

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 JANUARY 16th,

1862.

PHILADELPHIA:

WM. F. GEDDES, PRINTER, 320 CHESTNUT STREET.

The Committee on Water Works, for this year, not yet appointed
by Councils.

OFFICERS.

Chief Engineer

HENRY P. M. BIRKINBINE.

Register.

W. J. P. WHITE.

Chief Clerk.

THOMAS S. DARLING.

Permit Clerks.

JOSEPH M. SIMONS,
JOSEPH AITKEN,

CHARLES DIXEY,
CHARLES MEARS,

SIMON MUDGE.

Messenger.

WILLIAM HAIGHT.

Inspectors.

ALEXANDER MCCONNELL,
JOHN ORTH,

JOSEPH SWARTZ,
JOSEPH HEMPHILL.

Purveyors.

1st District,	C. B. COBB,	Office	615 Carpenter Street.
2nd "	D. B. MORRELL,	"	918 Cherry Street.
3rd "	JOHN SEDDINGER,	"	1420 Frankford Road.
4th "	WM. H. DURBORROW,	"	1324 Buttonwood Street.

Clerks at Engineer's Office.

CYRUS KRAUSER,

Draughtsman,

JACOB H. YOCUM, JR.

Engineers at Works.

<i>Fairmount Works,</i>	CHRISTIAN HUGHES,	JOSEPH MOYER,
<i>Schuylkill "</i>	JOSHUA BARTLEY,	WILLIAM HODGES,
<i>Delaware "</i>	BENJAMIN NORMAN,	BENJAMIN BERRY,
<i>24th Ward "</i>	JAMES GREGORY,	JAMES BUCKLEY.

CONTENTS.

	PAGE.
FAIRMOUNT DAM,	5
Deposits of Mud,	6
Surveys of it,	7
Drainage into it,	8
OTHER SOURCES OF WATER SUPPLY,	9
CONDITION AND OPERATION OF THE WORKS,	10
RESERVOIRS: FAIRMOUNT,	11
CORINTHIAN AVENUE,	11
SPRING GARDEN,	12
KENSINGTON,	12
Analysis of Mud from it,	13
TWENTY-FOURTH WARD,	14
Contents of the Reservoirs,	15
WORKS,	
FAIRMOUNT WORKS,	15
Repairs,	16
Running Expenses,	16
Table, No. 1, Water Pumped, &c.,	17
SCHUYLKILL WORKS,	18
Repairs,	18
Table No. 2, Water Pumped, &c.,	19
Coal, Oil and Tallow Account,	20
Running Expenses,	21
DELAWARE WORKS,	21
Coal, Oil and Tallow Account,	22
Table No. 3, Water Pumped, &c.,	23
Running Expenses,	24
Repairs,	25
TWENTY-FOURTH WARD WORKS,	25
Table No. 4, Water Pumped, &c.,	26
Repairs,	27
Coal, Oil and Tallow Account,	27
Running Expenses,	28
Table No. 5, TOTAL QUANTITY OF WATER pumped by all the Works,	29
Table No. 6, Comparative Economy of Works,	30
DISTRIBUTION.	
Pipe laid in First District,	30
" " Second District,	32
" " Third District,	34
" " Fourth District,	35
Recapitulation of Pipe laid,	37
Cost of laying Pipe,	37
NEW ATTACHMENTS,	38
STOPS AND FIRE-PLUGS,	39
PIPE ORDERED TO BE LAID,	39
Location of Fire-Plugs for Steamers,	40
Location of Drinking Hydrants,	41
Stock of Pipe, Branches, &c.,	42
Dead Ends,	43
Shop,	43
Shop Account,	44
BUILDINGS AND GROUNDS,	46

	PAGE.
EXTENSION OF WORKS,.....	46
NEW MILL HOUSE,.....	47
Wheels,.....	50
Gearing,.....	51
Pumps,.....	51
Pumping Mains,.....	52
Corinthian Avenue Reservoir,.....	53
WORK AND MATERIALS ON NEW MILL HOUSE,.....	54
Machinery,.....	55
Pumping Mains,.....	55
Tower,.....	56
Corinthian Avenue,.....	56
FURTHER EXTENSION OF WORKS,.....	56
Extensions Recommended,.....	57
Large Store Reservoir,.....	58
Surveys for Supply of Water,.....	59
RECEIPTS AND EXPENDITURES OF THE DEPARTMENT,.....	60
Receipts,.....	60
Table No. 7, Receipts since Consolidation,.....	61
Table No. 8, Receipts and Expenditures for Pipe,.....	62
LICENSING PLUMBERS,.....	63
ASSESSMENT OF WATER RENTS,.....	63
PIPE ACCOUNT,.....	64
PROTECTION OF THE RESERVOIR,.....	64
BETTER OFFICE ACCOMMODATIONS,.....	65
REGISTER'S STATEMENT,.....	66
Table No. 9, Receipts of Register's Office,.....	67
EXPENDITURES OF THE DEPARTMENT,.....	68
SALARIES,.....	68
SUPPLIES,.....	68
REPAIRS,.....	68
IRON PIPE,.....	69
Materials,.....	69
Labor,.....	70
SHOP,.....	70
REPAIRS TO MAINS,.....	70
MAKING NEW ATTACHMENTS,.....	70
EXTENSION OF THE WORKS.	
Corinthian Avenue Reservoir,.....	71
Turbine Wheels and Machinery,.....	72
Mill House,.....	72
Pumping Mains,.....	73
TOTAL AMOUNT EXPENDED FROM LOAN,.....	74

ANNUAL REPORT
OF THE
CHIEF ENGINEER OF THE WATER DEPARTMENT,
PRESENTED TO COUNCILS JANUARY, 1862.

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

Gentlemen:—The Department in presenting the Report for the past year, feel constrained to call attention to several points of great importance which we had the honor of submitting to you in the report of the previous year. They are as follows :

The condition of Fairmount Dam ; the drainage into it ; the encroachments upon its area ; the importance and in fact necessity of guarding the purity of the water. The Acts of the State Legislature bearing upon the subject, and the power of the City to protect the Schuylkill water from contamination were also recited. Since the presentation of that Report, the subject has grown in importance the more closely it has been investigated. With our convictions of the paramount importance, in a sanitary point of view, of the purity of the water supply, the Department would be recreant to a sense of duty should we fail again to press the subject upon your consideration. No sum of money judiciously applied in improving the character or increasing the amount and availability of the water supply, can be considered as wasted. A careful survey of the river has been made from the dam at Fairmount to the Columbia bridge, which is the part of

the river of most vital importance to the City. From this point upward to Flat Rock Dam it has been carefully examined, though not surveyed. The rapid accumulation of detritus in the dam will be evident upon comparing the surveys just made by the Department, with a hydrographic survey made by the Schuylkill Navigation Company, of the western part of the river, from a point below the Twenty-fourth Ward Works to the Girard Avenue bridge. The mud has accumulated in this portion of the river to such an extent as to impede navigation, and force all loaded boats to take the middle of the stream. This survey was made in 1853, and the comparison of the two shows the deposit of mud at this point to be 58,379 cubic yards, or an average yearly deposit of 7,297 cubic yards. In other parts of the dam the accumulation is evidently much more rapid, but for want of actual surveys with which to compare those recently made by the Department, it cannot be accurately ascertained. The entire amount would no doubt be found to be from 25,000 to 30,000 cubic yards per year in the lower reaches of the dam, viz: from Columbia bridge down. The deposits produced by the Skaters' Club House, which projects into the river, causing a retrograde motion of the water, furnish an instance. The accumulations at this point extend along the south of the Park to the steamboat wharf at Fairmount, where the water has become so shallow that the mud is disturbed every time the boats approach or leave the wharf. This mud thus agitated passes immediately into the fore-bay and is, in part, pumped into the reservoirs. The effect of this structure and the promontory formed to accommodate it upon the current, has been found to be much more disastrous than was at first feared, and its removal to some other site is absolutely demanded, and not for the above reason only. It so confines and directs the scour of the river that its bed is already washed to a depth of 31 feet within a short distance of the dam, endangering the permanence of the structure. The removal of the house and of the earth thrown in at this place, would allow the current to flow along the south front of the Park and carry away the present accumulated mud, and restore the river nearly to its original condition. Either this must be done, or the river must be filled in to a considerable distance from the present shore line, other-

wise the stagnant condition of the water and want of depth will lead to putrefaction. The remedy of filling in the river, and thus contracting the shores and diminishing the volume of the stream—as would be the case in this instance—is not a desirable alternative. It would be a permanent injury, as there would then be less opportunity for the subsidence of matter held in suspension, and the water ever after would be less pure. The water from this point is in part mixed with that supplied to the reservoir, and materially affects the salubrity of the City supply.

The surveys of the river have shown that the detritus which is brought down by freshets and deposited in the dam, is rapidly filling it up. In a few years there will be an extensive formation of solid land near the western bank of the river, commencing below the Girard Avenue bridge and extending south below the Twenty-fourth Ward Works, filling up nearly one half the river. A similar deposit is forming above the bridge, also near the western side. In order to prevent these accumulations and to increase the depth of the river, dredging should be at once resorted to. Perhaps the best means of getting rid of the difficulty would be to form islands of these deposits; this could be done at a small expense, and as the river would then probably keep its own channel clear, future accumulations would be prevented. During the warmer months there is a marked difference in character between the water flowing over this mud and that in the channel of the river.

The mean sectional area of the river between Fairmount and Columbia bridge is found to be 8,254 square feet. This cross section is maintained with considerable regularity. The smallest sectional area is immediately below Girard Avenue bridge, where it is 6,700 feet, and the greatest sectional area is at Turtle Rock, the south-west point of the Park, where it is 10,519 feet. The mean depth of the water in the dam is 11.3 feet, the deepest part is 35 feet, located south-west from Turtle Rock. The mean velocity of the water between the dam and Columbia bridge, a distance of 9,415 feet, in ordinary stages of the river is about two miles a day, giving a mean discharge of water of 650,000,000 gallons per day.

The shore line of the dam, on either side, should be protected by

walls and dredged, or built out into the river, so as to insure a depth of at least four feet in every place. This should be done at once, as far up as the Columbia bridge, and prosecuted as opportunity offers, until the entire shore line on both sides and around the islands is protected, and made of the above depth.

The open sewer, draining all of Coates street west of the Reading Rail Road, and emptying into the dam immediately above the Fairmount Works, demands immediate attention, as both the character, and amount of drainage, are becoming every day more objectionable. Some remedy should at once be applied as suggested in the last report of the Department; either by carrying the sewage to the comb of the dam, by pipe laid on the bottom of the river, or by a system of catch-reservoirs, and filter beds. The highly objectionable matter brought down principally from the breweries by the creek emptying at the Girard Avenue bridge, has not yet been turned into the sewer, constructed at so great a cost, to drain, and convey it by the Twenty-fourth street culvert, below the dam. This sewer has been finished for about two years to within a short distance of the creek. It is hoped that you will direct the connection to be made immediately. The Department would also remind you of the large amount of objectionable matter thrown into the river from factories at the Falls and Manayunk. The acts of the Legislature upon this subject, seem sufficient to protect the city, if enforced. In some rough experiments made to ascertain the hardness of the water, above Manayunk, and at Fairmount, that at Fairmount appeared to be harder, than that above Manayunk. If this be so, it can only be accounted for by the large amount of impurities discharged into the river by the factories, reaching many thousand tons in a year. Much of this discharge could be prevented without serious inconvenience or expense to the manufactories. The Gas Works still continue to discharge their wash water and refuse tar directly into the river. The character of this discharge and the repulsive appearance of the scum floating upon the surface, are such as to call imperatively for your interposition. As these Works are the property of the City, there will be no difficulty in the way, at least so far as the drainage is sensibly objectionable

While the quality of the water supply is so generally satisfac-

tory to the citizens, that no public complaint is heard, still by carefully guarding the dam as above suggested, its salubrity can be materially improved ; an object which, you need not be reminded, is worth a great amount of trouble and expense. Indeed it is impossible to estimate the value of any improvement in the quality of the water supply of a great city, no matter how slight that improvement may be.

OTHER SOURCES OF WATER SUPPLY.

Convinced of the great importance of this subject, the Department would again present it to your consideration. However carefully we guard Fairmount Dam, the quality of the water will of necessity be constantly deteriorating, as population and manufactories increase in the district of country drained by the Schuylkill and its tributaries, and as the section becomes more highly cultivated. The London water companies were, a few years ago, forced by acts of Parliament to remove their works from that part of the Thames affected by the sewage of the city, to a point higher up the river and above the city. They were also required to construct extensive subsiding reservoirs, and filter beds. A much greater sum of money was expended upon these alterations and improvements, than would represent the entire value of the works of this city, at the present time. Notwithstanding all this expense, surveys are now being made by one of the most eminent hydraulic engineers of that country, for bringing in a supply of water, to be collected in the mountains of Wales. Water collected in the same manner ; viz : from hills, is now supplied to the cities of Manchester and Liverpool, the superior quality of which, as well as the abundant and constant supply, has induced London to look to so distant and expensive a source. Water collected from the surface of hills not cultivated, and distant from cities and large towns, will be almost absolutely free from mineral and organic impurities. Indeed there is no other source from which water of such positive purity can be procured, not even from springs, for these are rarely free from mineralization. The Department is convinced that such sources of supply exist within moderate distance of this city, where abundant gathering grounds, of sufficient area and eligible sites

for store reservoirs can be procured, and the water delivered to the City at such elevation as to make pumping unnecessary. It is hoped that you will make the appropriation so often requested by this Department, for preliminary surveys and estimates, in order to ascertain the availability of such sources, and their value to the City. Any such entire change in the water supply, as above suggested, would require years to consummate; but is it not worth the expenditure of a few thousand dollars to demonstrate that such sources exist, even though it should not be thought advisable to construct the works at this time? I would therefore most respectfully ask that an appropriation of \$2,500 to \$3000 be made to this Department, for the above object. Such surveys would furnish much valuable information necessary to the Department, and may bring to light many available sources of water supply now unknown. They will also enable the Department to act intelligently and with confidence, in any extensions that may in future be suggested.

CONDITION AND OPERATION OF THE WORKS.

FAIRMOUNT DAM.

The structure of the dam is rapidly decaying, and will very soon require rebuilding. Its vital importance to the water supply of the City is such, that no possible risk of its failure should be incurred. The Department would again recommend that it be rebuilt of stone. This, although much more expensive, would make it a permanent structure. Wood work will last but from fifteen to twenty years, under the circumstances. If it be rebuilt of stone, early preparations should be made for the work, as it will require at least one year to collect and prepare the material, and at least two years more to rebuild the dam. The head race will require dredging, as more than one-half its original area is now occupied by mud.

RESERVOIRS.

Fairmount Reservoirs.—It was found necessary to make extensive repairs to these reservoirs, the action of frost having loosened the lining and displaced much of the brick work and flagging. The water was let down five feet, the lining taken out to that depth and reset upon a bed of cement mortar and grout poured into all the interstices. The lining of the small central reservoir will require removing this season. This is of wood, which is very objectionable, not only on account of its perishable nature, but decaying wood is highly prejudicial to the purity of the water contained in the reservoir—it should be lined with masonry. By removing all the partitions separating these reservoirs to a depth of five feet, thus making their surfaces one sheet of water, the appearance of the whole would be greatly improved; their effective storage capacity would also be increased. By placing the material removed from the partitions on the top of the outside embankment, the depth of the water could be increased, thus again augmenting the storage capacity, in all about four millions of gallons. The water supplied from these reservoirs would also be delivered in a better condition, as a more perfect subsidence would take place in the passage of the water from the supply end of the reservoirs, over the partitions, to the other, or distributing end. It would also give at least an additional foot in the depth of the water. At present, when full, they only contain 14 feet of water, a depth insufficient in our climate.

CORINTHIAN AVENUE RESERVOIR.

