUNNING EXPENSES OF TWENTY-FOURTH WARD WORKS.

Salaries of engineers and firemen, - - - -	$4,400 00
1,131 17-20 tons of coal at average price, $6 32 -	7,158 41
41 gallons of oil at average price, 71 22-100 cents,	29 20
591 pounds of tallow " 14 84-100 "	87 73
Coal oil for lighting works, - - - - -	132 50
Packing and small stores, - - - - -	356 86
Repairs, - - - - - - - - -	1,652 27
	$13,816 97
Interest on cost of works, ($55,000,) - - -	3,300 00
	$17,116 97

Cost of raising water into stand-pipe per million gallons, including interest on cost of works, -	28 24
Not including interest on cost of works, - -	22 80
Cost of raising water per million gallons one foot high, including interest on cost of works, -	12 2-10 cents.
Not including interest on cost of works, -	9 9-10 "

No. 7. OPERATIONS OF THE TWENTY-FOURTH WARD WORKS DURING THE YEAR 1866.

MONTHS.	WATER.		COAL.		OIL.		TALLOW.	
	Gallons of Water pumped during the Month.	Average number of Gallons pumped per Day.	Pounds of Coal consumed during the Month.	Duty in Gallons raised one foot high, per pound of Coal.	Quarts of Oil used during the Month.	Duty in millions Gallons raised one foot high per Quart of Oil.	Pounds Tallow used during the Month.	Duty in million Gallons raised one foot high, per pound Tallow.
January	42,981,390	1,386,496	189,000	52,302	3	3,295	30	329
February	39,587,400	1,413,835	159,800	56,971	3	3,035	32	285
March	45,710,550	1,474,534	197,500	53,222	3	3,504	32	329
April	45,262,350	1,508,745	173,400	60,030	3	3,470	28	372
May	49,030,020	1,581,613	192,200	58,673	3	3,759	24	470
June	51,398,010	1,713,267	195,400	60,490	3	3,940	28	422
July	65,324,160	2,107,230	234,000	63,020	3	5,008	40	375.8
August	58,994,660	1,903,208	228,000	59,340	3	4,523	24	565
September	54,697,140	1,823,238	218,600	57,500	4	3,145	34	410
October	53,097,250	1,712,814	188,800	64,676	3	4,070	32	381
November	50,231,250	1,620,363	181,500	63,641	5	2,301	24	481
December	50,361,200	1,624,232	173,400	66,992	2	5,790	26	426
Total	606,665,380	1,662,099	2,331,600	59,823	38		354	

Average duty for the year, 49,653,090 pounds raised one foot high by the consumption of 100 pounds of anthracite coal.

No. 8. COAL, OIL AND TALLOW ACCOUNT OF TWENTY-FOURTH WARD WORKS, FOR 1866.

MONTHS.	COAL.								TALLOW.		OIL FOR MACHINERY.	
	Amount of Coal received.				Amount of Coal consumed.				Amount of Tallow received.	Amount of Tallow consumed.	Amount of Oil received.	Amount of Oil consumed.
	Tons.	Cwt.	Qr.	Lbs.	Tons.	Cwt.	Qr.	Lbs.	Pounds.	Pounds.	Quarts.	Quarts.
Am't on hand Jan. 1,	75	9	3	26					150		140	
January					84	6	0	8		30		3
February	61	12	0	6	71	0	2	20		32		3
March	101	13	1	26	87	2	1	10		32	64	3
April	101	13	0	14	77	0	3	8	293	28		3
May	111	13	3	10	85	1	2	12		24		3
June	117	18	0	1	87	0	1	24		28		3
July	100	14	2	11	104	0	3	20		40		3
August	60	15	0	25	101	1	2	8		24		3
September	150	1	2	7	97	1	0	20		34		4
October	93	19	2	26	84	0	2	8	298	32		3
November	139	4	0	12	81	0	0	6		24		5
December	92	11	1	20	77	0	3	8		26		2
Total	1,207	7	0	16	1,035	17	0	12	741	354	304	38

GERMANTOWN WORKS.

These Works came under the care of the Department in May; they will be used for supplying Germantown until the new Works at Roxborough are completed. The water is now taken from a small stream and impounded in a dam, from which it is pumped. A large amount of detritus was taken out of the catch-dams where the water enters, and no complaints as to the quality of the water have since reached the Department. During the season of greatest demand, there was a scarcity of water; with the assistance of the citizens, however, who used as little as possible, a supply was kept up, but notwithstanding all this care, the water in the dam was several times almost exhausted.

To give Germantown a supply adequate to its greatest demands, will require about one million gallons per day. The largest amount furnished was in July, when an average of 680,253 gallons was pumped. It will be necessary to make the connecting main from Roxborough sufficient to supply double this amount. If the reservoir at Mount Airy could be bought at a fair price, it would be to the advantage of the city to purchase and rebuild it. It is expected to have this district supplied from the Schuylkill, by the Roxborough Works before the first of July. Table No. 9, exhibits the operation of the Works.

RUNNING EXPENSES OF GERMANTOWN WORKS.

Salaries of engineers and firemen,	$1,361	08
436 tons of coal at average price,	2,944	20
42½ gallons of oil,	29	12
420 pounds of tallow,	67	95
Packing and small stores,	94	32
Repairs,	1,153	66
	$5,650	33
Interest on cost of Works, ($112,000,)	6,720	00
	12,370	33

No. 9. OPERATIONS OF THE GERMANTOWN WORKS DURING THE YEAR 1866.

MONTHS.	WATER.		COAL.		OIL.		TALLOW.	
	Gallons of Water pumped during the Month.	Average number of Gallons pumped per day.	Pounds of Coal consumed during the Month.	Duty in Gallons raised one foot high per pound of Coal.	Quarts of Oil used during the Month.	Duty in millions Gallons raised one foot high per quart of Oil.	Pounds Tallow used during the Month.	Duty in millions Gallons raised one foot high per pound Tallow.
January								
February								
March								
April								
May	8,769,140	515,831	71,680	28,152	5	403.	12	168.
June	15,398,020	592,231	120,960	29,790	10	354.	27	131.
July	17,686,000	680,253	145,600	27,830	11	369.7	27	150.6
August	13,026,500	482,463	112,000	26,680	9	332.	33	90.
September	14,290,800	571,632	118,720	29,440	11	298.	39	83.6
October	15,475,000	573,148	143,360	24,817	14	254.	40	88.
November	12,067,800	482,712	109,760	25,277	12	231.	45	61.
December	9,655,800	386,232	89,600	24,771	11	201.8	45	49.
Total	106,369,060	537,217	911,680	25,436	83	294.7	268	80.

Pumped in May, 17 days; June 26 days; July 26 days; Aug. 27 days; Sept. 25 days; Oct. 27 days; Nov. 25 days; Dec. 25 days.
Average duty during the year 21,111,880 lbs. raised one foot high by consumption of 100 lbs. anthracite coal.

No. 10. COAL, TALLOW AND OIL ACCOUNT OF GERMANTOWN WORKS FOR 1866.

MONTHS.	COAL.		TALLOW.		OIL for machinery.	
	Amount of Coal received.	Amount of Coal consumed.	Amount of Tallow received.	Amount of Tallow consumed.	Amount of oil received.	Amount of oil consumed.
	Tons.	Tons.	lbs.	lbs.	Qts.	Qts.
Am't on hand Jan. 1,						
January						
February						
March						
April						
May	36	32		12		5
June	74	54	239	27	170	10
July	50	65		27		11
August	50	50		33		9
September	50	53		39		11
October	66	64		40		14
November	49	49		45		12
December	61	40	181	45		11
Total	436	407	420	268	170	83

Cost of raising water into reservoir, per million gallons including interest on cost of Works, . . $116 70

Not including interest on cost of Works, . . 53 30

Cost of raising water per million gallons one foot high, including interest on cost of Works, . 50 5-10 cents.

Not including interest on cost of Works, . 23 1-10 cents.

Quantity of Water Pumped by all the Works.

The amount of water furnished this year was 436,226,720 gallons less than last year, while the number of new attachments made was thirteen hundred and forty-eight, and the revenue from water was $30,614 00 more than in 1865. This has been the result of repairing the numerous leaks in the mains, and the prevention of useless waste of water, in which the police have rendered valuable assistance. By stopping this useless waste, $5,829 60 has been saved in pumping expenses.

Several times during the summer, the demands upon the Works exceeded their utmost capacity, and the reservoirs were almost exhausted. One of the days when the largest demands were made upon the Works, was the 9th of July, when 46,408,917 gallons were furnished from the different Works and reservoirs. At Fairmount, 38,494,997 gallons were pumped; at the Schuylkill Works, 2,689,920 gallons; at the Delaware Works, 6,279,000 gallons; at the Twenty-fourth Ward Works, 2,592,000 gallons; and at the Germantown Works, 650,000 gallons. From the reservoirs at Fairmount, 1,500,000 gallons were drawn; from Corinthian Avenue 2,000,000 gallons; from Spring Garden, 1,000,000 gallons; from Kensington, 1,000,000 gallons; from Mount Airy, 200,000 gallons.

AMOUNT OF WATER PUMPED BY ALL THE WORKS DURING THE YEAR 1866.