This is now finished, except the fence around the top. It has been tested to its full capacity—27 feet depth of water—and has given entire satisfaction. Before finishing and filling, it was thoroughly cleansed, and a leak in the old work repaired. It is now in good order. During the summer, when excessive demands have been made upon the Works, it has been of great assistance in maintaining a constant and abundant supply of water, by the greatly increased storage capacity it has furnished. The character of the water supplied from it is more satisfactory than that

from any other reservoir. On account of its greater depth and capacity, the water has time to deposit many of its impurities, and to decompose others, as well as escapes that degree of overheating in the sun's rays, which encourages the growth of confervæ and animalcules, and the putrescent decomposition of organic matter.

SPRING GARDEN RESERVOIRS.

These are in good order, and have required but little attention during the past year. Their only fault lies in their limited capacity, which is less than the amount pumped into and supplied from them, in a single day in summer. This allows but little time for the deposit of sediment and purification of the water. The depth of water in these reservoirs when full is seventeen feet, a greater depth than any other, except that on Corinthian Avenue.

There is sufficient land adjoining the reservoir, the property of the City, on which to erect another of the same capacity, but the elevation is not great enough to supply many parts of the district. When additional reservoirs are constructed for this part of the City they should be of greater elevation, say 200 feet above City datum.

KENSINGTON RESERVOIRS.

These reservoirs have occasioned the Department a great amount of trouble. The character of the water pumped into them from the Delaware has frequently been unsatisfactory, and the want of depth (but fourteen feet when as full as they can with safety be pumped,) has permitted the rapid development of living organisms and putrescent decomposition at various times during the summer, rendering it utterly unfit for household purposes, and giving rise to complaints from many of the consumers and the inhabitants of the district generally. Whenever it became offensive, the Department at such times have taken active measures to remedy the evil, and have generally succeeded in a few days, by the application of lime. So soon as an appropriation was procured, the south reservoir was cleansed, and although it had

received attention but three years previously, it was found to contain quite a large amount of black, fetid mud. The following analysis of the mud taken from the Kensington reservoir, made at the Polytechnic College of the State of Pennsylvania, has been kindly furnished the Department by President Kennedy :—

Water,	54.
Silica,	27.30
Alumina and ses-qui Oxide of Iron,	7.40
Carbonate of Lime,	5.90
Vegetable Matter,	4.70
Ammoniacal Salts,	.21
Loss,	.49
	<hr/>
	100.00

The large amount of lime is no doubt due to the lime thrown into the reservoir to purify the water.

The lining of the reservoir was repaired and the fence and stop houses put in good order. The north reservoir should be cleansed as early in the coming summer as possible. This will assist in maintaining the purity of the water, but will not be an effectual remedy so long as the supply is obtained from the present source, and the reservoirs remain as shallow as they now are. The property owned by the City at this point is extensive enough for the construction of a reservoir of a capacity of forty million gallons. This is a desirable location, the centre of an important district, in which a great amount of water is now furnished, and which will in future demand a very large supply.

It is about three miles distant from any of the other reservoirs. The Department have frequently reminded you of the unsatisfactory character of the water supplied by these works. The Board of Health has also found it necessary to call your attention to this matter, In their judgment the water is unfit for culinary, or drinking purposes. We may here be permitted to refer you to the report of this Department to Councils upon the communication and resolutions of the Board of Health on this subject. [See appendix to Journal of Select Council.] Several suggestions have been made by the Department with a view to the improvement,

of the character of the water supplied from these works. They are: 1. To extend the suction mains from the pumps into the river beyond the influence of the sewage and shore water: 2. To deepen the reservoirs, in order to prevent putrescent decomposition: 3. To procure the supply from the works already on the Schuylkill: 4. To remove the Works to a position further up the river and beyond the influence of the city. Either of these suggestions, if carried out, would materially improve the quality of the water. But the most satisfactory results would be procured by removing the works to a point on the Delaware above Frankford, where several most desirable locations may be found. Subsiding reservoirs and filter beds could be constructed, and water of the most desirable character obtained, which could at all times be delivered pellucid, and free from all perceptible impurities. This would however involve a heavy outlay. The method requiring the least expense of all would be the procuring of a supply from the Schuylkill; but in this case the reservoir should also be deepened. Without some such change, the Department will find it impossible to supply water of a satisfactory character to this part of the city during the summer months. You need not be reminded of its extent and crowded population. The district supplied by these works contains about 110,000 inhabitants, and pays but about \$70,000 water rents. From the receipts of the Department in other parts of the city, it is believed that a full and adequate supply of unexceptionable water to this district would have the effect to more than double the revenue derived from water rents alone; besides which the revenue of the city from other sources would be largely increased by a full supply of water, and the health and comfort of the inhabitants greatly promoted.

TWENTY-FOURTH WARD.

These Works are still dependent upon the Stand-pipe, and although a full supply has been kept up, it has been at great expense and damage to the machinery. It has frequently been necessary to run the engines for parts of the day at a speed far beyond that of safety, involving the necessity of a large amount of repairs. It is hoped that a reservoir will be immediately com-

menced. The subject has been so often urged upon your attention that further remarks are believed to be superfluous. An abundant and reliable supply of water would doubtless more than double the income of the Department from this district. See in regard to a reservoir for this district, under the head of *Further Extension of the Works*.

CAPACITY OF RESERVOIRS.

The storage capacity of the reservoirs when full is as follows :

Fairmount	5 Reservoirs,	. . .	26,000,000
Corinthian Avenue 1,	"	. . .	37,300,000
Spring Garden	2,	" . . .	9,800,000
Kensington	2,	" . . .	9,384,000
Total storage capacity,			83,300,000 galls.

This is about four days average supply to the City, and but a little over two days, when the greatest demands are made upon the Works.

WORKS.

FAIRMOUNT WORKS.

These Works have furnished a larger amount of water in 1861 than any previous year. Much of the machinery is old and dilapidated, and requires a large amount of repairs. Indeed the entire works should be rebuilt. When the new wheels are started the old works can be stopped and thoroughly repaired. The large amount of wood work entering into the construction of the old works is constantly decaying, and requires extensive repairs every year. The amount of water pumped this year exceeds that of last year 224,796,611 gallons. A part of this excess was supplied through the Corinthian Avenue reservoir to the district furnished from the Schuylkill Works. Table No. 1 exhibits the operation of the works for the past year. The following are the principal repairs made to these works during the year :—

REPAIRS AT FAIRMOUNT WORKS.

Valves of all the pumps overhauled and examined, and several refitted. New step in turbine. New piston in No. 8, with wooden packing. New crank pin in No. 1. New breast in Nos. 1 and 7. Overhauled wheels Nos. 4, 5, 6, 7, and 8. Valve chest of No. 2, cracked, and repaired. Counters were put on pumps Nos. 1, 2, 3, 4, 5, 6, 7 and 8. Flag pavements were placed in three of the wheel pits, where the wooden floors had become rotten and given way.

RUNNING EXPENSES OF FAIRMOUNT WORKS.

Salaries of engineers and labor, - - - -	\$1,999 99
Gas for lighting, - - - -	243 47
76 tons of coal for warming works, at average price	
\$3.70 ⁸ per ton, - - - -	274 84
120 gallons of oil, at - - - -	120 00
110 pounds of tallow, at - - - -	12 92
Packing and small stores, - - - -	566 76
Repairs, - - - -	2,990 00
	<hr/>
	6,207 98
Interest on cost of works and water power, -	36,000 00
	<hr/>
	\$42,207 98
Cost of raising water into reservoir per million gal- lons, including interest on cost of works, - -	\$11 31
Not including interest on cost of works, - -	1 66
Cost of raising water per million gallons one foot high, including interest on cost of works, - -	11 ³ / ₁₀ cents.
Not including interest on cost of works, - -	1 ⁰ / ₁₀ cents.

No. 1. OPERATION OF THE FAIRMOUNT WORKS DURING 1861.

MONTHS.	WATER.		OIL.			TALLOW.		
	Gallons of Water pumped each month.	Average number of gallons pumped per day	Quarts of Oil used during the month.	Gallons raised into Reservoir per quart of oil.	Duty in million gallons raised one foot high per quart of oil.	Pounds of Tallow used during the month.	Gallons raised into Reservoir, per pound of tallow.	Duty in million gallons raised one foot high, per pound of tallow.
January,.....	237,600,275	7,664,525	76	3,126,319	312	8	29,700,034	2,970
February,.....	234,394,875	8,371,245	52	4,507,593	450	5	46,878,975	4,687
March,.....	255,390,245	8,238,395	35	7,296,864	729	7	36,484,320	3,648
April,.....	272,939,810	9,097,993	32	8,529,369	835	6	48,234,952	4,823
May,.....	343,538,745	11,081,891	32	10,735,585	1,073	7	49,076,963	4,907
June,.....	329,274,515	10,975,832	34	9,684,544	968	16	20,579,657	2,057
July,.....	377,836,525	12,188,275	37	10,211,798	1,021	26	14,532,174	1,453
August,.....	389,153,560	12,552,760	36	10,809,321	1,080	9	43,237,284	4,323
September,.....	363,812,900	12,127,070	41	8,873,485	887	6	60,635,493	6,063
October,.....	392,340,960	12,656,160	48	8,173,770	817	10	39,234,096	3,923
November,.....	293,220,171	9,774,005	27	10,860,000	1,086	6	48,870,029	4,887
December,.....	242,283,047	7,815,579	30	8,076,101	807	4	60,570,761	6,057
Total,.....	3,731,785,628	10,224,070	480	7,774,553	777	110	33,925,324	3,392

SCHUYLKILL WORKS.

The operation of these Works has been extremely satisfactory through the year; a slight saving in fuel has been effected above the last year, as will be seen at the foot of table No. 2. The amount of water pumped has not been as large; the assistance rendered by Fairmount Works through the Corinthian Avenue reservoir making it unnecessary. The deficiency was 169,777,511 gallons. While the saving in coal has been considerable, the expense of pumping has been slightly increased. This is accounted for by the advance in the price of coal; the average price paid this year was \$3 51, last year it was but \$3 27, making a difference of \$792 in the total cost of the coal consumed. At least one new boiler should be placed in the old boiler house this season, as several of the old ones can hardly be considered perfectly safe.

Table No. 2 exhibits the operation of the Works for the past year. The following are some of the principal repairs made to the Works.

REPAIRS AT SCHUYLKILL WORKS.

Hollow valve-stem of No. 2 repaired; two $1\frac{1}{4}$ inch cocks and pipe renewed for charging No. 2 pump; new fire doors with holes for admitting atmospheric air put on all the boilers in new boiler house; three new guage cocks and pipes for one of the boilers of Cornish engine; three engine registers thoroughly repaired; fire plug in stop house repaired; new cylinder heads for Nos. 1 and 2; new valve and guard for air pump of Cornish engine; injection valve of Cornish engine repaired; new valve furnished and seat for same repaired for pump of Cornish engine; exhaust lever of Cornish engine made wider on face; a new steam valve for No. 2; a complete set of "grate bars" for boilers of Cornish engine; tubes of new tubular boilers caulked; two of boilers of Cornish engine patched; boilers in old boiler house patched several times; new stay bolts put in valve-chest of No. 3 pump; new air pump, bucket and valve for Cornish engine.

No. 2. OPERATION OF THE SCHUYLKILL WORKS DURING THE YEAR 1861.

MONTHS.	WATER.		COAL.			OIL.			TALLOW.		
	Gallons of water pumped each month.	Average number of gallons pumped per day.	Pounds of coal consumed during the month.	Gallons raised into reservoir per pound of coal.	Duty in gallons, raised one foot high per pound of coal.	Quarts of oil used each month.	Gallons raised into reservoir per quart of oil.	Duty in million celloons raised one foot high per quart of oil.	Pounds of tallow used during the month.	Gallons raised into reservoir per pound of tallow.	Duty in million gallons raised one foot high per pound of tallow.
January,	156,684,300	5,054,332	367,136	246.7	49,170	37 $\frac{3}{4}$	4,178,248	480	98	1,598,819	183
February,	170,295,670	6,81,988	472,530	360.2	41,423	38 $\frac{3}{4}$	4,423,264	508	100	1,702,956	196
March,	205,620,510	6,632,919	596,960	344.4	39,606	69 $\frac{3}{4}$	2,958,568	340	120	1,713,504	197
April,	202,456,700	6,748,556	629,216	321.4	37,095	49	4,131,769	475	134	1,510,870	173
May,	219,812,040	7,090,711	626,864	350.6	40,319	54	4,075,593	468	124	1,772,677	203
June,	222,805,240	7,426,841	669,536	332	38,180	62	3,594,600	413	115	1,937,436	222
July,	254,015,350	8,194,043	665,280	381.8	43,907	63	4,031,989	463	136	1,867,769	214
August,	252,387,510	8,141,532	756,896	333.4	38,341	63	4,006,151	460	159	1,587,342	192
September,	239,461,280	7,982,042	717,696	333.6	38,346	62	3,863,892	343	136	1,760,744	202
October,	191,714,820	6,184,360	646,464	296.5	34,097	47	4,079,038	469	126	1,521,546	174
November,	229,671,390	7,655,713	628,768	365.3	41,998	54	4,253,174	489	124	1,045,737	120
December,	182,257,900	5,879,287	595,840	306	35,190	33	5,222,960	604	108	1,691,276	194
Total,	2,527,182,710	6,923,788	7,373,186	343	39,445	632 $\frac{3}{4}$	3,995,545	459	1,480	1,707,555	196

Average duty for the year, 32,870,800 pounds, raised one foot high, by the consumption of 100 lbs. of anthracite coal,
 Average duty for 1860, 32,115,800 " " " " " " " " " " " "
 Average duty for 1859, 25,570,300 " " " " " " " " " " " "

COAL, OIL AND TALLOW ACCOUNT OF SCHUYLKILL WORKS, 1861.

Coal.

	Tons.	Cwt.	Qr.	lbs.
Amount on hand January 1st,	369	2	0	0
Received during January,	0	0	0	0
“ “ February,	54	5	0	0
“ “ March,	355	15	0	0
“ “ April,	240	11	0	0
“ “ May,	340	11	0	0
“ “ June,	207	5	2	0
“ “ July,	334	3	0	0
“ “ August,	436	6	0	0
“ “ September,	442	16	0	0
“ “ October,	423	10	0	0
“ “ November,	927	12	0	0
“ “ December,	129	6	0	0
	<hr/>			
	4,261	2	2	0
Coal consumed, including amount consumed in stoves,	3,300	13	0	2
	<hr/>			
Coal on hand Dec. 31st,	960	9	1	26

Oil.

Amount on hand January 1st,	-	-	-	72 gallons.
Received during the year,	-	-	-	146 “
				<hr/>
				218 “
Consumed during the year,	-	-	-	158 “
				<hr/>
On hand December 31st,	-	-	-	60 “

Tallow.

Amount on hand January 1st,	-	-	-	562	pounds.
Received during the year,	-	-	-	1,768	"
				<hr/>	
				2,430	"
Consumed during the year,	-	-	-	1,480	"
				<hr/>	
On hand December 31st,	-	-	-	950	"

RUNNING EXPENSES OF SCHUYLKILL WORKS.

Salaries of engineers and firemen,	-	-	-	\$7,070	17
3,300 tons, 13 cwt., 0 qr., 2 lbs. of coal at average price of \$3.51 per ton,	-	-	-	11,585	05
158 gallons of oil at \$1,	-	-	-	158	00
1,480 pounds of tallow at 11 $\frac{3}{4}$ cts.,	-	-	-	173	90
Coal oil and fluid for lighting,	-	-	-	249	66
Packing and small stores,	-	-	-	447	73
Repairs,	-	-	-	1,863	40
				<hr/>	
				21,547	91
Interest on cost of works, (\$150,000)	-	-	-	9,000	00
				<hr/>	
				30,547	91
Cost of raising water into reservoir per million gallons, including interest on cost of works,	-	-	-	\$12	08
Not including interest on cost of works,	-	-	-	8	52
Cost of raising water per million gallons one foot high, including interest on cost of works,	-	-	-	10 $\frac{1}{10}$	cents.
Not including interest on cost of works,	-	-	-	7 $\frac{4}{10}$	cents.

DELAWARE WORKS.

A much larger supply of water was furnished the past year by these Works to the district dependent upon them; yet not in sufficient quantity to meet its wants. This increased supply was procured by connecting the pumping main with the distributing mains at Frankford Avenue and at Second street, thus distribut-

ing the water before it entered the reservoirs, a mode which in some respects was objectionable; but the Department had no choice, as even then the deficiency was only partly made up. The engines have performed with entire satisfaction, and have probably operated as well as they can be made to do, particularly since the high pressure engine has been altered. But from essential defects in their construction as pumping engines, they are not worth running. The saving in fuel alone would more than pay the interest on the cost of engines of proper construction. Attention should also be given to procuring water of better quality for this district.

Table No. 3 exhibits the operation of the Works for the year 1861. The alterations made in engine No. 1, have resulted in the saving of thirty-eight per cent. in the amount of coal consumed in pumping a given amount of water, and also in increasing the amount of water pumped by this engine.

COAL, OIL, AND TALLOW ACCOUNT OF DELAWARE WORKS, 1861.

Coal.

	T.	cwt.	qr.	lbs.
Amount on hand January 1st,	161	17	0	3
Received during January,	0	0	0	0
“ “ February,	90	0	0	0
“ “ March,	100	0	0	0
“ “ April,	108	14	0	0
“ “ May,	217	0	2	14
“ “ June,	541	10	1	10
“ “ July,	0	0	0	0
“ “ August,	192	0	0	0
“ “ September,	164	0	0	0
“ “ October,	185	12	2	0
“ “ November,	168	10	0	0
“ “ December,	303	10	0	0
	<hr/>	<hr/>	<hr/>	<hr/>
	2232	14	1	27
Consumed during the year, including am't consumed in stoves,	1836	1	1	17
	<hr/>	<hr/>	<hr/>	<hr/>
Coal on hand December 31st,	406	13	0	10

MONTHS.	WATER.		COAL.			OIL.			TALLOW.		
	Gallons of water pumped each month.	Average number of gallons pumped per day.	Pounds of coal consumed during the month.	Gallons raised into Reservoir per pound of coal.	Duty in gallons raised one foot high per pound of coal.	Quarts of oil used during the month.	Gallons raised into Reservoir per quart of oil.	Duty in million gallons raised one foot high per quart of oil.	Pounds of tallow used during the month.	Gallons raised into Reservoir per pound of tallow.	Duty in million gallons raised one foot high per pound of tallow.
January,.....	60,267,380	1,944,109	284,185	212.1	23,744	19	3,171,967	355	30	2,008,912	224
February,.....	56,395,800	2,014,136	260,965	200.8	22,489	14	4,028,271	460	22	2,563,445	294
March,.....	63,605,050	2,051,776	288,320	220.6	24,707	22½	2,826,891	317	42	1,514,406	170
April,.....	69,559,230	2,318,641	310,200	224.2	25,116	24½	2,839,152	317	44	1,580,891	177
May,.....	84,910,320	2,739,042	368,085	230.6	25,827	32	2,656,885	297	54	1,572,418	176
June,.....	88,916,160	2,963,872	323,228	275.	30,700	25	3,556,644	398	52	1,709,939	191
July,.....	110,985,480	3,580,176	375,140	295.8	33,129	27½	4,035,832	431	50	2,219,709	248
August,.....	103,259,310	3,330,945	411,340	251.	28,112	28½	3,623,134	405	44	2,346,802	262
September,.....	102,217,200	3,407,240	392,345	260.5	29,176	25½	4,008,520	488	23	4,444,208	497
October,.....	92,083,810	2,972,445	369,080	249.4	27,732	23	4,003,644	448	48	2,048,600	229
November,.....	81,697,520	2,723,250	376,329	217.	24,304	24	3,404,063	381	42	1,945,179	217
December,.....	69,918,440	2,255,433	342,380	204.2	22,970	17½	3,995,333	446	34	2,056,424	230
Total.....	983,805,740	2,695,358	4,101,597	242	26,904	283	3,476,345	388	480	2,049,595	229

Average duty for the year, 22,420,000 pounds raised one foot high, by the consumption of 100 lbs. of anthracite coal.
 Average for 1860, 20,525,800 " " " " " " " " " " " "
 " " 1859, 19,720,800 " " " " " " " " " " " "

Oil.

Amount on hand January 1st,	29 gallons,
Received during the year,	86½ "
	<hr/>
	115½
Consumed during the year,	70¾ gallons.
	<hr/>
On hand December 31st,	44¾ gallons.

Tallow.

Amount on hand January 1st,	395 lbs.
Received during the year,	314 "
	<hr/>
	709
Consumed during the year,	480 lbs.
	<hr/>
On hand December 31st,	229 "

RUNNING EXPENSES OF DELAWARE WORKS.

Salaries of engineers, firemen &c.,	\$4,399 30
T. cwt. gr. lbs. 1836 1 1 17 of coal at average price of \$3 86 per ton,	7,187 23
70¾ gallons of oil at \$1.00,	70 75
480 pounds of tallow at 11¾ cts.,	56 75
Coal oil and fluid for lighting,	107 71
Packing and small stores,	138 33
Repairs,	1,499 54
	<hr/>
	13,459 26
Interest on cost of Works (\$150,000,)	9,000 00
	<hr/>
	\$22,459 26

Cost of raising water into reservoir per million gallons including interest on cost of Works,	\$22 84
not including interest on cost of Works,	13 69
Cost of raising water per million gallons one foot high including interest on cost of Works,	20 4—10 cts.
not including interest on cost of Works	12 2—10 “

REPAIRS AT DELAWARE WORKS.

Five follower bolts for No. 1, pump piston, three for No. 2. Valve face in No. 2 pump taken out and replaced. New register put on No. 1 engine. Six new bolts and one new spring for piston of No. 2. New india rubber air-pump valve for No. 2. India-rubber face for delivery valve for No. 2. No. 1, thoroughly overhauled and new valve gear made.

TWENTY-FOURTH WARD WORKS.

The engines of these works have been pressed beyond their capacity. It was thought, two years ago, that without a reservoir they could not furnish any larger supply than they were then pumping, which was a daily average of 727,277 gallons; but last year they furnished a daily average of 967,956 gallons. There is certainly a limit to the capacity of these works, and it is believed that point has been reached, and a reservoir is now absolutely necessary. The Almshouse was supplied from these works the greater part of the year. Table No. 4 exhibits their operation. The large amount spent in repairs is occasioned by over-tasking the machinery. The following are the principal repairs for the year:—

No. 4.

OPERATION OF THE TWENTY-FOURTH WARD WORKS DURING 1861.

MONTHS.	WATER.		COAL.			OIL.			TALLOW.		
	Gallons of water pumped each month.	Average number of gallons pumped per day.	Pounds of coal consumed during the month.	Gallons raised into Reservoir per pound of coal.	Duty in gallons raised one foot high per pound of coal.	Quarts of oil used during the month.	Gallons raised into Reservoir per quart of oil.	Duty in million gallons raised one foot high per quart of oil.	Pounds of tallow used during the month.	Gallons raised into Reservoir per pound of tallow.	Duty in million gallons raised one foot high per pound of tallow.
January,.....	23,127,300	746,042	112,450	205.6	47,288	5	4,625,460	1,063	14	1,651,950	879
February,	22,378,500	799,232	111,925	199.8	45,954	3½	6,393,857	1,469	10	2,237,850	512
March,.....	23,451,480	756,467	119,200	196.7	45,241	5	4,690,296	1,079	16	1,465,717	337
April,.....	25,235,820	841,194	121,544	207.6	47,748	3½	7,210,231	1,658	17	1,484,460	341
May,	27,828,860	897,689	142,350	195.4	44,942	3	9,276,120	2,133	20	1,391,418	319
June,.....	31,839,030	1,061,301	145,114	219.	50,370	4	7,959,783	1,830	16	1,989,946	457
July,	36,738,180	1,185,102	177,864	206.5	47,495	4	9,184,545	2,112	16	2,296,136	528
August,	38,066,130	1,227,939	179,700	217.4	50,002	4½	8,459,140	1,945	15	2,537,742	533
September,	34,629,750	1,154,325	169,500	204.3	46,989	4	8,657,437	1,989	14	2,473,553	568
October,	35,549,460	1,146,756	180,000	197.5	45,425	4	8,887,365	2,044	12	2,962,455	681
November,.....	24,621,750	820,725	126,000	195.4	44,942	4	6,155,437	1,415	14	1,758,696	404
December,	29,848,140	962,844	168,200	177.	40,710	4	7,462,035	1,716	12	2,487,345	572
Total,.....	353,313,900	967,956	1,753,847	201	46,230	48	7,360,706	1,692	176	2,007,465	660

Average duty for the year, 33,545,000 pounds raised one foot high, by the consumption of 100 lbs. of anthracite coal.
 Do. do. 1860, 33,500,800 " " " " " " " " " " " "
 Do. do. 1859, 28,520,800 " " " " " " " " " " " "

REPAIRS AT TWENTY-FOURTH WARD WORKS.

Bolts for holding down receiving valves of main pumps renewed; twelve new one inch bolts, put in caps of valve boxes; receiving valves of main pumps repaired several times, and one new valve and seat furnished; new plunger and stuffing box gland for feed pump; new piston rods for air-pump buckets, and one new bucket furnished; one bucket of cold-water-pump worn too small, and band shrunk on; lever of steam valves of both engines broke and were repaired; six new gauge cocks put in in north boilers; India rubber delivery valves for air-pumps substituted for pot-lid valves; five new strikers; three catches for rock shafts; one fulcrum pin for weighted lever; new valve seats put in feed pumps of both engines.

COAL, OIL AND TALLOW ACCOUNT OF TWENTY-FOURTH WARD WORKS.

Coal.

	Tons.	Cwt.	Qr.	lbs.
Amount on hand January 1st,	65	10	0	21
Received during January,	9	15	2	4
“ “ February,	51	15	3	15
“ “ March,	50	0	0	10
“ “ April,	53	12	3	0
“ “ May,	65	13	0	14
“ “ June,	84	16	1	18
“ “ July,	56	6	2	12
“ “ August,	87	9	0	10
“ “ September,	73	14	2	16
“ “ October,	81	3	3	25
“ “ November,	64	6	1	10
“ “ December,	115	4	1	27
	859	8	4	4
Consumed during the year, including amount consumed in stoves,	787	19	1	27
Coal on hand December 31st,	71	9	3	5
Less loss and refuse,	20	0	0	0
	51	9	3	5

Oil.

Amount on hand January 1st, - - -	40 gallons.
Received during the year, - - -	0 "
	<hr/>
	40 "
Consumed during the year, - - -	12 "
	<hr/>
On hand December 31st, - - -	28 "

Tallow.

Amount on hand January 1st, - - -	123 pounds.
Received during the year, - - -	283 "
	<hr/>
	406 "
Consumed during the year, - - -	176 "
	<hr/>
On hand December 31st, - - -	230 "

RUNNING EXPENSES OF THE TWENTY-FOURTH WARD WORKS.

Salaries of engineers and firemen, - - -	\$2,500 00
807 tons 19 cwt. 1 qr. 27 lbs. of coal, at average price of \$3.78 per ton, - - -	2,675 34
12 gallons of oil, at - - -	12 00
176 pounds of tallow, at - - -	20 68
Packing and small stores, - - -	46 11
Coal oil and fluid for lighting, - - -	175 04
Repairs, - - -	1,275 73
	<hr/>
	6,704 90
Interest on cost of works, (\$55,000,) - - -	3,300 00
	<hr/>
	\$10,004 90

Cost of raising water into stand-pipe per million gal- lons, including interest on cost of works, - - -	\$28 34
Not including interest on cost of works, - - -	\$18 99
Cost of raising water per million gallons one foot high, including interest on cost of works, - - -	12 ³ / ₁₀ cents.
Not including interest on cost of works, - - -	8 ¹ / ₁₀ cents.

No. 5.

TOTAL QUANTITY OF WATER PUMPED BY ALL THE WORKS DURING
THE YEAR 1861.

MONTHS.	Gallons pumped each month.	Average number of gallons pumped per day.
January,	447,679,255	15,409,008
February,	483,464,845	17,266,601
March,	548,067,285	17,679,589
April,	570,191,560	19,006,385
May,	676,089,465	21,809,337
June,	672,834,945	22,427,837
July,	799,575,535	25,147,596
August,	782,848,510	25,253,176
September,	740,121,130	24,670,697
October,	721,689,050	22,959,710
November,	629,210,831	20,973,693
December,	524,307,527	16,913,146
Total,	7,596,079,938	20,728,985

Of the above, the following amounts were pumped by each of the works :

	Total.	Daily average.
Fairmount,	3,731,785,628	10,224,070
Schuykill,	2,527,182,710	6,923,788
Delaware,	983,805,740	2,695,358
Twenty-fourth Ward,	353,313,900	967,956

As a whole, the operation of the Works is entirely satisfactory, and the engineers and their assistants have considered the interest of the City, and managed the Works with care and economy. Table No. 5, exhibits the amount of water pumped by the different works. Table No. 6 exhibits the comparative economy of the different works, from which it will be seen that the engines have done increased duty every year since the present organization of the Department, and it is believed, that by maintaining the system of management introduced by the Department, still greater

economy in running the works can be effected. The experience gained by the engineers and their assistants by so many years' attention to their respective works, is of great value to the City.

No. 6.

COMPARATIVE ECONOMY OF THE WORKS IN COAL, OIL AND TALLOW, FOR THE YEAR 1861.

WORKS.	Average number of gallons raised one foot high per pound of anthracite coal.	Pounds of anthracite coal per horse power per hour.	Number of pounds of water raised one foot high per one hundred pounds of anthracite coal.	Millions of gallons raised one foot high, per quart of oil.	Millions of gallons raised one foot high, per pound of tallow.
Fairmount,				480	3,392
Schuylkill,	39,445	6.	32,870,800	459	196
Delaware,	26,904	8.8	22,420,000	388	229
24th Ward,	46,230	5.1	35,545,000	1,692	660
Average,.....	37,526	6.6	31,278,600	754	1,119
Average of 1860,	36,457	6.9	30,380,820	731	1,784
Average of 1859,	29,527	8.1	24,606,366	500	771

DISTRIBUTION.

FIRST DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE FIRST, SECOND, THIRD AND FOURTH WARDS, 1861.

Street.	Location.	Size.	
		Inches.	Feet.
Cuba,	From Moore St., southward	4	125
Anthony.	“ Dickerson St. northward,	4	160
Park.	“ Twenty-seventh to Twenty eighth,	4	460
Twenty-seventh.	“ Federal to Ingram,	6	200
Twenty-eighth.	“ Federal to Park,	6	140
Catharine.	“ Sixteenth to Seventeenth,	6	450

Street.	Location.	Size.	
		Inches.	Feet.
Webster.	From Nineteenth to Twentieth,	4	460
Park.	“ Catharine to Fitzwater,	4	385
Evergreen.	“ Twentieth to Twenty-first,	4	555
Ninth.	“ Snyder to Jackson,	6	412
Bedford.	“ Twenty-first to Gray’s Ferry Rd.,	4	1010
Campbell.	“ Fitzwater to Sixth,	4	448
Montrose	“ Twenty-first to Twenty-second,	4	435
Twenty-first.	“ Christian to Montrose,	6	188
Christian.	“ Twentieth to Twenty-first,	6	527
Christian.	“ Fifteenth to Sixteenth,	12	409
	Fire-plug attachments,	4	109
	At Fairmount,	48	30
	“ “ “	30	209

Total number of feet of pipe laid in the First District, 6712
Or 1.27 miles. Average diameter 6.1 inches.

The number of feet of new pipe laid was :—

Of four inch,	4147
Of six inch,	1917
Of twelve inch,	409
Of thirty inch	*209
Of forty eight inch	*30

Total number of feet of new pipe laid, 6712

*Pumping mains at Fairmount Works laid by the Purveyor of First District.

Of the distributing pipes laid, sixty-four and one-tenth per cent was four inch pipe ; twenty-nine and six-tenths per cent, six inch pipe ; six and three-tenths per cent, twelve-inch pipe. Average size 5.1 inches.

SECOND DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE SIXTH, SEVENTH, EIGHTH,
NINTH, TENTH AND TWENTY-FOURTH WARDS, 1861.