	Gallons of water pumped during the month.	Average number of gallons pumped per day.
January, . . .	609,075,785	20,941,153
February, . . .	604,699,521	21,596,411
March, . . .	736,001,120	23,741,971
April, . . .	824,233,012	27,474,433
May, ...	911,722,862	29,690,164
June, ...	1,062,669,856	35,538,137
July, ...	1,184,683,068	38,402,986
August, . . .	1,143,074,065	36,873,356
September, . . .	926,605,151	30,886,811
October, . . .	985,952,003	31,804,901
November, . . .	849,821,494	27,413,627
December, . . .	775,806,527	25,026,527
	10,614,344,464	29,080,396

COST OF PUMPING.

The cost of pumping water has been reduced this year, as compared with former years. In 1864, the average cost of pumping one million gallons was $17 18; in 1865, $15 27; and in 1866, $13 59; making a total saving in pumping expenses, in 1866, as compared with 1865, of $18,706 02, and as compared with 1864, a saving of $37,723 72. The coming year, the saving will be fully equal to that of the past two years.

RESERVOIRS.

These are all in a satisfactory condition.

In introducing the water from the forty-eight inch main into the Corinthian Avenue reservoir, the water was taken over the top, instead of into the bottom of the reservoir, as has been the

case in all the other connections. This was done in order to avoid the risk of disturbing the embankment. The connection between this reservoir and Kensington is also completed, and answers perfectly.

The Works are now more deficient in reservoir capacity than in any other feature; the reservoirs, as compared with the amount of water furnished, are only equal to two days' supply. Last summer they were frequently almost exhausted, and the failure of one of the Works would doubtless have exhausted them entirely.

The Roxborough reservoir will be ready for use in June.

Work has been commenced on the Twenty-fourth Ward reservoir, but this cannot be finished under two years. Your action, increasing its capacity from 25,000,000 gallons, to 200,000,000 gallons, will greatly benefit the entire city. The water in this reservoir will be at an elevation superior to that in any other, except the one at Roxborough, and by connecting it with the other reservoirs, deficiency can be supplied. It can also be made to supply the higher parts of the Twentieth Ward, at a small expense.

The present Works require reservoir capacity to store at least 500,000,000 gallons, and even with the new reservoir, we shall still be deficient in storage capacity.

Buildings and Grounds.

It will be necessary to spend a large amount of money upon the buildings the coming year. Much of the wood work in the Old Mill-house requires renewing. The entire roof of the Schuylkill Works should be renewed, the gas from the coal having destroyed the tin covering.

The grounds at Fairmount have been kept in as good condition as the limited appropriation made for the purpose would allow. The grass has been greatly improved by careful culture, and will

present a still better appearance next season. The drive on the north side has been gravelled, and finished, and has become a favorite with visitors. Several new drains and gutters have been constructed. The only portion of this park now unimproved, is that lying between the road and the river. Considerable work has been done upon it, and efforts will be made to complete the improvements during the year, if the means can be procured. Sixty-two additional settees have been placed in the grounds. Three rustic summer-houses have been constructed, and a fourth is now being built. These are attractive in appearance, and form places of rest and shelter for the numerous visitors to the park. One is placed on the second terrace in line with the Wire Bridge; from it a fine view is obtained of the river and city. One is on the top of the reservoir, opposite Spring Garden street, from which a view is obtained through an opening in the trees. Another is placed near the lower fountain, in that portion of the grounds north of the reservoir. That now being built is on the west side of the reservoir, where the ascending walks meet.

A large marble vase has been purchased, and placed in the grounds.

These improvements, although they appear trifling, have increased the attractiveness of the place, and added greatly to the comfort and pleasure of the many citizens who frequent this favorite resort. It certainly would not be a waste of money, even if our finances were in a far worse condition, to make an annual appropriation, say of but ten thousand dollars, for the improvement of these grounds.

Operations of the Shop.

As the Water Works are extended the usefulness of the shop is increased, and the necessity of enlarging and improving it becomes more apparent. I would again suggest the appropriation of $15,000 for this purpose.

The management of the shop has been satisfactory. It has produced a profit of $6,620 41, as will be seen by the following statement of its operations.

STATEMENT OF THE OPERATIONS OF THE SHOP, FROM JANUARY 1st, TO DECEMBER 31st, 1866.

Dr. to stock on hand January 1st, 1866,							$3,859 24
"	34,194 lbs. wrought iron,	at average	6 cts.				2,051 64
"	1,515¾ lbs. steel,	"	"	23 5-10	cts.		358 09
"	146,270 " cast iron,	"	"	3 7-8	"		5,629 21
"	9,652½ " brass castings,	"	"	36½	"		3,523 16
"	7,124 " lead,	"	"	10	"		712 40
"	32,286 feet of lumber,	"	"	4½	"		1,402 87
"	hardware,						394 12
"	paints and oils,						261 43
"	leather and gum,						224 60
"	brooms and brushes,						22 88
"	coal,						563 50
"	scrap iron and brass from various districts and works,						450 00
"	wages paid hands,						10,582 12
"	machine work,						1,947 76
							$31,983 02
Cr. by	802 lbs. ferrules ½ inch	at	70 cts.			561 40	
"	843 " " ⅝ "	"	70 "			590 10	
"	374 " " ¾ "	"	90 "			336 60	
"	181 " " 1 "	"	90 "			162 90	
"	64 stop cocks, 4 "	"	$45 00			2,880 00	
"	76 " " 6 "	"	65 00			4,940 00	
"	4 " " 10 "	"	135 00			540 00	
"	13 " " 12 "	"	165 00			2,145 00	
"	1 " " 30 "	"	450 00			450 00	
	Amount carried forward,					$12,606 00	$31,983 02

Amount brought forward,	$12,606 00	$31,983 02
Cr. by 98 steam fire plugs, at $45 00	4,410 00	
" 189 plug cases, " 20 00	3,780 00	
" 585 stop cock boxes, " 4 00	2,340 00	
" 2 new hydrants, " 30 00	60 00	
" 119 frames and covers " 9 00	1,071 00	
" patterns made and repaired, .	500 00	
" scrap iron and brass turnings,	530 00	
" repairs for First District, .	784 06	
" " " Second " . .	1,398 43	
" " " Third " . .	876 16	
" " " Fourth " . .	790 21	
Work done for thirty-inch main,	519 35	
" " " forty-eight inch main, .	1,040 27	
" " " West Philad'a Works,	137 25	
" " " " " Extension,	155 78	
" " " " " Reservoir,	49 60	
" " " Fairmount Works, .	332 36	
" " " " Dam, .	1,428 20	
" " " Schuylkill Works, .	44 85	
" " " Delaware " .	158 58	
" " " Germantown " . .	203 34	
" " " Roxborough " .	966 56	

Stock on Hand.

995 lbs. of forged work, at 20 cents, .	199 00	
12 plug monkeys, " $6 00 .	72 00	
33 sharp thread screws, " 2 50 .	82 50	
6 four-inch, square top screws 8 00 .	48 00	
6 ten " " " " 12 00 .	72 00	
Amount carried forward,	$34,655 50	$31,983 02

Amount brought forward,		$34,655 50	$31,983 02
Cr. by 9 twenty-inch,			
square top screws, at	$16 00	144 00	
" 3 eight-inch, " " "	11 00	33 00	
" 6 six " " " "	9 00	54 00	
" 3 thirty " " " "	20 00	60 00	
" 7 three-inch spindles, at	5 00	35 00	
" 32 six " " "	6 00	192 00	
" 8 four " " "	5 00	40 00	
" 10 ten " " "	7 00	70 00	
" 60 stuffing box bolts, "	25	15 00	
" 24 eye bolts, "	50	12 00	
" 694 lbs. of bolts, $\frac{3}{4}$ "	16	111 04	
" 18 valve rods, "	1 00	18 00	
" 1,304 lbs. finished brasses, at	90	1,173 60	
" 19 pick handles, "	25	4 75	
" 9 brooms, "	50	4 50	
" 16 gum rings, "	10	1 60	
" 8,476 lbs. wrought iron, "	07	593 32	
" 100 lbs. steel, "	26	26 00	
" 26,223 lbs. cast iron, "	04	1,048 92	
" 1,400 feet lumber, "	04	56 00	
" 500 " pattern stuff, "	10	50 00	
" 22 wooden plugs, "	60	13 20	
" 100 lbs. nails, "	07$\frac{1}{2}$	7 50	
" 60 gallons of oil, "	1 20	72 00	
" 15 tons of coal, "	7 50	112 50	
Balance profit of shop,			6,620 41
		$38,603 43	$38,603 43

DISTRIBUTION.

The twelve-inch main laid on Twenty-second street, from Arch to South streets, has greatly increased the supply of water to the south-western portion of the old City. The thirty-inch main on Girard Avenue, Broad street and Lehigh Avenue, has been attached to the mains on the streets which it intersects; this gives a much better supply of water to those parts of the City through which the main passes.

The total amount of pipe laid during the year, was 66,324 feet, of this 47,777 feet were service mains, and 18,607 feeding mains. By the purchase of the Germantown Water Company's distribution, 124,362 feet of service mains is added to the Department, making a total of pipe of all kinds: 2,158,351 feet.

The entire cost of service mains laid during the year, was $2 24 per foot; this is an advance of thirteen cents a foot, over 1865. This increase of expense is wholly in the item of labor. It is not because of neglect or bad management on the part of the purveyors, but is entirely caused by the manner in which the pipe was delivered by the contractors, who were unable to fill their contract on account of the loss of their foundry, patterns and fixtures, by fire. By resolution of Councils the time of this contract, which is an advantageous one to the City, has been extended.

There is a large number of streets where Councils ordered pipe to be laid, in which it has not been done. In some instances the order was given several years ago, but as there did not appear a necessity for the pipe, it has not been laid; a list of these streets will be found in this report. In some of them, however, where the pipe is needed, it has not been laid, because the Department could not procure it.

A number of four-inch attachments have been made with the street mains this year. This has been done for the convenience of

establishments requiring a large amount of water, or as a protection against fire, placing fire plugs in yards and buildings. By resolution of the committee on water, the charge has been twenty dollars for the attachment and the cost of the work to the curb, where a stop is inserted.

DISTRIBUTION.

Service mains have been laid in the following streets, in 1866.

FIRST DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE FIRST, SECOND, THIRD, FOURTH AND TWENTY-SIXTH WARDS.

Street.	Location.	Size. Inches.	Feet.
Twenty-second.	From Washington to Carpenter,	6	408
Alter.	" Twenty-first to Twenty-second,	4	442
Christian.	" Gray's Ferry Road to Sutherland Avenue,	6	468
Burnett.	" Christian to Gray's Ferry Road,	4	361
"	" " " " "	6	12
Evergreen.	" Twenty-first to Twenty-second,	4	416
Bedford.	" Broad to Fifteenth,	4	327
Twentieth.	" Carpenter to Washington,	6	785
Kimball.	" Nineteenth to Twentieth,	4	457
Carpenter.	" " "	6	453
Federal.	" Sixteenth to Seventeenth,	6	480
Sixteenth.	" Catharine to Carpenter,	6	650
Sutherland Ave.	" Shippen to Christian,	6	511
Mifflin.	" Ninth to Twelfth,	6	1364
Twenty-second.	" Washington to Federal,	6	598
Martin.	" Catharine to Fitzwater,	4	332

Street.	Location.	Size. Inches.	Feet.
Bounty.	From Federal to Ellsworth,	4	325
Tenth.	" Mifflin to Morris,	6	750
Ellsworth.	connecting Twenty-second,	6	29
Washington Ave.	connecting Eighteenth,	6	33
Martin.	From Catharine to Fitzwater,	6	12
	Plug connections,	4	278
	" "	3	12
	Total number of feet of pipe laid,		9503
	Or 1.80 miles.		

The number of feet of new pipe laid—	
Of three inch,	12 feet
Of four inch,	2938 "
Of six inch,	6553 "
Total,	9503 "

SECOND DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE SIXTH, SEVENTH, EIGHTH, NINTH, TENTH, TWENTY-FOURTH AND TWENTY-SEVENTH WARDS.

Street.	Location.	Size. Inches.	Feet.
Twenty-second.	From Arch to Market,	12	765
"	" Chestnut to Locust,	12	236
"	" " "	6	876
"	" Arch to Market,	6	59
"	" " "	4	90
"	" Chestnut to Locust,	4	95
"	" Pine to South,	12	705
Pine.	" Twenty-first to Twenty-second,	6	458

Street.	Location.	Size. Inches.	Feet.
Hudson.	From Chestnut, south,	4	50
Walnut.	" Twenty-third to Twenty-fourth,	6	274
Darby Road.	" Market, south, (relaid),	8	105
Market.	" east side of Thirty-second, west, (relaid),	10	108
Thirtieth.	" Market to Oak, (relaid),	6	380
Oak.	" Thirtieth, west, (relaid),	6	150
Chestnut.	" west side of Thirty-eighth, (relaid),	8	72
"	" east side of Thirty-eighth, (relaid),	8	64
"	connecting Twenty-third,	6	72
"	" Thirty-ninth, west,	8	307
Locust.	" Fortieth, west,	6	144
Thirty-fifth.	" Sycamore to Aspen,	6	417
Oak.	" east to west side of Forty-third,	4	48
Thirty-second.	" Chestnut to Darby Road,	4	486
Oak.	" Thirty-second, east,	4	35
	Pine to Ashton,	4	30
Brooklyn.	" Haverford to Lancaster Ave.,	6	1450
Twenty-second.	" Arch to Cherry,	6	300
Thirty-eighth.	" Market to Filbert,	6	287
Filbert,	" Thirty-eighth, east,	6	226
Preston,	" Myrtle to Hutton,	6	111
"	" " "	6	247
Twenty-first.	" north to south side of Pine, (relaid),	6	66
Pine.	" east to west side of Twenty-first, (relaid),	6	42
Wyoming.	" 250 feet north of Haverford Road,	4	255

Street.		Location.	Size. Inches.	Feet.
Lancaster Ave.	"	east to west side of Forty-first, (relaid),	6	60
Cherry,	"	Twenty-third to Schuylkill River,	4	230
Thirty-seventh.	"	Haverford to Elm,	6	427
Arch.	"	Twenty-second, east,	6	28
Cuthbert.	"	" "	4	37
Filbert.	"	" "	6	31
Fairfield.	"	" "	4	27
Naudain.	"	" west,	4	34
Harmstead.	"	" east,	4	31
Tryon,	"	" "	4	30
Wyoming.	"	Haverford, north,	3	11
		Plug connections,	3	29
		" "	4	566
		Total number of feet of pipe laid,		10,551
		Or 1 mile, 5271 feet.		

The number of feet of pipe relaid was—

Of six inch,	698 feet.
Of eight inch,	241 "
Of ten inch,	108 "
Total,	1047 "

Total number of feet of new pipe laid—

Of three inch,	40 feet.
Of four inch,	2044 "
Of six inch,	5407 "
Of eight inch,	307 "
Of twelve inch,	1706 "
Total,	9504 "

Or 1 mile, 4224 feet.

THIRD DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE ELEVENTH, TWELFTH, SIXTEENTH, SEVENTEENTH, EIGHTEENTH, NINETEENTH, TWENTY-THIRD AND TWENTY-FIFTH WARDS.

Street.	Location.	Size. Inches.	Feet.
Huntingdon.	From Almond to Frankford Road,	6	720
Gordon.	" Geisse to Memphis,	4	1620
"	" " "	6	24
Leib.	" Harrison to south line of L. Harrison's estate,	4	257
Sixth.	" Somerset to Clearfield,	10	1548
"	" " "	6	27
Palethorp.	" York to Dauphin,	4	558
Reese.	" Dauphin to York,	4	258
Eyre.	" Wildey to Robertson,	4	207
Penn.	" Allen to Arrott,	6	396
Warren.	" Beach to Richmond,	4	333
Tulip.	" Dauphin to Huntingdon,	6	2079
"	" " "	4	72
Hewson.	" Sepviva to Memphis,	4	514
Aramingo.	" " "	6	575
Unity.	" Frankford Road to Leiper,	6	876
	Delaware Avenue Bridge,	6	78
York.	" Second to America,	6	325
Tulip.	" Dauphin to Huntingdon,	8	36
Sixth.	To 65 feet north of Alleghany Avenue,	10	1200
Beach and Hanover.	Government Buildings,	4	63
Fourth and Diamond.		6	18
Richmond.	Near Bridesburg,	6	9
	Plug connections,	6	294
Total number of feet of pipe laid,			12,087
Or 2 miles, 1527 feet.			

The number of feet of pipe laid—

Of four inch,	4176 feet.
Of six inch,	5127 "
Of eight inch,	36 "
Of ten inch,	2748 "
	12,087 "

FOURTH DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE THIRTEENTH, FOURTEENTH, FIFTEENTH, TWENTIETH AND TWENTY-FIRST WARDS.

Street.	Location.	Size. Inches.	Feet.
Ninth,	From Montgomery Ave to Berks,	6	549
Ridge Avenue,	" Twenty-second to Columbia Avenue,	6	880
Camac,	" Berks to Diamond,	6	570
Uber,	" Montgomery to Columbia Av.,	6	560
Jefferson,	" Twentieth to Ridge Avenue,	6	404
Torr,	" Ninth to Ridge Avenue,	4	417
Twenty-fourth	" Coates to Parrish,	48	1260
"	" " " "	6	48
"	To Fairmount Basin,	48	1212
"	" "	8	12
Venango,	From Township Line Road to Eighteenth,	6	2866
At Roxborough,		3	342
Thirty-first,	" Girard Av. to Thompson,	6	684
"	" Master to Jefferson,	6	270
Twenty-second,	" Ridge Road to Oxford,	6	234
Broad,	" Berks to 100 ft north of Diamond,	6	276
"	" " " " "	12	16

Street.	Location.	Size. Inches.	Feet.
Twenty-sixth,	" Brown to Parrish,	6	126
Master,	" Twenty-third to Twenty-fourth,	6	441
Alder,	" Oxford to Columbia Avenue,	6	531
Warnock,	" " " " "	6	324
Township Line Road, bel. Venango and Roxborough,		6	1716
Thompson, between Thirty second and Thirty-third,			6 486
Thirty-third,	From Thompson to Master,		
Thirty-first,	" Girard Avenue to Thompson,	6	802
Marshall,	" Oxford to Columbia,	6	486
Plug connections,		4	160
Thirty-inch main, connecting Corinthian Avenue reservoir with the Kensington reservoir,		30	15,876
Of		20	107
Of		18	268
Of		16	9
Of		12	37
Of		10	63
Of		6	217
Of		4	320

Total number of feet of pipe laid in the Fourth District, 32,569

Or 6 miles, 889 feet.