Street.	Location.	Size.	
		Inchcs.	Feet
Spruce.	From Forty-third to Forty-fifth,	8	762
Manning,	" Twenty-second to Twenty-third,	3	328
Lancaster.	" Market to Oak,	4	425
Forty-first.	" Market to Oak,	6	275
Thirty-second.	" Hamilton to Bridge,	6	300
Delaware Avenue.	" Market to Vine,	6	3422
Broad.	" Westmoreland to Pine, W. side,	6	679
Darby Road.	" Forty-third to Forty-sixth,	6	781
Broad.	" Locust street, northward,	6	177
Forty-sixth,	" Darby Road to Kingsessing Avenue,	6	680
Kingsessing Avenue.	" Forty-sixth to west of Forty- seventh,	6	709
Forty-seventh.	" Kingsessing Avenue, north- ward,	6	219
Porcelain.	" Twenty-first, eastward,	3	212
Locust.	" Eighteenth, westward,	6	252
Sansom.	" Albion to Twenty-fourth,	6	925
Dunlap.	" Sansom, northward,	3	175
Walnut.	" Twenty-first to Albion,	6	228
Nineteenth.	" Walnut to Lewis,	6	181
Exeter.	" Eighteenth, eastward,	3	228
Stratford.	" Currant to Miles Alley,	3	240
Aurora.	" Ninth street, westward,	3	87
Marble Alley.	" Walnut street, southward,	3	157
Davenport.	" Duponceau street, eastward,	3	70
Darby Road.	" Hamilton to Woodland Ter- race,	6	398
Albion.	" Locust to Spruce,	3	455
Forty-seventh.	" Kingsessing Avenue, south'd,	6	436
Woodland Terrace.	" Darby Road to Baltimore Pike,	6	437

Street.	Location.	Size. Inches.	Feet.
Forty-first.	" Walnut to Chestnut, re-laid,	6	382
Oak.	" Fortieth to Forty-first,	4	675
Race.	" Thirty-second to Thirty-third, re-laid,	6	425
	Fire-plug attachments,	4	258
	Connections,	3	74
	"	4	111

Total number of feet of pipe laid in the Second District, 15,163
Or, 2.87 miles. Average diameter, 5.5 inches.

The number of feet of pipe relaid was :—

Of six inch pipe, 807, or .15 of a mile.

The number of feet of new pipe laid was :—

Of three inch pipe, 2,026

Of four inch, 1,469

Of six inch, 10,099

Of eight inch, 762

Total number of feet of new pipe laid, . . . 14,356

Or, 2.72 miles.

Of the new pipe laid, fourteen and one-tenth per cent. was 3 inch pipe, ten and two-tenths per cent. 4 inch, seventy and three-tenth per cent. 6 inch, five and three-tenths per cent. 8 inch pipe.
* Average size, 5.5 inches.

THIRD DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE ELEVENTH, TWELFTH, SIXTEENTH, SEVENTEENTH, NINETEENTH AND TWENTY-THIRD WARDS, 1861.

Street.	Location.	Size.	
		Inches.	Feet.
Brinton.	From Master to Jefferson,	4	506
Canal.	“ Front to N. side Girard avenue,	6	3790
Tulip.	“ Norris to Otis,	6	324
Somerset.	“ Belgrade to Memphis,	6	1221
Montgomery.	“ Front to Howard,	6	284
Edgemont.	“ Reading Railroad, southwestward,	6	812
Hancock.	“ Berks to Susquehanna avenue,	6	1105
Girard Avenue.	“ Norris, westward,	6	350
Toronto.	“ Melvale, southward,	4	207
Girard Avenue.	“ Ash, eastward,	4	479
Howard.	“ Cumberland to Cambria,	6	2265
Norris.	“ Girard avenue to Richmond,	6	587
Fourth.	“ Norris to Diamond,	6	542
Lehigh Avenue.	“ Front to Second, south side,	6	1111
York.	“ Richmond to Aramingo Canal,	6	762
Lehigh Avenue.	“ Howard to Second, north side,	6	843
Amber.	“ Frankford road to Lehigh avenue,	6	1010
Hazzard.	“ Coral to Emerald,	4	424
Mascher.	“ Berks to Norris,	6	527
Perry.	“ Norris to Diamond,	4	550
Clairborn.	“ Ball to Plumb,	4	636
William.	“ Salmon to north of Thompson,	6	712
Braddock.	“ Huntingdon to Lehigh avenue,	4	640
Richmond,	“ Frankford Road, westward,	6	180
Norris.	“ Fourth to Leithgow,	6	150
Lehigh Avenue.	“ Edgemont to Salmon, west side,	6	312
Edgemont.	“ Anthracite, northeastward,	6	240
	Fire-plug attachments,	4	448

Connections,	4	173
“	6	17
“	10	14

Total number of feet of pipe laid in the Third District, 21,221
Or, 4.02 miles. Average diameter, 5.6 inches.

The number of feet of new pipe laid was :—

Of four inch pipe,	4,063
Of six inch pipe,	17,144
Of ten inch pipe,	14

Total number of feet of pipe laid, 21,221

Of the above new pipe laid, nineteen and one-tenth per cent. was 4 inch pipe, and eighty and eight-tenths per cent. 6 inch pipe ; one-tenth per cent. 10 inch pipe. Average size, 5.6 inches.

FOURTH DISTRICT.

ACCOUNT OF IRON PIPES LAID IN THE THIRTEENTH, FOURTEENTH, FIFTEENTH, TWENTIETH AND TWENTY-FIRST WARDS, 1861.

Street.	Location.	Size.	
		Inches.	Feet.
Montgomery.	From Sixth to Broad St.,	6	4335
Bucknell.	“ Hare to Brown,	4	480
Twenty-third.	“ College Avenue to Oxford.	10	1750
Brandywine.	“ Twenty-fourth to Twenty-fifth,	4	474
Fifteenth.	“ Jefferson to Columbia Av.,	6	1124
Sharswood.	“ Twenty-second to Twenty-third,	6	553
Cambridge.	“ Nineteenth to Twentieth,	4	495
Taylor.	“ Hare to Brown,	4	490
Dauphin.	“ Seventh to Eighth,	6	400
	At Fairmount,	30	678
	“ “ “	36	125
	“ “ “	3	13
Carlisle.	From Poplar to Jefferson,	4	2195

Street.	Location.	Size, Inches.	Feet.
Franklin.	" Susquehanna to Dauphin,	6	420
Redner.	" Twenty-second to Twenty-third,	6	457
Oxford.	" Fifteenth to Sydenham,	6	294
Fawn.	" Jefferson to Oxford,	4	625
Fernon.	" Seventeenth to Eighteenth,	4	488
Penn'a Avenue.	" Twenty-third to Twenty-fourth,	6	657
Cuyler.	" Nineteenth to Twentieth,	4	492
Brandywine.	" Fifteenth to Sixteenth,	4	473
	Fire-plug attachments,	4	228
	Connections,	6	106

Total number of feet of pipe laid in the Fourth District, 17,352
Or 3.29 miles. Average diameter 6.8 inches.

The number of feet of new pipe laid was:—

Of three inch pipe,	13
Of four inch,	6440
Of six inch,	8346
Of ten inch,	1750
Of thirty inch,	*678
Of thirty-six inch,	*125

Total number of feet of new pipe laid, 17,352

*Mains for the new pumps, at Fairmount, laid by the Purveyor of the Fourth District.

Of the distributing pipe laid, one-tenth per cent. is three inch pipe; thirty-nine per cent. is four inch; fifty and four-tenths per cent. is six inch; ten and six-tenths per cent. is ten inch pipe. Average size 5.6 inches.

The number of feet of new pipe laid in the year 1861 was:

Of three-inch pipe	2,039
Of four-inch pipe,	16,119
Of six-inch pipe,	37,506
Of eight-inch pipe,	762
Of ten-inch pipe,	1,764
Of twelve-inch pipe,	409

Total of new distribution pipe, 58,599 ft.
or 11 $\frac{1}{10}$ miles. Average diameter 5.5 inches.

RECAPITULATION OF PIPES LAID IN 1861.

WARDS.	3 in. diam.	4 in. diam.	6 in. diam.	8 in. diam.	10 in. diam.	12 in. diam.	TOTAL.
1, 2, 3, 4,		4,147	1,917			409	6,473
5, 6, 7, 8, 9, 10, 24,	2,026	1,469	10,906	762			15,163
11, 12, 16, 17, 18, 19, 23,		4,063	17,144		14		21,221
13, 14, 15, 20, 21, ...	13	6,440	8,346		1,750		16,549
	2,039	16,119	38,313	762	1,764	409	59,406

TABLE SHOWING THE COMPARATIVE COST OF LABOR LAYING WATER PIPES IN THE SEVERAL DISTRICTS.

DISTRICTS.	Feet.	Average size of diameter.	Cost per foot per inch of diameter.	Cost per lineal foot.
First,	6,473	5.1 inch.	2.65 cts.	14 cts.
Second,	14,356	} 5.5 "	} 2.92 "	16 "
Second, relaid pipe,	807			
Third,	21,221	5.6 "	2.39 "	13 "
Fourth,	16,549	5 6 "	2.97 "	17 "
	59,406	5.5 inch.	2.74 cts.	15 cts.

Being a total of 58 feet more than $11\frac{1}{10}$ miles.

Number of feet previously laid, 1,718,649
 Laid in the year 1861, 60,448

Total water pipe, 1,779,097 ft.

Being a total of 263 feet less than 337 miles of water main laid in the City.

Laid for the new pumps at Fairmount.

Of thirty-inch pipe, 887
 Of thirty-six inch pipe, 125
 Of forty-eight inch pipe, 30

Total of pipe for the new pumps, 1,042 ft

The number of feet of relaid pipe was:

Of six-inch pipe, 807 ft.
or .15 of a mile.

Total number of feet of pipe laid in the year 1861, 60,448 ft.
or 80 feet less than $11\frac{1}{2}$ miles.

Of the new distribution pipe laid, three and five-tenths per cent. is three inch. Twenty-seven and five-tenths per cent. is four inch. Sixty-four per cent. is six inch. One and three-tenths per cent. is eight inch. Three per cent. is ten inch. Seven-tenths per cent. is twelve inch. Average diameter 5.5 inches.

ACCOUNT OF THE NUMBER OF HOLES DRILLED FOR MAKING NEW ATTACHMENTS TO PUBLIC MAINS DURING THE YEAR 1861.

MONTHS.	Half inch diameter.	Five-eighths inch diameter.	Three-fourths inch diameter.	One inch diameter.	Total holes and attachments made.	Shut off for repairs to private pipes.	Shut off for repairs to public pipes.	Average cost per each attachment.
January,	42	6	1	1	50	40	16	\$3 52
February,	53	17	0	0	70	68	7	2 05
March,	63	28	1	1	93	44	10	2 63
April,	91	26	3	3	123	26	4	2 17
May,	90	25	1	1	117	42	8	2 01
June,	102	32	4	0	138	38	11	1 46
July,	87	39	2	1	129	26	16	1 92
August,	70	41	4	0	115	40	10	2 04
September,	83	21	4	1	109	26	11	1 95
October,	112	31	6	0	149	46	11	1 63
November,	103	19	4	4	130	51	16	1 68
December,	57	21	2	0	80	42	16	2 12
	953	306	32	12	1,303	489	136	\$2 02

THE ABOVE ATTACHMENTS WERE MADE IN THE DISTRICTS AS
FOLLOWS :

DISTRICT.	Half inch diameter.	Five-eighths inch diameter.	Three-fourths inch diameter.	One inch diameter.	Total holes and attachments made.	Shut off for repairs to private pipes.	Shut off for repairs to public pipes.	Average cost per each attachment.
First,	207	60	9	5	281	56	32	\$2 53
Second,	216	49	10	4	279	101	5	1 75
Third,	189	32	4	1	226	287	84	2 81
Fourth,	341	165	9	2	517	45	15	1 53
	953	306	32	12	1,303	489	136	\$2 02

ACCOUNT OF NEW STOPS AND FIRE-PLUGS SET IN 1861.

DISTRICT.	No. of Stops.	No. of Fire Plugs.
First	24	18
Second	36	26
Third	41	26
Fourth	51	38
New stops.....	152	New fire-plugs... 108
Account per last report	3,526	Account per last report ... 2,664
Total	3,678	Total..... 2,772

Water pipes have been ordered to be laid in the following streets by Councils :

Pipes ordered to be laid in the First District.

Twenty-sixth.	From Park to Gray's Ferry Road.
Moore.	" Seventh to Ninth.
Twelfth.	" Wharton to Passyunk Road.
Wharton.	" Sixteenth to Seventeenth.
Ninth.	" Jackson to Buck Road.
Pierce.	" Seventh to Eighth.
Watkins.	" Seventh to Eighth.
Taylor.	" Eighth to Ninth.
Christian.	" Sixteenth to Seventeenth.
Christian.	" Twenty-first to Gray's Ferry Road.

Pipes ordered to be laid in the Second District.

Hamilton. From Thirty-second to Thirty-third.

Pipes ordered to be laid in the Third District.

York. From Second to Germantown Road.
 Toronto. " Melvale to Bank.
 Lehigh Avenue. " Kensington Avenue to Front.
 Wager. " Fourth to Fifth.
 Day. " Girard Avenue to Thompson.

Pipes ordered to be laid in the Fourth District.

Master. From Twenty-seventh to Twenty-eighth.
 Diamond. " Seventh to Ninth.
 Thompson. " Twenty-fourth to Schuylkill Works.
 To lay the above streets will require 20,421 feet of pipe.

**LOCATION OF THREE-WAY FIRE PLUGS FOR THE USE OF STEAM FIRE
 ENGINES, SET DURING THE YEAR.**

For location of those previously set, see report of 1860, p. 55.

Second District.

In Third Street, west side, below Walnut Street.
 In Sixth Street, west side, below Spruce Street.

Third District.

In Norris Street, north side, east of Germantown Road.
 In Frankford Road, south side, west of Lehigh Avenue.
 In Third Street, west side, above Brown Street.
 In Canal Street, east side, below George Street.

Fourth District.

In Ridge Avenue, east side, above Wood Street.
 In Callowhill Street, north side, west of Twenty-fifth Street.
 In Eleventh Street, west side, cor. of Hamilton Street.
 In Hamilton Street, south side, cor. of Twenty-third Street.

LOCATION OF PUBLIC HYDRANTS, SET DURING THE YEAR.

For location of those set previously, see report of 1860, p. 37.

First District.

In Eleventh Street, east side, above Fitzwater Street.

Second District.

S. W. cor. of Eighth and Chestnut Streets.

Third District.

In Girard Avenue, north side, east of Sixth Street.

The whole number of three-way fire plugs for steam fire engines set during the year,	10
Set previously,	33
	<hr/>
The whole number erected to date,	43
The whole number of drinking hydrants set during the year,	3
Set previously,	31
Old hydrant pumps, say	100
	<hr/>
Total number in charge of Department,	134
The whole number of new stop valves set during the year,	152
The whole number of common fire plugs set during the year,	108

The whole number of holes drilled for making new attachments, was 1303, at an average cost of \$2 02 per each attachment.

The number of shut-offs for repairs to public mains, was 136, and for repairs to private hydrants, 489.

The cost of making attachments has increased during the year, \$495,09 over 1860. This is accounted for by the small number of attachments made as compared with former years. It was necessary to keep the same number of drillers employed; their spare time has, however, been occupied in notifying delinquents

and making repairs, and their services will more than compensate for this additional sum. In the cost of laying pipe a further reduction has been effected, amounting to \$1,682 18, showing the interest felt by the purveyors in their respective districts. The extension of the service mains requires additional supply mains, and there is now a scarcity of water in many sections of the city, simply for want of feeders of sufficient capacity.

STOCK OF PIPE, BRANCHES, ETC.

The stock of pipe, branches, stops, &c., has been considerably increased during the past year; also the value of the stock in the shop—all of which was paid for out of items thirty-nine and forty. The increase in the value of the stock above what it was in 1860, is about \$8000, which is properly credited to the appropriation to the above items for the past year.

Statement of pipe, branches, turns, &c., &c., on hand Dec. 31, 1861.

108 feet of 30 inch pipe, 36,000 lbs.					
48	"	20	"	12,400	"
12	"	18	"	1,440	"
57	"	16	"	7,932	"
				<hr/>	
				57,772 lbs.,	@ \$35.00 per ton, \$902.67
1,242	"	12	"	"	1.00 per foot, 1,242.00
1,805	"	10	"	"	77 " 1,004.85
45	"	8	"	"	67 " 30.15
5,517	"	6	"	"	49½ " 2,720.91
4,239	"	4	"	"	29 " 1,229.31
585	"	3	"	"	20 " 117.00
<hr/>					
13,158 feet					\$7,246.89
868 Branches, turns, &c., 161,489 lbs., @ 2 cts.					3,229.78
18 Stop-cocks in District yards,					700.00
Lead, 9,716 lbs., @ 6 cts.					582.96
Gasket, 360 " " 12 "					43.20
29 Fire-plugs in District yards,					580.00
Stock in shop,					7,227.92
<hr/>					<hr/>
					19,610.75

DEAD ENDS.

The dead ends which have been such a frequent cause of annoyance and complaint, you gave the Committee on Water discretionary power to correct, and pay for out of Items 39 and 40 of last year's appropriation. The ordinance was passed so late in the season that the dead ends in the Eighth Ward alone have been connected. To do this required 630 feet of three inch, 1270 feet of 6 inch, and 320 feet of 12 inch pipe, nine branches and ten stop-cocks. To connect all the dead ends in the city will require 51,469 feet of pipe, 273 branches and 176 stop-cocks. Some of them are not of sufficient importance to demand immediate attention, but in the closely built portions of the city, where a large quantity of water is consumed, the water in the dead ends very soon becomes offensive for want of circulation. It is hoped that you will give the same discretionary power to the Committee on Water this year. The Department have prepared plans and estimates of the required connections for each Ward separately, so as to assist the Committee in deciding upon the propriety of making the different connections. When the pipes are connected so as to allow of the free circulation of the water, the difficulty complained of is entirely obviated.

SHOP.

In presenting the usual annual statement of the operations of the shop, the necessity of enlarged accommodations, of a steam engine and proper tools, is again urged upon your consideration. The shop, by careful management, has been of great service to the Department, and has yielded a profit to the City, which should certainly be satisfactory, when we consider the limited amount of business possible to be done in it, as at present arranged. With increased facilities, a great amount of work, now of necessity sent to other shops, could be done in it, and a corresponding increase of profits realized to the City.

The following statement exhibits the value of work done and profits earned by the shop for the past three years; no account of its operations was kept before this time.

	Value of Work Done.	Expenses for Labor and Materials.	Net Profit of Shop.
1859,	\$21,545 12	\$16,582 01	\$4,963 11
1860,	24,074 98	19,172 66	4,902 32
1861,	24,220 13	19,807 47	4,412 66
	<hr/>	<hr/>	<hr/>
	\$69,840 23	\$55,562 14	\$14,278 09

The total amount of profits for the past three years would pay for the enlargement, and purchase such tools as are immediately necessary.

STATEMENT OF THE OPERATION OF THE SHOP DURING THE
YEAR 1861.

Dr. to stock on hand January 1st, 1861.		\$5,496 71
“ bills of material, iron brass, &c.,	:	9,508 16
“ wages paid hands,		4,802 60
		<hr/>
		\$19,807 47
Cr. by Ferrules furnished Register's office,	\$681 00	
“ Stops, fire-plugs, &c., furnished to First District,	2,183 17	
“ Stops, fire-plugs, &c., furnished to Second District,	4,043 44	
“ Stops, fire-plugs, &c., furnished to Third District,	3,420 55	
“ Stops, fire-plugs, &c., furnished to Fourth District,	4,287 80	
“ Repairs to Delaware Works,	8 49	
“ “ Fairmount Works,	39 00	
“ “ Schuylkill Works,	10 65	
“ “ Twenty-fourth Ward,	3 15	
	<hr/>	
Amounts carried forward,	\$14,677 25	\$19,807 47

Amounts brought forward, \$14,677 25 \$19,807 47	
Cr. by Merchandise and smithwork for new ascent at Fairmount and Park,	13 66
“ Merchandise and smithwork for extension,	2,098 70
“ Scrap iron and brass turnings sold,	202 60
“ Merchandise and smithwork for stock on hand Jan'y 1, 1862,	7,227 92
	<hr/>
	\$24,220 13
To balance profit of shop,	4,412 66
	<hr/>
	\$24,220 13

Statement of the number of stops, fire-plugs, &c., furnished each district from the shop.

First District.—Ten six-inch stops; twelve four-inch stops; thirty-three fire-plugs; one fire plug for steamer, and seven plug cases.

Second District.—Thirty-five six-inch stops; five four-inch stops; six three-inch stops; sixty-two fire-plugs; two fire-plugs for steamers, and forty-six plug cases.

Third District.—Four ten-inch stops; thirty-three six-inch stops; twelve four-inch stops; twenty-three fire-plugs; two fire-plugs for steamers, and thirteen plug cases.

Fourth District.—Eight ten-inch stops; twenty-six six-inch stops; fifteen four-inch stops; sixty-six fire-plugs; four fire-plugs for steamers, and three fire-plug cases.

Extension of the Works.—One thirty-six inch stop; four thirty-inch stops, and one three-inch stop.

In all, one thirty-six-inch, four thirty-inch, twelve ten-inch, ninety-four six-inch, forty-four four-inch, and six three-inch stops, one hundred and eighty-four ordinary fire-plugs, and nine fire-plugs for steamers, and sixty nine fire-plug cases.

BUILDINGS AND GROUNDS.

A large amount of repairs are now necessary to the buildings. Those at Fairmount Works should be repainted; so many thousands resort to this place during the year, that the whole should be kept in most thorough repair, and never allowed to present the dilapidated appearance they now do. The old engine house could be remodeled so as to be much more attractive in appearance.

About one-half of the tin roof on the Schuylkill Works needs renewal. It should be replaced by slate, as the tin is acted upon by the gases from the coal. These works require painting on the outside. The other engine houses require no more than ordinary repairs. The grounds at Fairmount have been much improved. There is great difficulty in keeping the grass in good condition in the small park. The contracted area, and the crowds who throng it in summer time, together with the dense foliage of the trees, interfere with its growth. No work was done on the new part of the grounds during the past year, except to keep them clean and in good repair. It is hoped that a liberal appropriation will be made to finish the improvement of these grounds and to add some ornaments, such as vases, statuary, &c. The bridge across the fore-bay should be raised, so as to present a more imposing appearance, and guarded by a stone balustrade in place of the present dilapidated wooden railing. A similar balustrade should be continued around the top of the new mill house. A stone balustrade will be more expensive in first cost than an iron or wooden railing, but as stone will require no repairs, it will be found less expensive in the end. The principal avenue leading from the Green Street gate to the bridge, and from the bridge to Landing Avenue, should be provided with gas lights. The grounds at the Twenty-fourth Ward Works and stand-pipe, should be improved. They are both centrally located, and would, if improved, add much to the appearance of the neighborhood.

EXTENSION OF WORKS.

Of the extension of the Water Works authorized by ordinance of April 8th, 1859, the main to the first district, and the enlarge-

ment of Corinthian Avenue reservoir have been completed, leaving the new mill house still to finish. This can be completed in sixty days if properly managed. The finishing of this portion of work has been delayed partly by the great increase which has been given to the capacity of the work as originally designed, and partly by the difficulty in procuring foundations; but for the delay of the last five months the Department is in no way responsible. The party with whom the Committee thought advisable to contract for the construction of the machinery, having no shop of his own was dependent on others, and has not finished his part of the work, as contracted to be done, by the first of October; at which time the works were to have been finished and in operation. The arrangement of placing a middle man between the Department and the machinists who executed the work—a party who could render no possible assistance to the Department, but only receive the difference between the value of the work and his contract price—has been greatly to the disadvantage of the city, delaying the work many months, greatly increasing its cost, and taking away from the Department that immediate supervision and direct responsibility of the machinists, necessary to insure the best work, as well as the advantage of improvements which would have suggested themselves during its progress, had it been under the inspection of the Department while in the shops. The plans and specifications which were prepared with great care by the Department, have fortunately required no alteration of any importance; and though the works will not be in every respect as perfect as it was hoped to make them, still it is believed they will be satisfactory, and will compare favorably with any machinery constructed for similar purposes. It will be necessary to make an additional appropriation for the machinery as it is now being constructed.

NEW MILL HOUSE.

The following description of the Works may not be inappropriate at this time, as they are so nearly finished:—

Upon an examination of the water power of Fairmount Dam, it was ascertained that, except for a few days, (not over ten in

each year,) a large amount of surplus power flowed over the dam; and for ten months more power was wasted than could be passed upon the nine wheels then in operation at Fairmount. As the City required an additional supply, and as a large amount of the water then supplied was pumped by steam power, which could be replaced by the surplus water power passing over the dam, it was determined to increase the power of these works to something near the mean capacity of the river. To utilize this surplus power, the first plan that suggested itself was that of removing the old breast wheels, and substituting wheels better adapted to the peculiarities of the location, of better construction, and of much larger capacity. The first difficulty encountered in this suggestion, was the fact that the entire capacity of all the wheels was required to keep up a supply to the City—none of them could be spared. Secondly; the difficulty and danger in blasting the rock upon which the building stands, to procure sufficient depth to utilize the entire head and fall at low tide. Again: the head-arches, where the water from the dam enters the fore-bay, were found to be of too limited area to allow of the free passage of a sufficient amount of water to furnish the proposed increase of power. These arches could not be enlarged without stopping the entire Works at Fairmount for some length of time. These considerations were decisive against the practicability of this plan. The mere possibility of interfering with the supply from this point, upon which so large a part of the City depends, was alone sufficient to discourage any attempt at remodeling these old works at that time. The next plan suggested, was the placing of wheels in the old engine house, now the public saloon. The objections to this plan were the restricted area of the head-arches above referred to, and the difficulty in constructing a flume of sufficient area from the fore-bay to the wheel pits; the flume, wheel pits and tail race would have to be excavated through the solid rock under the building. Examinations were then made at the site now occupied by the new wheel house. The objections to this location, were: the possibility of accident to the dam in making the required excavations in and through it; the necessity of guarding against the freshets so common to the Schuylkill, and the difficulty of procuring satisfactory foundations. It

being however the only site where works of sufficient magnitude could be constructed, and where a sufficient volume of water could be drawn from the dam, it was believed that with proper care all possibility of accident could be guarded against and reliable foundations made. After a careful survey and examination of this point, work has commenced on the north or up-river side, by constructing a coffer-dam. Great pains were taken to make this firm and reliable against any possible rise in the river. This work was frequently severely tested by freshets. Inside, the coffer-dam was excavated to a proper depth, a bed of broken stone was prepared upon which twelve-inch white pine logs were laid; sheet piling was then driven around this platform, the interstices between the logs were filled with broken stone and cement-grout was run in, thus binding the whole mass together. This was then covered with three-inch pine plank, and upon this foundation the front wall, head-arches and gates were erected. The gates and flumes are of cast iron faced with brass, and are raised by simple screws. They open an area of water way of sixty-five feet for each wheel. The front wall was carried up to its full height, the gates put in place, and the flume carried a sufficient distance into the embankment to secure perfect safety against the pressure of water in the dam, before any work was done upon its south or lower side. Some idea may be formed of the care necessary in prosecuting this entire work, when it is remembered that the dam backs the water up about seven miles, and its destruction would not only be disastrous to the valuable property along the river below it, but the entire city would be deprived of its water supply, except that part supplied by the Delaware Works. While the north front was in course of construction, the Schuylkill Navigation Company endeavored to stop the works, claiming to have certain rights to the structure of the dam, and that the navigation of the river would be endangered by the work. An injunction was procured, restraining the City from prosecuting the work in any other way except as it was then being done, and according to the plans exhibited to the Court by this Department. A coffer-dam was next constructed on the south or lower side of the dam. This was found a matter of difficulty, on account of the great depth required for wheel pits, and the trouble in procuring a good connection with

the dam, which was found to be composed principally of loose stone. After excavating into the dam as far as safety would allow, and piling, a large quantity of water still leaked into the coffer-dam when the tide was up. The south side of the dam had been excavated to a depth of fourteen feet below mean high tide, when a deep stratum of river mud was reached, into which three hundred and fifty piles were driven, passing through the mud and a stratum of from three to five feet of gravel—sixteen to twenty-three feet in all. The mud was then excavated to the depth of eighteen inches around the heads of the piles and the space filled in with broken stone. Upon the heads of the piles twelve-inch timbers were laid, and around the exposed sides of the platform thus formed, a double row of jointed sheet-piling was driven. The interstices between the timbers of the platform were also filled in with broken stone, into which grout was run.

This platform, 113 feet by 23 feet, was then covered with a double thickness of three-inch planking, upon which the masonry for the building and pumps and part of the foundations for the machinery were placed. The wheels are placed immediately upon this floor. The foundations for the pumps are partly upon the structure of the dam. The loose stones composing this structure, were leveled to a proper depth for the foundation, and the interstices of the stones filled with a cement-grout, in which 33,500 cubic feet of grout were used. By this means the entire floor was cemented into one compact mass, forming a satisfactory foundation for the masonry.

Plates 1 and 2 represent sections of the buildings, and sections and elevations of the wheels, pumps, &c. The roof of the mill-house is supported upon wrought iron girders, and is formed by brick arches laid with cement mortar, and covered with flagging.

WHEELS.

The wheels are placed near the south front of the wheel house. This was necessary on account of the danger there would have been in excavating further into the dam. The water is conducted from the head arches to each wheel by an elliptical wrought iron flume, having a sectional area of seventy feet. It is

then delivered into a cast iron case, or reservoir, immediately over the wheel; from this it passes through the guide curves, which direct the water upon the movable wheel under them, giving motion to the wheel. The water, after having acted upon the wheel, passes down through the draft tube, and out at the gate, which is a hollow cylinder, forming a continuation of the draft tube, resting upon the bottom of the wheel-pit and opening from below. These wheels have no essential feature not common to well constructed Jonval turbines. They have been proportioned and constructed with care, with direct reference to the work they are to perform, and the peculiarities of the water-power under which they are to act. An inspection of Plates Nos. 1 and 2 will show the arrangement of the wheels. The guide wheels are fitted into a conical cylinder, and the number of curves in each wheel is seventeen. The movable wheel is nine feet in diameter, and has fifty buckets.

GEARING.

The gearing by which the power is transmitted from the turbine wheel to the pumps, is composed, first of a pair of bevel wheels, carrying the power from the vertical shaft of the turbine to a horizontal counter shaft, then through a pair of spur wheels to the crank-shaft of the pumps, to which crank wheels are attached at either end, giving motion to the pumps. The pinions of both pairs of wheels are of iron, with the cogs accurately dressed, working into mortice wheels with hickory cogs.

PUMPS.

Two pumps are worked by each wheel, making six in all. They are placed in pairs horizontally, one on each side. They are eighteen inches in diameter, with six feet stroke of piston. The valves are double beat, working vertically in chambers placed at both ends of the pumps. One air vessel is placed immediately over each set of valves, one on the connecting main, between the chambers, and one on the suction pipe, which takes the water from the flumes supplying the wheels. The packing of the pump pistons is end wood, which is kept tight by means of a cone forced

under the wooden ring. The mean capacity of all six pumps will be 16,000,000 gallons per day, although they can be worked up to 18,000,000 gallons, if necessary.

THE MAINS CONNECTING THE NEW AND. OLD WORKS.