The number of feet of pipe relaid was, of 18 inch, 238 feet.

" " " 6 " 170 "

408 "

Total number of feet of new pipe laid was,

Of three inch,	342 feet.
Of four inch,	897 "
Of six inch,	12,300 "
Of eight inch,	12 "
Of ten inch,	63 "
Of twelve inch,	53 "
Of sixteen inch,	9 "
Of eighteen inch,	30 "
Of twenty inch,	107 "
Of thirty inch,	15,876 "
Of forty-eight inch,	2,472 "
	32,161 "

Or 6 miles, 481 feet.

GERMANTOWN.

ACCOUNT OF IRON PIPE LAID IN THE GERMANTOWN DISTRICT, TWENTY-SECOND WARD.

Street.	Location.	Size. Inches.	Feet.
Hancock,	From Price to Chelton Avenue,	4	350
Chelton Avenue	" Hancock to Willow,	6	165
School House Lane, west of Township line,		4	487
Chelton Avenue,	From present terminus to Morris,	4	761
Haines,	" Morton to Main,	6	173
Mill,	" Cumberland to Hancock,	4	250
Washington Lane, east of Railroad (relaid),		3	185
Adams, above Washington Lane (relaid),		3	170
East Tulpohocken (relaid),		3	660
Laid at Dam, from Harvey's Spring,		3	780

Street.	Size. Inches.	Feet.
Morton street, (relaid),	3	60
Chelton Avenue and Wayne (relaid),	4	83
East Washington Lane,	3	26
Plug connections,	4	99
Total number of feet of pipe laid		4,249

The number of feet of pipe relaid was,	
Of three inch,	1,075 feet.
Of four inch,	105 "
	1,180 "
Total number of feet of new pipe laid,	
Of three inch,	806 "
Of four inch,	1,925 "
Of six inch,	338 "
	3,069

In addition to the above, the City has purchased from the Germantown Water Company, their distribution, consisting of the following size pipe:—

Of twelve inch,	725 feet
Of ten inch,	12,013 "
Of six inch,	9,596 "
Of four inch,	38,443 "
Of three inch,	56,738 "
Of two inch,	6,847 "
	124,362 "

No. 11. RECAPITULATION OF PIPE LAID IN THE SEVERAL DISTRICTS DURING THE YEAR 1866.

WARDS.	3 in. diameter.	4 in. diameter.	6 in. diameter.	8 in. diameter.	10 in. diameter.	12 in. diameter.	16 in. diameter.	18 in. diameter.	20 in. diameter.	30 in. diameter.	48 in. diameter.	TOTAL.
1st District, 1, 2, 3, 4, 26,.....	12	2,938	6,553									9,503
2d " 5, 6, 7, 8, 9, 10, 24, 27.....	40	2,044	5,407	307		1,706						9,504
3d " 11, 12, 16, 17, 18, 19, 23, 25,		4,176	5,127	36	2,748							12,087
4th " 13, 14, 15, 20, 21,..... ...	342	897	12,300	12	63	53	9	30	107	15,876	2,472	32,161
Germantown, 22d,.....	806	1,925	338									3,069
Total	1,200	11,980	29,725	355	2,811	1,759	9	30	107	15,876	2,472	66,324

Being a total of 12 miles, 2,964 feet.

Total number of feet of pipe as per last report,.....	1,967,665
Germantown distribution purchased from the Company,.....	124,362
Total number of feet of pipe laid during the year,.....	66,324
	2,158,351 feet,

or 408 miles, 4,141 feet.

SERVICE MAINS ORDERED.

Councils have ordered pipe laid in the following streets:

FIRST DISTRICT.

Pipe ordered to be laid in the First District.

Street.	Location.
Moore.	From Seventh to Ninth.
Taylor.	" Eighth to Ninth.
Twenty-Sixth.	" Park to Gray's Ferry Road.
Twelfth.	" Wharton to Passyunk Road.
Price.	" Seventh to Eighth.
Reed.	" Eleventh to Thirteenth.
Moore.	" Ninth to Broad.
Fernon.	" Tenth to Eleventh.
Reed.	" Fifteenth to Sixteenth.
Montrose.	" Jessamine, west 170 feet.
Pierce.	" Passyunk Road to Thirteenth.
Twenty-third.	" Shippen to Pemberton.
Ingerson.	" Christian to Gray's Ferry Road.
Carpenter.	" Burnett " " "
Ingerson.	" " " " "
Seventeenth.	" Federal to Reed.
Wharton.	" Sixteenth to Eighteenth.
Mount Holly.	" Wharton, south 300 feet.
Gray's Ferry Road.	" Twenty-ninth to Thirty-first.
Twenty-third.	" Washington Avenue to Federal.
Washington Avenue.	" Third to Fourth.
Peter.	" Twelfth, east 261 feet.
Ellsworth.	" Seventeenth to Eighteenth.
South Marshall.	" Thirteenth to Fifteenth.
Washington Avenue.	" Twenty-third to Twenty-fourth.

SECOND DISTRICT.

Pipe ordered to be laid in the Second District.

Street.	Location.
Story.	From Thirty-seventh to Thirty-eighth.

THIRD DISTRICT.

Pipe ordered to be laid in the Third District.

Street.	Location.
Toronto.	From Mervale, south 806 feet.
Wager.	" Fourth to Fifth.
Day.	" Girard Avenue to Thompson.
Tilton.	" Emery to Huntingdon.
Sergeant.	" Cedar to Memphis.
Emlen.	" Trenton Avenue to Cedar.
Waterloo.	" Cumberland to Davis.
Lloyd.	" Sergeant to Hamilton.
Anthracite.	" Salmon to Almond.
Berks.	" Front to Germantown Road.
Newkirk.	" Cumberland to line of property owned by the Church of the Messiah.
Ann.	" Emerald to Kensington.
America.	" Master to Jefferson.
Hackley.	" Fourth to Fifth.
Sellers.	" Frankford Road to Unity.
Unity.	" " " Water.
Ireland.	" Hanover to Palmer.
Tulip.	" Huntingdon to Lehigh Ave., 700 feet.
Eagle.	
Ihowron.	" Diamond to Susquehanna Avenue.

FOURTH DISTRICT.

Pipe ordered to be laid in the Fourth District.

Street.	Location.
Thompson.	From William to Schuylkill Water Works.
Master.	" Twenty-seventh to Twenty-eighth.
Franklin.	" Diamond to Susquehanna Avenue.
Diamond.	" Seventh to Ninth.
Geary.	" Poplar to Wiley.
Callowhill.	" Twenty-sixth to Wire Bridge.
Cadbury.	" Columbia Avenue to Berks.
Eleventh.	" Berks to Norris.
Mervine.	" " "
Twelfth.	" " "
Thirteenth.	" " "
Bolton.	" Ridge Avenue to Twenty-fourth.
Thirty-third.	" Pennsylvania Avenue, running N. W.
Noble.	" Thirteenth to the works of Messrs. Stuart & Peterson.
Buttonwood.	" Fifteenth to Sixteenth.
Judson.	" Brown to Parrish.
Girard Avenue.	" Girard College Gate to the Bridge.
Twenty-ninth.	" Girard Avenue to Pennsylvania Ave.
Thirty-third.	" Pennsylvania Avenue to Master.

GERMANTOWN.

Pipe ordered to be laid in the Germantown District, Twenty-Second Ward.

Street.	Location.
Bringhurst.	From Germantown Avenue to Philadelphia and Germantown Railroad.
Walnut Lane.	" present termination to Adams.
Adams.	" Walnut Lane, north 350 feet.

No. 12.

ACCOUNT OF THE NUMBER OF HOLES DRILLED FOR MAKING NEW ATTACHMENTS TO PUBLIC MAINS DURING THE YEAR 1866.

MONTHS.	½ inch diameter.	¾ inch diameter.	¾ inch diameter.	1 inch diameter.	Total holes drilled and attachments made.	Shut off for repairs to private pipes.	Shut off for repairs to public pipes.
January	6	12	3	6	27	10	8
February	21	33	5	9	68	31	9
March	56	45	25	8	134	33	4
April	72	56	19	12	159	24	10
May	101	95	55	21	272	23	6
June	89	106	47	21	263	23	12
July	74	68	33	12	187	13	11
August	86	72	16	7	181	17	11
September	58	84	30	11	183	22	10
October	91	72	42	15	220	23	14
November	88	120	56	23	287	29	12
December	38	60	32	29	159	24	16
Total	780	823	363	174	2,140	272	123

No. 13.

THE ABOVE ATTACHMENTS WERE MADE IN THE WARDS AS FOLLOWS:

WARDS.	½ inch diameter.	¾ inch diameter.	¾ inch diameter.	1 inch diameter.	Total holes drilled.	Shut off private pipes.	Shut off public pipes.
1st Dist., 1, 2, 3, 4, 26,	182	101	36	49	368	31	11
2d " 5, 6, 7, 8, 9, 10, 24, 27,	162	196	107	45	510	117	16
3d " 11, 12, 16, 17, 18, 19, 23, 25,	281	116	45	36	478	64	69
4th " 13, 14, 15, 20, 21,	155	387	164	38	744	57	21
Germantown, 22d,	0	23	11	6	40	3	6
Total,	780	823	363	174	2,140	272	123

No. 14.