From the mill house to near the foot of the upright pipe there are three thirty inch mains ; at that point they branch into one forty-eight inch main, this connects with the upright pipe at its base. Provision is also made to continue the forty-eight inch main in the opposite direction to the reservoir at Corinthian Avenue, at any time when the demand for water shall make it necessary. The upright pipe is of wrought iron, sixty inches in diameter and sixty-four feet high ; the top is closed, and a branch leads off from the upright tube seven feet below the top ; the space between this branch and the top forms an air chamber, so that if there should be any irregularity at this point in the flow of the water, it would have a tendency to equalize it. This branch is but thirty-six inches in diameter, which is the size of the connections between the upright pipe and the old stand pipe. In the connecting pipe the flow of the water will be slightly retarded when all the pumps are working at their maximum speed. No larger pipe could be connected with the old stand pipe. When the whole power of the works is required, it will be necessary to lay the forty-eight inch main, provided for at the foot of the upright pipe, directly to the reservoir on Corinthian Avenue. From the old stand pipe, the water supplied by the pumps in the new millhouse can be discharged either into the reservoirs at Fairmount through the connections now made, or into the Corinthian Avenue reservoir through the thirty inch main now connecting it with the old stand pipe. Through this thirty inch main, eight millions of gallons may be forced into the Corinthian Avenue reservoir per day. This main will therefore be found of sufficient capacity for two or three years to come ; thus saving the expense of laying the large main for that length of time. The upright pipe is enclosed with stone work, forming an ornamental tower, connected with the rocky side of the hill by an arch which carries and encloses the thirty-six inch main. On the top of this arch a walk is constructed, leading to the top of the tower.

CORINTHIAN AVENUE RESERVOIR.

This reservoir has been finished and in use most of the summer. We have found the additional storage capacity it gave, of the greatest importance. The work has been thoroughly tested; the maximum depth of water, 27 feet, has been pumped into it. There is nothing now to be done but the railing around the top, which, if made of wood, will cost \$1,500; if of iron, about \$7,000. This reservoir is 738 feet long and 388 wide inside, at the top. The embankments are of earth lined with 18 inches of clay puddling, and $4\frac{1}{2}$ inches of brick. The depth of water, when full, is 27 feet; the surface of the water is then 125 feet above mean high tide. This reservoir will now contain 37,000,000 of gallons. The slope of the embankment on the outside is $1\frac{1}{2}$ to 1, on the inside $1\frac{1}{2}$ to 1. Retaining walls faced with cut stone are built on Poplar Street, Twenty-second Street, and Corinthian Avenue. The surface of the water in this reservoir can now be maintained at the same height as that of the Schuylkill Works, and they are connected, so that they can both be used at the same time, and so assist each other.

The lot south of the reservoir will accommodate another reservoir of about the same capacity, although this will probably never be necessary at this location, as the one already constructed will be of ample capacity for a distributing reservoir. There are objections to placing large open reservoirs in thickly settled parts of the City. Indeed, all reservoirs in the built-up portions of the City should be permanently covered in, but as the one now constructed will be of sufficient capacity for distribution, other and more remote locations should be selected for storage reservoirs.

The lot would be valuable if enclosed and levelled, and appropriated for a parade or play ground. It may not be out of place for the Department to remind you that there is a necessity for such open spaces, where the boys may enjoy those sports and plays necessary for physical development, without obstructing the streets, injuring the paths, grass, or statuary in the squares and works, or committing depredations upon private property. This would be a most admirable location for such a play-ground—central, easy of access, and at present of no other use to the City.

The following is a statement of the amount of work done on the extension of the Works :

Work done and materials used in the construction of the New Mill House at Fairmount.

	1859 and 1860.	1861.
Timber in platforms, coffer dams, &c., in ft.	145,249	
Sheet piling, planking and scaffolding, "	60,923	
No. of hemlock piles, 23 ft. long, 10 in. diameter, "	300	
Lumber, assorted qualities, "		7,999
Earth and stone excavation, cu. yds.	5,758	
" " filling in, "	1,590	
Cement grouted stone work, perches,	5,017	232
Square feet face cut ashler,	8,917	5,795
Dry wall on mound rebuilt, perches,		63
Dry wall paving around south front, "		261
Cement-grouting, cu. ft.	6,419	3,383
Bricks in arches, jambs, &c.,	71,913	
Leiper stone in six pump foundations, cu. ft.		7,404
Square feet, cut face on foundations,		20,756
Door, platforms, brackets and steps, cu. ft.		529
Bricks in arches of roof in cement,		37,500
Skew-back bricks, in roof in cement,		3,634
Cement-grouting on backs of arches, cu. ft.		2,912
Flagging on tops of arches, sq. ft.		9.0
Coping, 3 ft., 2 in. wide, 10 in. thick, lin. ft.	106½	
" 3 " 5 " " " " "	52	
" 3 " " " " " "		220
Curbing, 16 in. wide, 10 in. thick, "		68
Lime, bu.		673
3 cast iron beams, over pits, lbs.	6,300	
12 " " brackets in walls, "		5,546
6 " " columns, bases and pipes, "		16,919
24 " " grates, brackets, &c., "		2,788
17 ps. cast iron for sky-lights,		2,350
6 wro't iron gratings, guard gates, lbs.		10,135
Phœnix wro't iron work for roof, "		64,183

	1859 and 1860.	1861.
3 wro't iron elliptical flumes,	lbs.	51,949
6 guard gates with frames, seatings, &c.,	" 53,390	
6 lifting screws with nuts and pins,		\$215 65
Bar iron, bolts, &c.,	lbs. 836	5,092
2 bull-eye sky lights each 3 ft. 9 in. sq.		\$140 60
Hardware, cordage, &c.,		\$424 95
Window frames with sash,		17
Door frames with transoms,		3
Gates with hinges for wheel pits,		3
Temporary bridge over forebay erected and removed.		
Earth excavation, removing coffer dam, cu. yds.		1,000
No. piles, 10 in. square, extracted,		32
No. piles, 3 in. thick, extracted,		320
Earth spreading around mill house, cu. yds.		500

Machinery.

3 Jonval turbines,	lbs.	187,254
3 sets gearing,	"	174,297
6 pumps,	"	342,648

Work on and materials used in laying forcing mains from New Mill House to Fairmount Reservoir.

Earth and stone excavation,	cu. yds.	640
" " filling in,	"	640
Stone excavation on causeway,	"	233
" filling in	"	116
Cement-grout on top of causeway,	cu. ft.	1,314
Perches stone work to rebuild coal vault,		31
Square feet flag over coal vault,		411½
Bricks used to rebuild coal vault,		6,000
20 in., 30 in., 36 in., and 48 in. pipe branches and bends,	lbs.	465,758
5 feet wrought iron vertical pipe and branches,	"	28,153

Materials and work on Tower.

	1861.
Square feet, cut face, brown stone,	4,655
Cubic feet brown stone,	1,012½
Square feet cut face of Gneiss in walls,	4,425
Perches of stone in all the walls,	648
Bricks in arches,	7,500
Square feet flag in triple windows,	18

Materials and work on Corinthian Avenue Reservoir.

	1859 and 1860.	1861.
Embankment, cu. yds.	34,160	1,542
Puddle lining, "	2,965	1,343
Black earth for sodding, "	1,081	458
Sodding, sq yds.	4,325	322
Brick in lining,	225,000	160,500
Excavation, cu. yds.	2,374	
Mason work, perches.	5,259	
Cut stone face, sq. ft.	18,296	
Concrete, cu. yds.	79	

FURTHER EXTENSION OF THE WORKS.

This subject has so often been urged upon your consideration by petitions from citizens, by the annual reports of His Honor the Mayor, by the Committees on water and by the Department, that further argument is scarcely necessary. The net profits of the Works the past year alone are \$57,028 56 over the entire amount expended from the fund created by loans for enlarging the Works since consolidation. The entire amount disbursed for extensions has been \$313,341 26. The net profits since consolidation amount to \$1,895,113 99. In the item of iron pipe the City has received from this Department \$280,835 17, without taking into account the large sums received by the city solicitors and paid into the treasury, and also that now secured by liens amounting to \$159,016 05. In all this time the City has laid but one large supply main with connections, costing \$127,175 10. After a careful examination of the reports of the Department upon the subject and an examination of the localities, works, &c., the committee

on water recommended the following extensions, all of which the Department deemed essential to the interests of the City; and have reason to think would prove remunerative. These recommendations were as follows:—

First—a thirty-inch main, to connect the pumping main from Fairmount with the thirty-inch distributing main from the Spring Garden reservoir on Twenty-second street. Second—a twenty-inch main, to connect the thirty-inch main from Spring Garden reservoir, with the two sixteen-inch mains at Ridge Avenue and Poplar street, on Poplar street. Third—a thirty-inch main from the reservoir on Poplar street, to Broad and Columbia Avenue, on Poplar street, Corinthian Avenue, Girard Avenue, and Broad street. Fourth—a twenty-four inch main from Broad street at Columbia Avenue, to Sixth street and Germantown Road, on Columbia Avenue, to connect with the eighteen-inch main from the Kensington reservoir. Fifth—a twenty-inch main from Kensington reservoir to Frankford Road and Lehigh Avenue. Sixth—a twelve inch main, from the crossing of Kensington Avenue and Lehigh Avenue to Frankford Road and Westmoreland street. Seventh—a sixteen-inch main from Frankford Road to Richmond Avenue, on Lehigh Avenue. Eighth—a sixteen-inch main from Fifth to Front streets on Washington Avenue. Ninth—a twenty-inch main from Fairmount reservoir to Twenty-second and Chestnut streets, on Callowhill and Twenty-second streets. Tenth—a sixteen-inch main from Chestnut street to Locust street, on Twenty-second street. Eleventh—a twelve-inch main from Pine to South, on Twenty-second street. Twelfth—a reservoir and twenty-inch main, for Twenty-fourth Ward Works, and real estate for locating reservoir. Thirteenth—a Cornish engine, and forty-eight-inch pumping main for Schuylkill Works, and the necessary alterations to the engine house. Fourteenth. A works to supply a part of the Twenty-first Ward, viz: Manayunk and Roxborough, located above Flat-rock Dam. The above extensions, the committee estimated would require an appropriation of \$525,000. It will not be safe to expect to carry out all the above improvements with an appropriation less than \$600,000, as there are many contingencies in such work which cannot be estimated for, and it has never been found, in the experience of the Department, necessary

to contract the size or capacity of any part, but frequently to enlarge and increase, (as has been the case with the work now in progress,) making additional appropriations necessary, and leading to misunderstanding and loss of time. A careful comparison of the recommendations made in the various reports, will exhibit the fact that the extent of the work has been increased in each case, and the Department is now prepared to recommend even further enlargements. In regard to the fourth recommendation above named, the Department would propose to substitute a thirty-inch main on Columbia Avenue, instead of a twenty-four inch. The Department would also suggest an additional thirty-inch main from the Corinthian Avenue reservoir to Broad and Girard Avenue. A twenty-inch main should also be laid on Broad street from Washington Avenue to Passayunk Road. These would probably perfect the distribution for the present.

The Department would also suggest, that instead of placing a large engine and main at the Schuylkill Works, and an engine and reservoir at Manayunk, a large engine be placed at or near Belmont—the site selected first for the Twenty-fourth Ward Works—and that a large reservoir be constructed on the high ground west of the river, in the vicinity of the old inclined plane, where a number of eligible sites for such a reservoir can be procured, thus also taking the place of the one proposed to be constructed here for the Twenty-fourth Ward. The water in this reservoir should be 200 feet above the river. This would be of sufficient elevation to supply all of the Twenty-fourth Ward, Manayunk, and that part of the Fifteenth, Twentieth and Twenty-first Wards which lie too high to be supplied by the reservoirs already constructed. This reservoir should have the capacity of 300,000,000 gallons, which would require about fifty acres of land. It would not only supply these wards, now to a considerable extent destitute, or but partially supplied, but it would give to the City adequate storage capacity, in which the Works are now very deficient. But a little over two days' supply for the season of greatest demand can be stored in all the existing reservoirs. The above reservoir, together with those now constructed, would contain a supply for ten days, when the largest demands are made upon the Works. The confusion, loss and

trouble occasioned to the City by cutting off the water supply for a single day would, if represented in figures, be found fully equivalent to the entire cost of such a reservoir. Another advantage would be, that in times of freshets, when the river is turbid, a supply of pellucid water could be drawn from this store reservoir, thus enabling the Works to furnish pellucid water at all times, no matter what the condition of the water in the river might be. The citizens would no doubt be willing to bear the expense of such a reservoir, if by this means they might be rid of the frequent annoyance which they now suffer from the turbid condition of the water. Sufficient ground should be procured at the river, upon which to construct filter beds and subsiding reservoirs, whenever such may become necessary. But with the large reservoirs above recommended, no artificial means of purification would be required at present.

The Department cannot bring these recommendations to a conclusion without again adverting to the necessity of a thorough survey of the vicinity of the City, with direct reference to its water supply. This has never been done, not even in constructing the original Works. Surveys were made to the Wissahickon and to Spring Mill, and we cannot now understand why the water of the Wissahickon was not brought into the City, as recommended by Franklin. Were it not now so thoroughly occupied, and the region drained by it so densely inhabited, the Department would at once recommend it as a source of supply. The large reservoir above recommended should be so located, that in case of an entire change in the mode of the water supply, it could still be used as a store reservoir and form part of such new works. Without surveys and accurate information of the surrounding country made with direct reference to the water supply, all the recommendations of the Department for extensions would be made under disadvantageous circumstances.

RECEIPTS AND EXPENDITURES

OF THE

WATER DEPARTMENT

FOR THE YEAR 1861.

RECEIPTS.

The statement of W. J. P. White, Esq., the Register of Water, will be found below. From this it will be seen that notwithstanding the embarrassment in financial affairs, and the stoppage of numerous factories, the receipts from water rents have been greater this year than ever before. There is a falling off in the receipts for iron pipe, which make the total receipts of the year less than 1860, but the expenses of the Department were also less; making the net profits upon the works \$10,992 77 greater than in 1860; to which should be added the difference in the value of the stock of iron pipe, branches, coal, &c., making the total net profits of the year at least \$20,000 greater than last year. In this statement we only take into view the amount of money actually received and paid into the Treasury by the Department, and not the additional amount sent to lien for iron pipe, or the amount due and unpaid on the water tax. It is gratifying to the Department to present so satisfactory a statement of its operations. It will be found by inspecting table No. 7, that the net earnings of the works have been increasing every year since the present organization of the Department. They have increased from \$224,820 29 in 1857 to \$371,255 12 in 1861. About \$45,000 of this increase is due to permits issued for new buildings and new uses of water, and \$102,634 83 to discoveries of illegal uses of water and saving in the working expenses of the Department.

The total net earnings of the works since the present organi-

zation of the Department amount to \$1,461,794 49; of which, \$1,327,155 91 was paid directly into the City Treasury. The balance consists (1) of \$75,929 09 paid by the Department out of the item of general expenses for enlargement of the works, as per report of 1861, p. 62; (2) \$2,500 paid by this Department for paving Poplar street, and (3) \$56,209 51 sent to City Solicitor for collection, some of which has been paid into the Treasury by the Department of Law, and the remainder is secured by liens upon property, in front of which it is laid. This does not include the sum expended in the improvement of the grounds at Fairmount, also paid by the Department, nor the increased stock of pipe, coal, &c., on hand, amounting to about \$10,000.

The value of the water supplied for city use is not represented. This would be a large sum of money, and a tax levied upon insurance companies, for that used in fires and for the repairs of the plugs, would not be unjust. A great amount of water is also supplied for cleaning gutters and flushing sewers, to public schools, station houses, the Almshouse, County Prison, &c., &c., for which the Department receives no remuneration.

No. 7.

THE FOLLOWING TABLE EXHIBITS THE RECEIPTS, EXPENDITURES AND NET INCOME OF THE DEPARTMENT SINCE CONSOLIDATION.

YEARS.	Receipts.	Expenditures.	Net Income.	
1855,	\$382,036 72	\$250,895 37	\$131,141 35	
1856,	351,936 49	138,954 85	212,981 64	
1857,	425,426 11	200,605 82	224,820 29	= \$568,943 28
1858,	457,518 48	187,978 09	269,540 39	
1859,	551,180 08	225,082 03	326,098 05	
1860,	558,531 53	198,269 18	360,262 35	
1861,	533,980 06	162,724 94	371,255 12	= 1,327,155 91
Total,	\$3,260,609 47	\$1,364,510 28	\$1,896,099 19	

No. 8.

Table exhibiting the amount of pipe laid; the amount expended in laying the same; amount received for pipe; the amount sent to City Solicitor for lien; and the amount paid by the City for pipe since consolidation.

	Feet of new pipe laid.	Gross amount expended.	Amount received for pipe.	Amount sent to Solicitor for lien.	Amount paid by City.
1855,	31,574	\$40,673 09	\$21,351 01	\$7,980 71	\$9,341 37
1856,	54,879	69,915 81	31,922 61	6,938 20	31,055 00
1857,	61,182	78,527 02	30,373 58	28,923 91	19,229 53
	147,635	\$189,115 92	\$83,647 20	\$43,842 82	\$59,625 90
1858,	67,519	80,944 12	37,145 91	29,448 40	14,349 81.
1859,	97,993	115,705 81	63,249 13	27,302 11	25,154 57
1860,	97,095	99,142 79	62,297 57	26,459 47	9,985 75
1861,	59,406	65,063 89	34,495 36	31,963 25	6,719 38*
Total	469,648	\$549,972 53	\$280,835 17	\$159,016 05	\$115,835 41

*This includes the difference between the amount of pipe bills remaining unpaid Jan'y 1st, 1860, and 1861.

LICENSING PLUMBERS.

The city is often wronged by plumbers who make attachments, extend pipe, and introduce additional fixtures, contrary to ordinance, without the knowledge or consent of the Department. Such fixtures are frequently in use for a long time, and some of them no doubt entirely escape the vigilance of the Department. Instances have occurred where a permit for building purposes has been taken out, and the water afterwards laid on and the house supplied without any additional permit, or any water rent paid for years. Such extensions are only made by dishonest plumbers, for none with a proper sense of right would thus lend themselves to the defrauding of the city. Others are only anxious to procure work and oblige their customers, without troubling themselves about the morality of the transaction; or they look upon the act as one committed against the city, and as different from that which would lead to individual loss. Such plumbers, on the contrary, as have a proper sense of right often lose work by refusing to make extensions without a permit. Their less scrupulous neighbors succeed in procuring the work, but at a loss of revenue to the city. The Department would, therefore, recommend that all plumbers be required to procure a license before any permits are granted to them, and that the Department be required to refuse the issuing of permits to other than licensed plumbers; and that any plumber who does not conform to the regulations intended for the protection of the city and the proper working of the Department, shall be deprived of his license until such fines as may be thought proper by the Committee on Water be paid. It has been found necessary in all large cities to pursue a similar course, both for the protection of themselves and honest plumbers.

ASSESSMENT OF WATER RENTS.

The assessment of the water rents of the City, made in the latter part of 1858, produced a marked increase in the revenue of the Department. Although this assessment was made with considerable care, it was still deficient in many respects, and will no doubt

require revision in order to arrive at any satisfactory degree of accuracy in the accounts. Since this assessment, a large number of new attachments and many alterations in the fixtures have been made. It is therefore now necessary to re-assess the entire City. This will cost about five thousand dollars, and will no doubt increase the revenue of the Department from twenty to thirty thousand dollars. The system adopted by the Department of charging the water rent against the property, has been found to work satisfactorily. The only difficulty arises in the outer wards, where the numbering of the houses has not been enforced, and where there is some difficulty in locating the property.

PIPE ACCOUNT.

Table No. 8 exhibits the amount of iron pipe laid, expenses, and income for the same. It will be seen that but little over one-half of the amount due for frontage has been collected by this Department, a very large proportion having been sent to the city solicitor for collection. By offering some additional inducements for prompt payment, a much larger amount could be collected before the time expires when by law liens must be entered against the property in front of which the pipe is laid. By allowing a discount upon bills paid within sixty days, or placing a penalty upon the bills if not paid within that time, a large amount could be collected without the trouble and expense now incurred by sending so many accounts to lien.

PROTECTION OF THE REVENUE.

In the last annual report some suggestions were offered relating to the absence of proper protection to the City in collecting and paying over the revenue of this Department, the City being now dependent solely upon the integrity of the officers. While this is certainly flattering, it is far from satisfactory, to those occupying positions of trust. It is hoped that this matter will receive your attention, and that the method recommended in that report, or such other as you may devise, be pursued in the protection of the revenue. The ordinance of October 18, 1858, creating a water tax on every building fronting upon a street in which the water

mains are laid, requires revision, as it is now difficult, and in some instances it is feared it will be impossible, to collect this tax.

BETTER OFFICE ACCOMMODATIONS.

The inconvenient and insufficient office accommodations of the Department have been a subject of complaint in every annual report made since consolidation. The Committee on Water have also recommended their enlargement, without effect. The convenience of the public as well as the officers of the Department, the interest of the revenue, which now suffers for want of system in conducting the business, all demand improvement in this respect. The expense and loss incurred in the present inadequate and inconvenient apartment would more than pay the rent of suitable accommodations, and the whole business of the Department could be properly systematized.

REGISTER'S STATEMENT.

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER,
REGISTER'S OFFICE,
January 9, 1862.

H. P. M. BIRKINBINE, Esq.,
Chief Engineer of the Water Works :

DEAR SIR :—The following statement of the transactions of this office for the year 1861 is respectfully submitted.

Notwithstanding the great commercial embarrassment during the past year, and the almost total prostration of all manufacturing interests which have seriously affected the revenue of this Department, the receipts for water rent have reached the sum of \$480,114 72, being an advance of \$10,810 31 on the receipts of the year preceding, and of \$90,288 11 on the receipts of 1858, when I first took charge of this office.

As compared with last year, the total receipts of this office show a falling off of \$24,027 00. This arises from the fact that the Department has laid during the year nearly 40,000 feet of pipe less than the year preceding, while the receipts for pipe are \$28,202 18 less than in 1860.

The amount due for iron pipe still outstanding is \$24,260 41, exclusive of the amount of \$31,963 25 sent to the Department of law for lien in 1861.

I deem it my duty again to urge on your attention, the propriety of procuring better accommodations for transacting the business of this office. The books of record and accounts are very valuable and are ever increasing, and now necessarily entirely unprotected, while the want of sufficient room prevents that system and despatch in the conduct of the business of this office, which it has ever been my object to obtain.

Respectfully yours,

W. J. P. WHITE.

No. 9.

Statement of Receipts at the Register's Office from January 1st to December 31st, 1861.

MONTHS.	Rents of 1859.	Rents of 1860.	Rents of 1861.	Penalties of 1861.	Fractional rents.	Iron pipes.	Total.
January,.....	\$221 17	\$2,176 16	\$31,127 50		\$793 35	\$4,796 58	\$39,114 76
February,.....	130 48	1,013 06	48,279 25		918 34	2,956 15	53,297 28
March,	5 00	678 87	290,794 45		1,180 82	3,325 87	295,985 01
April,	9 00	205 54	9,253 00	\$325 66	1,659 55	2,807 12	14,259 87
May,		373 88	6,283 75	278 49	1,289 47	2,284 64	10,510 23
June,	25 88	61 80	30,074 25	1,418 55	1,419 78	3,165 20	36,165 46
July,	14 95	53 33	3,577 25	323 56	1,218 10	2,766 60	7,953 79
August,	7 50	52 56	11,933 50	1,685 88	1,100 69	1,671 82	16,451 95
September,	7 50	79 82	13,651 00	1,804 27	915 10	2,927 16	19,384 85
October,	18 75	115 88	7,328 75	943 87	949 04	2,190 82	11,547 11
November,		58 00	6,855 00	851 19	672 58	1,772 20	10,208 97
December,		201 85	12,404 55	921 00	856 88	3,831 20	18,215 48
Total,	\$440 23	\$5,070 75	\$471,562 25	\$8,552 47	\$12,973 70	\$34,495 36	\$533,094 76

The following amounts have been received at the Cherry Street Office and paid to the City Treasurer :

Rents,	\$255 00
Stone,	46 25
Cement Barrels,	3 46
Attachment,	65 42
Old Boiler,	75 00
Old Iron,	170 05
Old Brass,	149 55
Use of Steam Engine and Pump,	76 00
Grass from Fairmount,	42 57
Coal Dust,	2 00
	<hr/>
	\$885 30

EXPENDITURES OF THE DEPARTMENT

FOR THE YEAR 1861.

Ordinary Expenses.

Salaries of chief engineer, register, clerks, &c.,	\$18,580 81
Office expenses,	2,603 95
Salaries of engineers, firemen, &c., at Works,	15,969 46
Supplies to Works, viz.,	
Coal,	\$24,943 69
Tallow and oil,	1,484 39
Wood,	40 00
Small stores,	1,198 93
	<hr/>
	27,667 01
Repairs, viz.,	
Fairmount Works,	\$2,999 00
Delaware "	1,499 54
Schuylkill "	1,863 40
Twenty-fourth Ward Works,	1,275 73
	<hr/>
	7,637 67
Buildings, grounds, &c.,	7,979 48
	<hr/>
	15,617 15

Service Mains and Materials.

Amount brought forward,		\$80,438 38
Iron pipe, fire-plugs and other fixtures, and materials for laying pipe, &c., viz.,		
Iron pipe,	\$31,535 28	
Iron castings,	3,094 80	
Brass do	1,807 15	
Lead,	4,092 64	
Clay,	7 00	
Wrought iron,	521 15	
Wood,	33 00	
Hardware,	185 17	
Coal,	149 75	
Bolts,	473 59	
Leather,	166 79	
Lumber,	880 91	
Oil,	41 50	
Gasket,	150 97	
Tool house,	74 57	
Bricks,	74,00	
Paint,	58 18	
Powder,	41 00	
Lead pipe,	9 96	
Coal tar,	6 00	
Roller cloth,	32 06	
Straw, and salt hay,	85 44	
Stop-cocks,	125 83	
Soap,	4 79	
Tallow,	40 30	
Wharfage,	5 00	
Copper,	4 70	
Sundry bills,	163 90	
		<hr/>
		43,865 43
		<hr/>
Amount carried forward,		\$124,303 81

Amount brought forward,		\$124,303 81
Labor, laying pipe, setting plugs, &c., and for fitting up stop-cocks, fire-plugs, &c, viz.,		
Pipe First District,	1,338 63	
" Second "	2,705 26	
" Third "	3,560 54	
" Fourth "	3,840 02	
	<hr/>	11,444 45
Shop,		
Wages,	\$4,802 60	
Bills,	1,981 15	
	<hr/>	6,783 75
Pipe plans,	1,036 00	
Surveyors, for measuring pipe,	1,934,26	
	<hr/>	21,198 46
Keeping pipes, plugs, stops and fixtures in good order, viz.,		
Wages First District,	\$1,515 76	
" Second "	1,872 80	
" Third "	1,931 78	
" Fourth "	2,081 35	
	<hr/>	7,401 69
Hay and Straw,	83 32	
Plumbing,	10,85	
	<hr/>	7,495 86
Drilling and making new attachments, viz.,		
Wages First District,	\$937 95	
" Second "	852 79	
" Third "	1,286 04	
" Fourth "	1,143 35	
	<hr/>	4,220 13
Germantown Water Company,		550 00
		<hr/>
Amount carried forward,		157,768 26

Amount brought forward,		\$157,768 26
Railing at Fairmount, viz.,		
Coping,	\$3 52	
Hardware,	12 09	
Wrought iron,	37 54	
Iron castings,	254 80	
Wages,	701 37	
		<hr/> 1,009 32
Paid as per bill of Highway Department for paving in front of city property on Poplar street, west of Corinthian Avenue and east of Twen- ty-second street,		2,500 00
Old bills of 1857, 1858, 1859, and 1860,		1,012 97
Drinking hydrants,		434 39
		<hr/> Total amount of ordinary expenses,
		\$162,724 94

EXTENSION OF WORKS.

AMOUNT PAID FROM WATER LOAN.

(Item No. 1.)

Iron pipe, branches, stops, lead, gasket, labor, &c., viz.,	
Hoisting machine,	\$3 00

(Item No. 2.)

Raising reservoir at Corinthian Avenue
and Poplar street, viz.,

Bricks,	\$1,160 60
Clay,	400 00
Lumber,	30 29
Hardware,	10 74
Machine work,	24 33
Buckets,	6 16
Wages,	3,782 57
	<hr/> 5,414 69

Amounts carried forward,	\$5,417 69	\$162,724 94
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Amount brought forward, \$5,417 69 \$162,724 94

(Item No. 3.)

Erecting turbine wheels and pumps, viz.,

E. Geysten as per contract,	27,623 44	
Iron castings,	243 16	
Wrought iron,	155 68	
Hardware,	5 68	
Wrought iron flumes,	3,246 81	
Hoisting crab,	25 00	
Smithwork,	5 25	
Bolts,	3 02	
Lumber,	72 44	
Hammer handles,	6 84	
Stone,	2,138 87	
Sand and wood,	6 81	
Cement,	220 00	
Slate,	10 00	
Wages,	9,921 20	
	<hr/>	43,684 20

Erecting new Mill-house along the

Mound dam, viz.,

Bricks,	\$350 34
Lumber,	129 71
Machine work,	200 85
Bolts,	10 26
Hardware,	67 04
Sky lights,	92 48
Wrought iron,	145 48
Stone,	448 00
Cement,	367 60
Flagging,	128 85
Lime,	149 16
Ropes,	149 67

Amounts carried forward, \$2,239 44 \$49,101 89 \$162,724 94

Amounts brought forward,		\$49,101 89	\$162,724 94
	2,239 44		
Girders,	3,000 00		
Leather,	4 35		
Gas,	3 50		
Gum,	35 14		
Powder,	19 25		
Slate,	20 00		
Coke,	326 00		
Cast iron,	520 99		
Coal,	407 75		
Hod,	2 50		
Hammer handles,	12 72		
Incidentals,	2 55		
Wages,	6,940 99		
	<hr/>	13,535 18	

(Item No. 5.)

Connecting new works with the stand
pipe, viz.,

Wrought iron pipe,	1,548 53		
Cast iron pipe,	7,227 15		
Lead,	798 00		
Cordage,	61 20		
Lumber,	15 37		
Stone,	236 40		
Freight,	114 43		
Iron castings,	52 22		
Wrought iron,	7 38		
Lime,	24 50		
Incidentals	11 75		
Wages,	3,530 60		
	<hr/>	13,627 53	
		<hr/>	76,264 60
Total amount expended 1861,			<hr/>
			\$238,989 54

The following is the total amount expended upon the extension of the Water Works, and paid from the Water Loan:—

(Item No. 1.)

For laying a thirty-inch main from Corinthian Avenue Reservoir to the First District, with connections.

1859,	\$126,098 76	
1860,	73 34	
1861,	3 00	
	<hr/>	\$126,175 10

(Item No. 2.)

For increasing the capacity of Corinthian Avenue Reservoir,

1859,	\$37,499 99	
1860,	18,722 12	
1861,	5,414 69	
	<hr/>	61,636 80

(Item No. 3.)

For Turbine Wheels and Pumps for New Mill House,

1859,	\$2,059 14	
1860,	422 41	
1861,	43,684 20	
	<hr/>	46,165 75

(Item No. 4.)

For erecting a Mill House on the Mound Dam,

1859,	\$16,209 92	
1860,	34,991 98	
1861,	13,535 18	
	<hr/>	64,737 08

(Item No. 5.)

For Mains to connect the New and Old Works,

1861,		13,627 53
		<hr/>

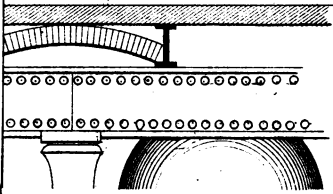
Total amount expended from Water Loan, \$312,342 26

Respectfully submitted,

HENRY P. M. BIRKINBINE,
Chief Engineer.

WORKS,

PS.



DEPARTMENT FOR SUPPLYING THE CITY WITH WATER, }
PHILADELPHIA, APRIL 24, 1862.

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

GENTLEMEN:—In compliance with a resolution adopted by your honorable bodies, and approved March 15th, 1862, I beg leave to state, that the district usually supplied with water by the Kensington Water Works has been supplied temporarily from the Spring Garden works, and that the reservoirs of the former have been emptied and cleaned in the meantime. In the performance of this duty, I have found an accumulation of a soft mud in the bottom of the reservoirs, undoubtedly derived from the river Delaware, and which appears to have been deposited at the rate of nearly one inch per month.