THE FOLLOWING TABLE EXHIBITS THE NUMBER OF REPAIRS TO MAINS, STOPS, PLUGS, BY DIFFERENT DISTRICTS, DURING THE YEAR 1866.

DISTRICTS.	Repairs to MAINS.	Repairs to STOPS.	Repairs to PLUGS.
First District	37	209	424
Second "	10	448	357
Third "	71	424	306
Fourth	30	314	379
Germantown	6	4	6
Total	154	1,399	1,472

ACCOUNT OF NEW STOPS AND FIRE PLUGS.

DISTRICT.	No. of Stops.	No. of Fire Plugs.
First District	16	15
Second "	38	28
Third "	36	29
Fourth "	51	17
Germantown	3	14
Total	144	103

INSPECTORS.

The water inspectors, besides their ordinary duty of examining premises where new permits have been issued, (see Table No. 15,) have inspected every property upon which water is used in the Second, Sixth, and Twenty-second Wards; and have made numerous discoveries of illegal use of water, adding to the income more than the entire expense of this part of the Department.

A number of Wards will be examined during the year, and doubtless many discoveries will be made. In this connection, I would

again urge upon you the licensing of plumbers, so that the practice of making alterations and additions to the water-fixtures of premises, without notifying the Department, may be stopped.

Bills for water pipe have been served during the year, in the different wards in which pipe has been laid, as follows:

Bills for Water Pipe Delivered in the year 1866.

Ward.	Feet.	Inches.		
First,	1,437	7½	$1,448	96
Seventh,	1,670		1,486	85
Eighth,	1,677	3	1,363	37
Ninth,	435	5	390	40
Thirteenth,	497	8¾	432	82
Sixteenth, 17th, 18th and 19th,	12,715	5½	10,382	45
Twentieth,	12,026	2½	9,058	20
Twenty-first,	1,965		1,861	50
Twenty-second,	1,826	11⅜	1,538	89
Twenty-third,	2,311		1,681	17
Twenty-fourth, and Twenty-seventh,	2,334	1	4,631	42
Twenty-sixth,	11,900	½	9,785	44
Twenty-fifth,	4,276		3,210	1
Total amount of Bills after deductions,			$47,271	48
Total amount of feet as per Bills,	58,071	9⅜		

No. 15.

PERMITS FOR THE YEAR 1866.

WARDS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24 27	25	26	TOTAL
Dwelling,	61	11	14	5		2	41	30	14	19	1	2	5	8	110	11	17	45	132	243	9	39	18	119	25	153	1134
" ½ and ¾,	7	1			3		4		6	1		1		1	6		1	10	17	4	1			3		3	69
Bath,	20	10	12	2	4	2	21	21	15	21	6	6	10	13	85	7	6	14	40	119		13	9	41	3	26	526
Wash Paves,	16	5	9	6	12	8	20	37	22	22	10	11	9	14	92	6	10	21	34	90	1	16	13	18	7	17	526
Water Closets and Urinals,	5	3	2	1	13	30	20	29	22	12	3	7	10	6	38	2		2	11	21	1	12	3	15	2	2	172
Basins and Sinks or Tubs,	1				13	12	20	52	50	21	1	5	30	3	52	2	1		3	44		10	2	16	2	4	344
Steam Engines,	3	1	1		7	10	8		4	2	1			2	3	8	5		7	3		3		3	11	5	87
Horse-power,	24	40	10		48	76	106		18	37	5			23	31	184	69		68	42		19		43		22	865
Distillery,	20	15	10	12	6	11	29	6	7	3	3			4	6	2	9		3	4				2		22	174
Brewery,													1			1						1		1		5	9
Stables,	1	6		4	1		1	4	1	1			28	2	9	1	1	7		10		6		4			87
Church and Sunday-school,																								2			2
Fountains,					1	1		2	3	2	1			5		1				5				5			26
Marble Yard,																								1			1
Stores,							1	5																2			8
Barber Shops,			1																					1			2
Foundry,																								1			1
Slaughter Houses,	2														1				2		1			1			7
Hotel and Bars,	2				6	3		3	3	1	2	4	1	1			2	2	5	11				1	2	4	53
Beer Vaults,														3	4	1								1			9
Factory,									1										2	3				1		3	10
Skating Parks,	1	1								1					1				1	1	1	1					8
Bakery,	1								1									3	1								6
Mineral Water Establishm't.	1																		1								2
Sugar Refinery,			1																								1
Market Houses,																			2								2
Dye Houses,																		3	5								8
Photograph Galleries,																1											1
Total,	165	93	60	30	114	155	271	189	167	143	33	36	94	85	438	227	121	107	334	600	14	120	45	281	52	266	4240

EXTENSION OF THE WORKS.

The total amount expended upon the Extension of the Works during the year, was $330,553 75 as will be seen in detail under the head of Expenditures.

FORTY-EIGHT INCH MAIN.

This important part of the extensions has been finished, and the new Mill House may be said to be completed. The full capacity of these Works can now be used, and the water raised with a great saving of power. The total cost of the main was $80,674 07.

THIRTY-INCH MAIN.

This main connecting the Corinthian Avenue reservoir with the Kensington reservoir, is now laid. It has increased the supply of water to Broad street and its vicinity, and furnished an ample supply to the district, which formerly received its water from the Kensington Works. The eighteen-inch pumping main, from the Works to the reservoir, is now used as a distributing main. This arrangement doubles the capacity for supplying the Kensington district. The total cost of this main was $156,317 55.

WORKS FOR SUPPLYING ROXBOROUGH AND GERMANTOWN.

The engine-house, boiler-house and stack, are now almost completed and quite ready for the machinery. The work on the engine is being pressed, and if no unlooked-for delay occurs, it will be in position and ready for use in May. The pumping main and distributing mains are nearly all cast, and a large portion of the pipe delivered on the ground, and ready to be laid so soon as the season opens. The reservoir is so far advanced, that it can be made ready to receive water as soon as the engines are in place.

The bottom has been puddled and laid with stones, leaving only the sides to be puddled, when the reservoir will be finished. The amount expended upon the different parts of this work, will be shown in detail under the head of Expenditures.

TWENTY-FOURTH WARD WORKS.

When the enlargement of these Works was suggested, it was proposed to erect the new Works near the Columbia Bridge, a site I recommended before the present Works were built. The impurities of the river have increased to so great an extent, during the past few years, that the Department has been forced to abandon this project, and preparations are now being made to place the new engine in the old building, as water of a better quality can be procured at this point, it being farther removed from Manayunk, the principal source of the impurities drained into the river.

To accommodate the engine a well has been sunk in the rock.

This engine and the one intended for Roxborough are being constructed by Messrs. Matthews & Moore, of this city, under an arrangement made by direction of the Committee on Water, by which the material is paid for by the pound, and the work by the day. The drawings are all furnished by the Department. Both are Cornish engines of the ordinary character, fitted with my patent equilibrium governor. The arrangements of the pump valves are my patent, and are the same as those in use in the pumps of the new Mill House.

A lithograph of the new engine for the Twenty-fourth Ward Works, accompanies this Report. It is a Cornish engine, known as the Bull Engine, and similar to those now in use at these Works The steam cylinder is placed over the pump, and the piston connected directly with the pump plunger. The Department has had twelve years' experience with engines of this class, and has found them more economical and efficient than any other.

FURTHER EXTENSION OF THE WORKS.

The most important necessary Extension to the Water Works is the placing of turbines and pumps in the old Mill House, and erecting a large steam pumping.engine in the old engine-house, at Fairmount. This would give to the City an ample supply of water under all contingencies that may occur from drought or accident.

The main pipes also require extending, so as to meet the growing demands for water. That on Broad street should be continued south to Passyunk road; that on Washington street, east to Front and west to Gray's Ferry road; that on Lehigh Avenue, to Frankford road; that on Columbia Avenue, east and west from Broad street. It will also be necessary to provide a twenty-inch main, for connecting the distribution in Germantown with the Roxborough Works. Also, a main to connect the pumping works in the Twenty-fourth Ward, with the reservoir now being built at Landsdown.

PURITY OF WATER.

Before, however, any further extensions are made to the Works located on the Schuylkill, the importance of maintaining the purity of the water, should receive your attention.

Within no equal period of time, has the amount of impurities drained into the Schuylkill increased to such an alarming extent as during the past year. This has been the result of the stimulation of manufactures, and the erecting of a number of new works in Manayunk and vicinity; such as paper-mills, oil refineries, &c.; all discharging their refuse into the dam, from which the water supplied to the City is taken. The discoloration occasioned by these impurities is plainly discernible as far as the Falls, and sometimes at Columbia Bridge.

This subject has so often been urged upon your consideration, that it is scarcely necessary to add anything to the many facts communicated in my former Reports. Yet that it is one of vital importance, is evident from the following, among other facts that might be adduced: "When the cholera visited London, in 1853, the parts of the city supplied with impure water suffered three and a half times as much as those supplied with better water; the deaths being 37 to 10,000 in the one case, and 130 to 10,000 in the other."

It was the intention of the Department to give you a detailed account of all impurities drained into the dam, and of the sources from which they come, but unforeseen circumstances prevented the procuring of the requisite *data*. Enough has been ascertained, in addition to what has been communicated in former Reports, to call for immediate action on the part of the City. It may be too late to prevent all this objectionable drainage, as a large amount of capital is invested in these manufactories, and a large and increasing population now inhabits the region drained immediately into the dam. Enough can be seen by the most casual observer, to satisfy him of these facts. When the river is not turbid, the water flows over Flat Rock Dam, and among the rocks, limpid, bright, and beautiful as a mountain stream; but follow it down a few hundred yards, and after passing the paper-mills, the river, for one half its width, is of a dark-brown color. Further down, it receives the refuse from dye-works and manufactories of every kind, the entire sewage of Manayunk, and the refuse from the Gas Works.

Below Manayunk, the river assumes a dark, dirty, milky appearance, and is covered with soiled waste and shreds from shoddy mills; but by the time the water flows to the Falls, it assumes almost its original brilliancy; here, again, it receives more objectionable matter from the chemical and dye-works, but at the Columbia Bridge it seems to have deposited or destroyed all objectionable matter; and at Fairmount has apparently regained its original

purity. But there is no doubt that a constant deterioration in quality is going on, which, if not arrested, will ultimately force the City to abandon the Schuylkill as a source of supply, if the time to do so has not already arrived.

"The waters of rivers which traverse the grand centres of population become more impure in proportion to the developement of industry; for while the mass of the water remains the same, the causes of impurity become daily more abundant." So with the numerous creeks draining the undulating surface of our City, many of which, once bright and beautiful, are now befouled by refuse from manufacturing establishments, and are being covered out of sight, one after another, as objects too loathsome to look upon, whose fetid waters would spread disease and death, were they not thus hidden. Is there no remedy for this? Shall our industry only tend to make the most beautiful and necessary of objects loathsome, or shall we, by the strong arm of law, protect the purity of the water, and force manufacturers to find some other means of carrying away refuse matter?

The City has invested a large amount of money in the Works for pumping water from the Schuylkill, and the purity of the water supplied is a matter of great importance. If it is determined to continue this as a source, a large expenditure for the purpose of securing pure water, will be warranted.

If the drainage from factories and other sources could be prevented from flowing into the dam, the quality of the water would be unexceptionable, except in time of freshet, when, for a few days, the water is always turbid. This could be prevented by subsiding reservoirs of sufficient capacity. A city with the wealth and number of inhabitants of Philadelphia, should, at least, be able to supply itself with an abundance of pure water.

The project of purchasing the property on both sides of the lower part of the dam, and using it as a park, is a valuable suggestion, and worthy of your approval. It would do much to prevent

objectionable drainage in the immediate vicinity of the Works; but this alone, will not insure the purity of the water; some disposition must be made of the objectionable drainage from above.

HYDROGRAPHICAL SURVEY OF THE SCHUYLKILL RIVER.

The dam at Fairmount forms a subsiding reservoir, in which the water of the Schuylkill is allowed to partially purify itself before being pumped into the reservoir. It is, therefore, of the utmost importance that it should be kept as free as possible from shallow, stagnant pools. For the purpose of ascertaining the amount of mud deposited, and the general features of the river, a survey was made, in 1861, extending from Fairmount to Columbia Bridge, (see my Report for that year, pp 9—18.) Between these points, a large percentage of the matter held in suspension in the water is deposited, owing to the slow current; viz :—two miles per day.

This was compared with a partial survey made in 1852, under the direction of the Schuylkill Navigation Company, which showed that some portions of the river were rapidly filling up, and that great alterations in its general features were taking place.

In 1864, a second survey within the same limits was made and compared with that of 1861, when great changes in the shore and channel were found, (see my Report for that year, pp. 4—13)

These changes were great, and increased so visibly, that, in order to ascertain the physical laws controlling the deposits, a third survey was made, in November and December of the past year. It was more extensive and thorough than either of the others, embracing the river from the Wire Bridge, at Fairmount, to the Reading Railroad Bridge, at Schuylkill Falls. From it the accompanying map was made. This map is an exact plot of the river between these points, and exhibits the general topography of the shore and islands, the location of buildings near the river, the

position of bridge-piers and wharves, lines of soundings, etc., and the line of shore, in 1861. The principal boundaries are the Philadelphia and Reading, Pennsylvania Central, and Junction Railroads.

The transverse sections are taken at various points, A–A¹, B–B¹, C–C¹, &c., which best show the general prism of the river; and in those embraced in the other surveys, the variation is shown by dotted lines. Thirty-eight such transverse sections were taken, averaging 500 feet apart, and, on these, soundings were taken every twenty feet. The longitudinal section exhibits the deepest soundings on each of the thirty-eight lines, and is on a scale of 200 horizontal to 1 vertical.

The rapidity of these changes will appear from the following *data*. The amount of water contained in the river, between Fairmount Dam and the Columbia Bridge, and the amount of deposit, is as follows:

Contents of river, 1861,	84,203,928	cubic feet.
" " 1864,	80,890,247	"
" " 1866,	74,247,658	"
Deposit from 1861 to 1864,	3,313,681	"
" " 1864 to 1866,	6,642,589	"
" " 1861 to 1866,	9,956,270	"
Daily average deposit,	5,430	"

This deposit may be locally divided, as follows:

From Fairmount Works to line D–D¹, at the Skating Club House,	2,221,356	"
From line D–D¹ to line G–G¹,	5,856,858	"
" " G–G¹ to line K–K¹, at Columbia Bridge,	1,878,056	"
Total,	9,956,270	

The mean daily average discharge of the river, exclusive of storm-water, is estimated to be 87,162,240 cubic feet. Accordingly, this reservoir is more than emptied each day. The contents of the river were equal in

1861,	to the amount		discharged in	23	hours,	11	minutes.
1864,	"	"	"	22	"	16	"
1866,	"	"	"	20	"	26	"

The general appearance of the river has changed considerably, as will be seen by following the dotted line which exhibits the shore line of 1861. Long Island, just below Columbia Bridge, has enlarged and changed its position somewhat. Briar Creek has made a bar at its mouth, and the bar opposite it, outside of the canal, is increasing. Below the rolling-mill, on the opposite side of the river, the shore has made out considerably into the stream. Under the eastern end of Girard Avenue Bridge, the shore is now nearly out to the end of the Schuylkill Water Works' wharf; and along the Park, the shore line has, in several places, encroached considerably upon the river. The most prominent of these encroachments is below Turtle Rock and the Skating Club House, where, for 800 feet, light batteaux cannot approach to within 100 feet of the original shore line. There is also a large deposit just above the steamboat wharf, at Fairmount.

The greatest and most prominent deposit in this portion of the river is, however, opposite the Twenty-fourth Ward Water Works, where an island 1100 feet long, and averaging 160 feet wide, has been formed. The tow-path, between the points D^1 and G^1, is now useless, as even light-draught boats cannot, in some places, approach within 500 feet of it. Three-fifths of the whole deposit in the river, nearly 6,000,000 cubic feet, is contained in this island and in the encroachment of the shore between those points. These deposits have necessarily contracted the river, and reduced the superficial area about nine per cent.

Superficial area in 1861,	7,333,327	square feet.
" " 1864,	7,032,123	" "
" " 1866,	6,646,801	" "
" " reduced from 1861 to 1864,	301,204	" "
" " " " 1864 to 1866,	385,322	" "
" " " " 1861 to 1866,	686,526	" "
Or 15.76 acres.		
Daily decrease of superficial area,	375	" "

The mean sectional area, or the prism of the river, is less than in 1861. The stream has increased in depth and decreased in breadth. The decrease of the sectional area and width, and the increase of depth, will demonstrate that, in time, a mere channel will take the place of the large subsiding reservoir which was formed by the construction of Fairmount Dam; and the water drawn into the pumps will have less opportunity to be at rest, and to deposit matter held in suspension.

COMPARISON OF THE THREE SURVEYS.

	1861.	1864.	1866.
Greatest breadth,	1,105 ft.	1,050 ft.	1,010 ft.
Least breadth,	420 ft.	440 ft.	450 ft.
Mean breadth,	825 ft.	732 ft.	735 ft.
Greatest depth,	35.2 ft.	36.1 ft.	37.5 ft.
Greatest average depth,	18.8 ft.	17.2 ft.	20 ft.
Least average depth,	7.6 ft	5.8 ft.	3.9 ft.
Mean depth,	11.3 ft.	10 ft.	11.5 ft.
Greatest sectional area,	10,518 sq. ft.	13,136 sq ft.	12,644 sq. ft.
Least sectional area,	6,700 sq. ft.	2,589 sq. ft.	1,380 sq. ft.
Mean sectional area,	8,254 sq ft.	8,153 sq. ft.	8,087 sq. ft.

No comparisons of contents, area, &c., can be made with that portion of the river between Columbia Bridge and the Reading Rail Road Bridge, as no survey was made of it, prior to 1866.

The present survey will be a basis for future comparisons. Columbia Bridge is about midway between Fairmount Dam and the Reading Rail Road Bridge, being 8,750 feet from the former, and 8,420 feet from the latter. It may be interesting to compare these two portions of the stream.

	Below Columbia Bridge.	Above Columbia Bridge.	Total.
Cubical content,	74,247,658ft.	54,347,703ft.	128,595,361 c. ft.
Superficial area,	6,646,801ft.	6,004,828ft.	12,651,629 sq. ft.
			Mean.
Greatest sectional area,	12,644sq. ft.	9,192qs. ft.	
Least sectional area,	1,380sq. ft.	3,192sq. ft.	
Mean sectional area,	8,087sq. ft.	6,157sq. ft.	7,117sq. ft.
Greatest breadth,	1,010 ft.	975 ft.	
Least breadth,	450 ft.	375 ft.	
Mean breadth,	735 ft.	658 ft.	697 ft.
Greatest depth,	37.5 ft.	25 ft.	
Greatest average depth,	20 ft.	12.7 ft.	
Least average depth,	3.9 ft.	6.4 ft.	
Mean depth,	11.5 ft.	9 6 ft.	10.6 ft.

From these *data* it will be seen, that, while the superficial area of the portion above the Bridge is nearly as great as that below, yet the cubical contents are one third less. The breadth of the stream is more regular, and the mean depth less.

The above *data* will be of great service in any plan for maintaining the purity of the water. The Department is not prepared to suggest a plan, as further investigations will be necessary.

RECEIPTS AND EXPENDITURES.

RECEIPTS.

The gross receipts for the year have been $670,222 13. The sources from which this amount has been received will be exhibited by the statement of the Register, W. J. P. White, Esq. Of the above sum, $3,927 18 has been recieved at the Engineer's Office.

The following amounts have been received at the Chief Engineer's Office, and paid to the City Treasurer:

For rents,	$745 00
" Old Iron and brass,	365 55
" Wharfage,	43 20
I. & P. Baltz, for four-inch attachment to Main,	339 65
G. Bergner, do do do	212 00
Massey, Collins & Co., do do do	133 37
Thomas Dolan, do do do	252 79
H. C. Oram, do do do	156 35
Howell & Brother, do do do	125 42
Newhall, Borie & Co., do do do	129 71
Bement & Dougherty, do do do	334 54
Philip Guckes, do do do	116 80
Ficken & Williams do do do	171 67
U. S. Government, do do do	165 46
Wm. Oglesby, for repairs to fire-plug,	12 00
Paul J. Field, for fire-plug,	75 00
West Chester Rail Road Co., for lowering pipe,	41 23
Highway Department, for gravel,	97 25
J. Jarden & Nephew, discount,	4 00
J. H. Carman, damages to plug,	15 00
E. Struse, unloading pipe,	58 60
For gravel and stone,	332 59
Total,	$3,927 18

REGISTER'S STATEMENT.

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER
REGISTER'S OFFICE,
January 20th, 1865.

H. P. M. BIRKINBINE, ESQ.,
Chief Engineer of the Water Department:

DEAR SIR:—The tabular statement inclosed, will present to you, in detail, a full report of the financial operations of the office for the year 1866.

By comparing the receipts of 1866 with 1865, will be noticed an increase in the amount of Water Rents of $11,888 25, but a decrease in the amount received from Water Pipe of $2,109 96.

Through the energy of all the officers connected with my Department, I am pleased to be able to state an extraordinary increase of the amounts collected from delinquents, it being $19,863 22, or an increase over the year 1865, of $7,902 44, leaving but comparatively little uncollected.

The amount yet remaining due for Water Rent of 1866, is principally upon properties that have no water connection, and, in consequence, we are unable to collect the same, to wit, $42,962 50. This, however, includes $7,653 paid to the "Germantown Water Company," previous to our obtaining possession of their property and Works.

The decrease in the amount of receipts from Water Pipe, is attributable to the large amount yet remaining due, it being $22,935 34, exclusive of $4,160 13 sent to the City Solicitor, for lien, a large amount of pipe having been laid near the close of the year, the collection of which could not be made during 1866, part of which has been paid during the first two weeks of January, 1867, amounting to $5,130 88. The income from Water Pipe is, of course, dependent upon the number of feet laid. About sixty per cent. of the cost of which is collected at this office, twenty per cent

is sent to the City Solicitor, for lien, and the remainder is absorbed in expense of intersections, crossings, and allowances for corner properties, &c.

Annexed, you will find the amounts of the duplicates numerically arranged in Wards, for the years 1866 and 1867, showing the aggregate amount of Water Rent charged upon the same, and the increase thereof; which, with the income from fractional Water Rents and delinquent Water Rent, will probably show a grand total of $660,000 for the year 1867.

Ward.	Am't of Duplicates for 1866.	Am't of Duplicates for 1867.
First,	$23,427 50	$24,510 75
Second,	27,913 75	28,812 50
Third,	16,944 75	17,236 75
Fourth,	17,783 50	18,007 75
Fifth,	27,503 25	27,744 50
Sixth,	32,570 00	33,211 50
Seventh,	32,899 50	33,486 50
Eighth,	33,371 00	34,389 75
Ninth,	28,512 50	28,658 75
Tenth,	28,817 00	29,851 00
Eleventh,	17,750 25	17,850 50
Twelfth,	19,117 75	19,161 75
Thirteenth,	26,921 75	27,088 00
Fourteenth,	30,282 25	32,528 50
Fifteenth,	50,658 75	51,797 00
Sixteenth,	22,270 00	22,847 50
Seventeenth,	19,364 75	19,644 50
Eighteenth,	24,450 25	24,478 00
Nineteenth,	33,840 50	36,321 00
Twentieth,	52,490 50	57,436 50
Twenty-first,	3,277 00	3,333 00
Twenty-second,	8,682 50	8,940 00
Twenty-third,	605 00	816 00
Twenty-fourth,	17,960 00	17,326 50
Twenty-fifth,	4,722 75	5,020 00
Twenty-sixth,	24,040 00	26,410 75
Total,	$626,156 75	$646,909 25

No. 16.

STATEMENT OF RECEIPTS AT THE REGISTER'S OFFICE, FROM JAN'Y 1ST TO DEC'R 31ST, 1866.

MONTHS.	Rents, 1864.	Penalties, 1864.	Rents, 1865.	Penalties, 1865.	Rents, 1866.	Penalties, 1866.	Fractional Rents.	Water Pipe.	TOTAL.
January	$132 00	$13 05	$1,769 00	$250 32	$31,413 50		$910 75	$1,554 16	$36,042 78
February	421 25	44 78	2,175 55	274 94	67,009 75		1,112 59	1,802 38	72,841 24
March	583 75	54 35	2,616 00	342 04	95,158 37		1,675 50	1,248 42	101,678 43
April	817 00	86 93	2,584 75	326 21	277,426 66		1,725 00	421 64	283,388 19
May	377 75	38 11	1,930 25	238 32	20,243 50	859 89	2,728 50	393 37	26,809 69
June	260 50	19 08	769 00	77 74	38,709 50	1,526 71	3,362 25	1,410 81	46,135 59
July	199 00	17 84	427 00	51 74	3,956 50	545 18	1,898 50	962 29	8,058 05
August	206 25	11 84	397 50	47 20	6,171 00	818 72	1,279 75	1,238 58	10,170 84
September	133 00	10 47	290 00	34 55	9,610 25	1,286 18	1,331 73	2,703 45	15,399 63
October	137 75	14 01	309 25	36 25	16,109 50	2,220 76	1,382 75	10,499 90	30,710 17
November	217 50	21 70	420 50	58 06	11,657 50	1,294 41	1,617 50	5,268 37	20,555 54
December	251 25	18 46	311 50	37 93	6,731 75	615 17	2,011 00	4,527 74	14,504 80
Total	3,737 00	350 62	14,000 30	1,775 30	584,197 78	9,167 02	21,035 82	32,031 11	666,294 95

The acquisition of the Germantown Water Works compelled a careful assessment of the Twenty-second and a portion of the Twenty.first Wards. The revenue arising from the same, though not as large as we anticipated, will soon, in this thriving portion of our City, when a good supply of water is furnished, show a steady increasing income.

The increasing business of this Department suggested the necessity of procuring a separate apartment for the use of inspectors. Accordingly, a room in the basement of this office, was fitted up for their sole use. A more systematic plan was adopted, by which means, inspections and other duties appertaining to their office, are more promptly completed. One of the inspectors was chosen as chief; to him inspections are reported, and, through him, the chief clerk makes the proper entries and corrections. The wisdom of this change has been demonstrated by a more active attention to their respective duties.

In conclusion, I beg leave to add, that in my estimate of Receipts from Water Rents, for 1866, I named the sum of $630,000, and I am happy to observe that the actual receipts exceeded the amount estimated by about $2,000.

Respectfully yours, &c.,

W. J. P. WHITE,
Register.

EXPENDITURES OF THE DEPARTMENT FOR THE YEAR 1866.

Salaries of chief engineer, register, clerks, &c.,		$27,043 69
Office expenses,		3,887 59
Salaries of engineers, firemen, &c., at Works,		24,357 75
Supplies to Works, viz.,		
Coal,		39,256 27
Tallow, oil and gas,		3,649 11
Wood,		118 70
Small stores,		2,785 83
Repairs, viz.,		
Fairmount Works,	$7,198 14	
Delaware "	7,152 81	
Schuylkill "	2,827 34	
Twenty-fourth Ward Works,	1,652 27	
Germantown Works,	995 06	
		$19,825 62
Building, Grounds and Reservoirs,		
Lumber,	1,726 23	
Bricks,	81 50	
Lime,	128 18	
Stone,	458 18	
Boating stone,	100 00	
Roofing,	72 00	
Paints,	579 78	
Plumbing,	340 17	
Hardware,	186 15	
Paper hanging,	58 42	
Smith-work,	98 53	
Sprinkling grounds,	250 00	
Lamp posts,	24 00	
Amounts carried forward,	$4,103 14	$120,924 56

Amounts brought forward,	$4,103 14	$120,924 56
Lamps,	50 00	
Drain pipe,	86 80	
Castings,	125 33	
Super phosphate,	46 10	
Repairs to Kensington reservoir,	160 50	
Trees,	252 42	
Wages,	14,607 19	
Sundry bills,	371 25	
		19,752 73
Keeping grounds in order at Fairmount,		
Lumber,	130 60	
Hardware,	44 37	
Castings,	44 20	
Lime,	36 95	
Trees,	67 00	
Wages,	1,950 41	
Sundry bills,	19 76	
		2,293 29
Iron pipes, fire plugs, and other fixtures and materials for laying pipe, &c.,		
Iron pipe,	$51,001 05	
Iron castings,	5,261 39	
Brass "	2,617 12	
Lead,	5,134 77	
Wrought iron and steel,	1,400 44	
Wood,	10 00	
Hardware,	444 92	
Coal,	480 00	
Repairs,	708 78	
Bolts and nuts,	644 10	
Amounts carried forward,	$67,702 57	$142,970 58

Amounts brought forward,		$67,702 57	$142,970 58
Leather,		215 35	
Lumber,		1,601 42	
Oil,		133 92	
Gasket,		1,350 02	
Paints,		230 32	
Machine work,		879 10	
Covering spindles with brasses,		220 00	
Sundry bills,		220 68	
			72,553 38
Labor, laying pipe, setting plugs, &c., and for fitting up stop cocks, fire plugs, &c., &c., viz,			
Pipe, First District,		$2,182 23	
" Second "		4,470 62	
" Third "		5,058 05	
" Fourth "		6,586 52	
" Germantown,		2,028 58	
			20,326 00
Shop, viz.,			
Wages,	$10,582 12		
Bills,	1,739 73		
		12,321 85	
Inspecting pipe,		479 70	
Surveyors for measuring pipe,		1,295 99	
			34,423 54
Keeping pipes, plugs, stops and fixtures in good order, viz.,			
Wages, First District,		$3,314 25	
" Second "		4,113 37	
" Third "		4,941 57	
Amounts carried forward,		$12,369 19	$249,947 50

Amounts brought forward,	$12,369 19	$249,947 50
Wages, Fourth District, . .	4,164 86	
" Germantown, . .	141 00	
Paving, &c., Plumbing, . . .	688 72	
		$17,363 77
Drilling and making new attachments, viz.,		
Wages, First District, .	$1,291 50	
" Second " . . .	1,304 75	
" Third " . .	1,224 00	
" Fourth " . . .	1,595 00	
" Germantown, . .	129 50	
		5,544 75
Railing at Fairmount, ...		572 72
Carriage hire, ...		177 50
		$273,606 24
J. Meel & G. Graham for damages, . . .		150 00
Surveys for a better supply of water, . . .		143 28
Bills for over paid water rent, &c., for 1861, 1864 and 1865, ...		$385 03
Repairs to Fairmount Dam, viz.,		
Lumber, ...	$505 99	
Hire of scow, ...	576 00	
Iron, ...	130 78	
Hardware, ...	44 70	
Smith-work, ...	30 92	
Powder, ...	97 41	
Wages, ...	2,069 84	
Sundry bills, ...	278 76	
		3,734 40
Sewer on Twenty-fifth street, from Green to Pennsylvania Avenue, ...		140 22
		$278,159 17

EXTENSION OF WORKS.

AMOUNTS PAID FROM WATER LOAN.

Making and sinking a crib in front of Fairmount Dam, through the deep water, and placing an oak apron upon it.		
Timber and lumber,	$2,306 29	
Iron, etc.,	332 20	
Ropes,	91 16	
Towing logs, etc.,	10 00	
Sundries,	990 86	
Wages,	4,733 20	
Contract,	1,595 50	
Stone,	1,739 78	
Powder,	480 33	
Damages,	1,050 00	
		$13,329 32
For extending the wharf, laying a suction main, erecting a stand pipe, and connecting the same at the Delaware Water Works.		
Wages,	35 97	
Tin work,	20 30	
Lime,	40 00	
Sand,	5 75	
		102 02
Amount carried forward,		$13,431 34

Amount brought forward,		$13,481 34
For purchase and laying forty-eight inch pumping main from the new mill house at Fairmount to the Corinthian Avenue Reservoir.		
Main, ...	8,831 96	
Gasket, ...	163 22	
Lumber, ...	135 39	
Hardware, ...	40 50	
Castings, ...	122 88	
Wages, ...	7,545 95	
Bricks, ...	332 33	
Damages, ...	175 00	
Sundries, ...	80 65	
		17,427 88
Drawn from appropriation:		
For laying a twenty inch main on Washington Avenue, from Broad to Twenty-first Street, to complete forty-eight inch main.		
Wages, ...		*3,382 49
Drawn from appropriation:		
For laying a thirty inch main on Poplar Street, to complete forty-eight inch main.		
Wages, ...	1,638 32	
Lead, ...	954 52	
Damages, ...	200 00	
Powder, ...	214 75	
Smith work, ...	76 66	
Sundries, ...	57 92	
		*3,142 17
Amount carried forward,		$37,383 88

FOR WORKS AT FLAT ROCK.

Item 1.

Amount brought forward,		$37,383 88
For Cornish engine, boilers and connection, viz.:		
Engine,	18,296 03	
Tubing,	24 71	
Wages,	1,922 25	
Sundries,	34 28	
		20,277 27

Item 2.

For engine house foundations and stack, viz.:		
Contract,	11,296 64	
Wages,	309 25	
Survey expenses,	35 60	
		11,641 49

Item 3.

For pumping main, viz.:		
Stops,		413 21

Item 4.

For reservoir, viz.:		
Machine work,	2,114 85	
Brass castings,	254 10	
Cement,	312 80	
Lime,	215 22	
Amounts carried forward,	$2,896 97	$69,715 85

Amounts brought forward,	$2,896 97	$69,715 85
Powder,	415 00	
Iron,	347 82	
Tubing,	59 09	
Lumber,	265 02	
Hardware,	61 07	
Coal,	97 50	
Tempering machines,	203 50	
Clay,	100 00	
Mason work,	207 06	
Wages,	30,484 47	
Sundries,	380 50	
		35,499 17

Item 5.

For twenty inch, sixteen inch, and twelve inch mains, viz.:		
Mains,	30,313 71	
Brass castings,	85 14	
Wages,	321 25	
		30,720 10

Item 6.

For real estate, viz.:		
Property and titles,	13,206 87	
Lumber,	435 75	
Carpenter work,	153 30	
Hardware,	23 50	
Plastering,	52 30	
Amounts carried forward,	$13,871 72	$135,935 12

Amounts brought forward,	$13,871 72	$135,935 12
Paints,	34 15	
Surveys,	83 50	
Sidling,	564 75	
Wages,	381 63	
		$14,935 75

Item, 7.

For Incidentals, viz.,		
Photographs,	$171 36	
Chief Engineer, as per resolution,	1,200 00	
Sundries,	12 07	
		1,383 43

FOR TWENTY-FOURTH WARD WORKS.

Item, 8.

For Cornish pumping engine, boilers and connections, viz.,	
Wages,	793 75

Item, 9.

For engine-house, foundations and stack, viz.,		
Wages,	$4,196 16	
Smith-work,	78 68	
Barrows,	28 50	
Hardware,	16 00	
		4,319 34
Amount carried forward,		$153,367 39

Item, 10.

Amount brought forward, . .		$153,367 39
To Reservoir, viz.,		
Lumber, ...	$460 44	
Hardware, . . .	213 70	
Wheelbarrows, . . .	65 00	
Smith-work, . . .	32 75	
Surveys, ...	118 29	
Wages, ...	6,698 96	
Sundries, ...	184 41	
		7,773 55

Item, 11.

For real estate,		
Property and title, ...		13,903 68

Item, 12.

For pumping main, to complete forty-eight inch main.		
Lime, ...	$116 16	
Plumbing, ...	9 15	
Lumber, ...	40 70	
Repairs, ...	268 03	
Wages, ...	2,882 07	
		*3,316 11

Item, 14.

For a thirty inch main to connect Corinthian Avenue Reservoir with Kensington Water Works,		
Mains, ...	$115,102 05	
Lead, ...	10,264 83	
Amounts carried forward,	$125,366 88	$178,360 73

Amounts brought forward,	$125,366 88	$178,360 73
Inspecting main, . .	968 82	
Hardware, ...	143 41	
Lumber, ...	874 85	
Gasket, ...	176 49	
Machine work, . .	4,612 85	
Iron castings, . . .	1,427 80	
Brass castings, . .	530 38	
Powder, ...	76 25	
Bricks, ...	317 00	
Digging ditch, . . .	4,336 85	
Damages, . . .	320 00	
Transfer to Highway Department,	3,011 71	
Wages, ...	17,715 09	
Sundries, . . .	314 64	
		160,193 02
		$338,553 75

*$11,625 24 to complete forty-eight inch main.

HENRY P. M. BIRKINBINE,
Chief Engineer.