The Kensington reservoirs have been thoroughly cleansed, and the induction passage from the river to the pumps, which consists of a wooden trunk or box, has been repaired so as to make it certain that water will be taken hereafter from the end of the wharf. This trunk has for some time past been in such bad repair that the water has been taken mainly from the sluiceways of the docks, and has contained, consequently, more or less impurity.

I beg leave to say in this connection, that although this alteration and some care in future, may prove a partial remedy, I regard it as certain that the supplying of pure, or in any considerable degree suitable water for domestic purposes from the river Delaware at the location of the Kensington water works, is impossible.

The sewers opening into the river Delaware discharge their contents at the rate of an average of about thirteen millions of gallons daily, which large quantity is greater during summer, and necessarily includes every description of impure and refuse matter from the city, and this impurity is undoubtedly increased of late years by the prevalent and growing plans of constructing and connecting with the sewers, water closets in the large hotels and in private dwellings. It is by no means safe to assume that the water in the channel of the Delaware is beyond the reach of the deterioration

which results from the cause here alluded to, and the action of the tides very probably carries a large portion of the impurities from the sewers much beyond the present location of the Kensington works, and before there can be any complete subsidence or deposit in the bottom of the river. Other less important causes—the movements of steamboats and the general traffic on the river, for instance—also co-operate with the tides to keep in suspension, for a time, the contents of the sewers thus thrown into the river.

At the Kensington works the water is further deteriorated by the emptying of Gunner's run into the Delaware, which takes place at less than fifty yards above their location, and by the fact that the docks in their immediate vicinity have been for some years much used for the preparation of cat-fish and other fishes for the markets of the city.

I beg leave to state that there are demonstrable, in my opinion, ample causes for the unsuitable quality of the water supplied by these works, and which also, in my opinion, render impracticable and inexpedient any plan for obtaining water from the river Delaware. One plan, which is the extension of the main induction passage into the channel of the river, I regard as too doubtful to be worthy of the expense of the experiment, and another, which is to remove the works to a point above the city, is not only very doubtful in point of success, but would be much more expensive than an obvious remedy which I beg leave to suggest.

The district now supplied from the Delaware can readily be supplied from the Schuylkill (and the supply of water from the Schuylkill throughout the city can be readily equalized when the new additions to the Fairmount works are completed, and with an additional engine at Spring Garden works). For this purpose it would be necessary to elevate the reservoir at the Kensington works to the same height as the reservoir at Corinthian avenue and Spring Garden works, and to connect the former with the two latter by a main of forty inches diameter to Tenth street, thence by a thirty inch main to Kensington reservoir. This would give an additional capacity to the Kensington

reservoir of eight millions of gallons, and the greater height would much increase its capability of distribution over an area now but partially supplied in its higher localities and in its more distant parts, for instance in the late borough of Frankford, in which the supply is deficient.

The proposed elevation of the Kensington reservoir and the connection suggested would also insure a supply of water to an extensive district which it is now impossible to supply from any of the works, and would thus tend materially to the general improvement of that portion of the city.

It is proposed to connect the Spring Garden reservoir and that at Corinthian avenue by a forty-eight inch main with the necessary branches to which may connect a forty-eight inch main from Spring Garden works, and also a main of forty-eight inches from Fairmount works; then connect the Spring Garden and Kensington reservoirs by a main, as before suggested.

This main would be of sufficient capacity to fully supply the Kensington reservoir, with the additional elevation above suggested, and to allow all the distributing mains on the high parts of the district included between the Spring Garden reservoir and ~~the~~ Tenth street to be attached, thus giving a reliable supply to the higher portions of the Fifteenth and Twentieth Wards, which are now deficient, and frequently almost without any supply of water whatever.

The proposed connections would effectually remedy the evil of a short supply by bringing an ample storage into the immediate vicinity of the demand. By opening the connections between the Kensington district and the lower portion of the district now supplied from Spring Garden reservoir, the great draught from the higher parts of the latter district would be prevented, and the Kensington district, from its increased head and an additional distributing main would still have a better supply than at present.

The water supplied from the Kensington reservoir would, under the arrangement and connection, be the purest of any in the city, on account of its increased depth and the Spring Garden and Corinthian avenue

reservoirs acting as subsiding reservoirs. At present the Kensington works supply the Seventeenth, Eighteenth, Nineteenth, and parts of the Sixteenth, Twenty-third and Twenty-fifth Wards.

The greatest demand on the works is during the months of July and August, at a season when there is a possibility of low water in the Schuylkill, and the consequent inability of the Fairmount and Spring Garden works to make up the additional demand which would arise from the connection of the Kensington district; should any serious accident occur in the machinery at the Spring Garden works, further inability would necessarily arise.

I would therefore recommend the erection of an additional Cornish engine at these works, capable of pumping ten millions of gallons per day with a forty-eight inch ascending main to the reservoir, and which would be sufficient to meet all emergencies.

For the purpose of supplying water to all parts of the city from Fairmount and Spring Garden works, I would recommend also the laying of a main forty-eight inches in diameter from Fairmount works to Corinthian avenue reservoir, which would enable these works to pump directly into the three reservoirs to which I have above referred. This arrangement would render the new works now in progress and nearly completed at Fairmount, completely available, and during nearly the whole year these new works could be exclusively devoted to contributing to the supply now derived from the Spring Garden, Corinthian avenue and Kensington reservoirs, and only in cases of extreme draught or accident at the Fairmount works, would the proposed additional power at the Spring Garden works be called into requisition.

The proposed main between the Spring Garden and Kensington reservoirs would contain 811,091 gallons, and would be a valuable addition to the storage capacity of the higher localities with which it would be connected.

The capacities of the several reservoirs here alluded to are as follows :

The Corinthian avenue reservoirs,	37,500,000	gallons.
The Spring Garden	“ 9,800,000	“
The Kensington	“ 9,400,000	“

Total, - - - - - 56,700,000 gallons.

The demand on the Corinthian avenue reservoir is about three and a half millions of gallons per day, and it has therefore a capacity of ten and three quarter days' supply.

The demand on the Spring Garden reservoir is about seven millions of gallons daily, and its capacity is therefore not quite one and a half day's supply.

The demand on the Kensington reservoir is about two and a half millions of gallons daily, and its capacity less than four days' supply.

The suggested elevation of the Kensington reservoir added to the preceding, would make a total storage capacity of the three reservoirs, of 65,000,000 gallons, and the total daily demand on them is 13,000,000 gallons, or their united capacity would be five days' supply by connecting them as I have herein suggested.

This connection would insure five days' supply to the whole of the 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th and 20th Wards, and to parts of the 21st, 22d, 23d and 25th Wards, in portions of which at present there is not more than a supply for half this time, and in some localities a supply for only a few hours.

The connection of the three reservoirs here alluded to would not only give a better supply, but would so equalize the storage capacity that localities now having only a few hours' supply would be increased to five days, and some portions of the district supplied from the Fairmount works could be added so as to entirely equalize the supply to the whole city. Such an arrangement would somewhat increase the supply in the district watered by the Fairmount works, and the increase and consequent advantage to the districts supplied by the Kensington and Spring Garden works are sufficiently obvious.

The arrangement suggested would be a permanent remedy, and would certainly, as above stated, so greatly

increase the capacity of the Kensington reservoir as to include a large area now impossible to supply, and would undoubtedly create an additional demand for water from property owners, and incidentally increase its value and greatly encourage improvement and enterprize.

In the first year after the laying of the thirty inch main which supplies the first four wards of the city and the consequent greater capability of supply, the increased receipts were about twenty per cent. of its cost and there has been a constant annual increase.

The total quantity of water supplied by the Kensington Works

in 1861 was, 988,805,740 gallons.
Or a daily average of, 2,695,358 “

The total cost of supplying the above, . . . \$22,470 12

To supply the same quantity from Spring Garden Works would cost, 11,884 37

And the same quantity supplied from the Fairmount Works would cost, 11,126 84

These sums include the interest on the cost of the Works, and exclusive of such interest the cost of supply would be as follows:

From Kensington,	\$13,468 30
Spring Garden,	8,882 00
Fairmount,	1,632 00

The value of the property owned by the City now occupied by and including the Kensington Works is about sixty thousand dollars, and in the event of adopting the proposed recommendation, their use as a water works would be abandoned.

The present pumping main, which would cost about \$50,000 to lay, could be advantageously used as an additional distributing main, already much needed, and even now almost indispensable in supplying fully the higher parts of the district, and would leave the present distributing main to connect directly with the lower portions of the Kensington and Spring Garden Districts.

The district supplied by the Kensington Works con-

tains a population of 120,000, and pay water rents amounting to \$70,000.

The first four wards of the city, which are supplied from the Corinthian Avenue reservoir, contain a population of 110,000, and pay water rents amounting to \$95,000.

In these two cases the smaller population pays the larger amount of water rents.

The increased demand in the Kensington District in 1861 over that of 1856 is little more than 590,000 gallons per day, while in the district supplied from Fairmount Works, during the same period of five years, the increase is about 2,500,000 gallons daily.

In the Spring Garden District the increased demand in the same period is about 1,500,000 gallons per day, and in the Twenty-fourth Ward, where the facilities for obtaining a supply are not reliable and are inferior to those of the Kensington Works, the daily increase in a period of five years is over 800,000 gallons. These facts are given for the purpose of showing that causes exist rendering the demand for water supplied by the Kensington Works comparatively more restricted than the demand from any other of the Water Works of the city.

The proposed arrangement would very probably much increase the value of property in the entire district now supplied from the Kensington Works, and also in the more limited districts above referred to in the Fifteenth and Twentieth Wards, and would tend directly to the development of general improvement in those parts of the city.

The greatly increased ability to supply, by means of the proposed connections, and the additional area which would result from raising the Kensington reservoir, would undoubtedly create a very largely increased demand for consumption, and this ability to supply may very properly be kept in advance of private enterprise.

In compliance with your resolution the Kensington District was supplied with water from the Spring Garden Works for thirty-four days, during which time no complaint of the quality of the water, nor relating to

the health of the district, reached this Department, nor has there been to my knowledge any further action of the Board of Health nor of the citizens of the district.

Very respectfully,

ISAAC S. CASSIN,
Chief Engineer of Water Works.

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER, }
PHILADELPHIA, APRIL 24, 1862. }

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

GENTLEMEN:—In compliance with a resolution adopted by your honorable bodies, and approved April 10th, 1862, I herewith submit the following estimates.

For connecting a 40 inch main on Master street, from Spring Garden Reservoir to Tenth street, together with necessary connections to service pipes in cross streets from Twenty-sixth to Tenth street, with stops, branches, &c.,	\$93,150 00
For connecting a 30 inch main running on Master street, from Tenth street to Seventh street, and on Seventh street to Kensington Reservoir,	79,569 00
For building retaining wall around and raising Kensington Reservoir seven feet, or to the same level as Corinthian Avenue and Spring Garden Reservoirs,	68,335 00
For connecting a 48 inch main from Corinthian Avenue Reservoir to Spring Garden Reservoir,	46,500 00
Total,	\$287,554 00

Very respectfully,

ISAAC S. CASSIN,
Chief Engineer of Water Works.

WATER RATES

OF THE

CITY OF PHILADELPHIA.

DWELLINGS.

	Per annum.
Hydrant in Yard and Kitchen, or either,	\$5 00
Hydrant in Yard and Kitchen, and each supplied by a separate ferrule from the main, for each public attachment,	5 00
Baths, each tub	3 00
Baths; if supplied by a separate ferrule from the main —for one bath only	5 00
For each additional bath	3 00
Water Closets, each	1 00
Urinals, each	1 00
Biddets, or Foot Tubs, each	1 00
Wash Basins in Chambers, each	1 00
Wash Basins, or Sinks in Pantries, each	1 00
Wash Pavements of every description, each	3 00

(A screw nozzle on a hydrant in the yard is considered
a wash pavement, unless there is a wash pavement
charged to the dwelling.)

SMALL DWELLINGS

With but one room on a floor,	2 50
With one room on a floor and one story kitchen back,	3 75

STORES.

	Per annum.
Hydrant in Yard, or Basin in the Store,	\$5 00
Each Basin or Sink additional,	2 00
Water Closets, double acting, self-closing, each	1 00
Water Closets, single acting or hopper, each	2 00
Urinals, self-closing, each	2 00
Urinals of other descriptions, each	3 00

PUBLIC BUILDINGS.

Hydrants, each	5 00
Each Basin or Sink,	3 00
Water Closets, double acting, self-closing, each	3 00
Urinals, self-closing, each	3 00
Water Closets, and Urinals of other descriptions, each	5 00

HOTELS.

Hydrant, Family keeping the Hotel,	5 00
Hotel Bars, with water in or not,	10 00
Wash Basins, each	2 00
Slop Sinks, each	3 00
Water Closets, double acting, each	3 00
Water Closets of other descriptions, each	5 00
Urinals, self-closing, each	3 00
Urinals of other descriptions, each	5 00
Baths for use of Boarders, each	6 00
Wash Tubs in washing room, each	1 00
Kitchen, according to capacity and number of draw-cocks,	\$5 to 25 00
Boarders, ten persons or under,	5 00
Boarders, twenty-five persons or under,	10 00
Boarders, for each twenty-five persons additional,	5 00
Horse Troughs for watering horses,	10 00

STABLES.

Stables, per stall,	1 00
Each four-wheel carriage,	1 00
Each two-wheel carriage,	50
Country Stables, per stall,	50

PUBLIC BATHING ESTABLISHMENTS.

	Per annum.
Baths, each tub	\$6 00

BAKERIES.

Family Bakers, in addition to charge for dwelling, each	3 00
Large Establishments rated according to capacity.	

BARBER SHOPS.

One Basin, private attachment,	3 00
One Basin, public attachment,	5 00
Each additional Basin,	1 00

DRUG STORES.

One Sink, private attachment,	2 50
One Sink, public attachment,	5 00
Counter Fountains, not exceeding one-sixteenth of an inch,	5 00

PUBLIC SCHOOLS.

Each hundred children,	3 00
And their several openings to be charged the same as in " <i>Public Buildings.</i> "	

HATTERS' PLANKS.

Fours, per set	8 00
Sixes, per set	10 00
Eights, per set	12 00
And the Dye-Houses assessed in accordance with their capacity.	

BUILDING PURPOSES.

Bricks, per thousand,	05
Stone, per perch,	02

PACKET SHIPS OR OTHER VESSELS.

For each one hundred gallons water,	05
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STEAM ENGINES.

	Per annum.
High Pressure Steam Engines, per horse power,	. \$3 00
Low " " " for boiler only	. 4 00

**Sugar Refineries, Distilleries, Breweries, Dye-Houses,
and Manufacturing Establishments,**

Rated according to capacity and size of ferrule granted.

FOUNTAINS

Flowing ten hours a day for Six Months of the year,
from a half-inch ferrule (*five* dollars being always
charged on the first opening.)

For the first jet of one-sixteenth of an inch,	. . 6 00
For each additional jet of one-sixteenth,	. . 1 00
For the first jet of one-eighth of an inch,	. . 7 50
For each additional jet of one-eighth,	. . 2 50
For the first jet of one-fourth of an inch,	. . 14 00
For each additional jet of one-fourth,	. . 9 00
For half-inch jet,	. . 32 00

No Ferrule larger than a half-inch granted for Fountains exclusively.

For a Flow of Water twelve hours per day—

From a half-inch ferrule, per annum,	. . \$200 00
" five-eighths " "	315 00
" three-quarters. " "	450 00
" seven-eighths " "	600 00
" one inch " "	800 00

ORDINANCES

IN RELATION TO

THE USE OF WATER SUPPLIED FROM THE

Water Works of the City of Philadelphia.

PUBLISHED FOR THE INFORMATION OF PLUMBERS AND TO WHOM IT
MAY CONCERN.

Ordinance, March 15th, 1806.

SECTION 4. If any plumber or other person shall, without a written or printed permit from the Register of Water Rents, introduce a ferrule into any public or private pipes, or form any connection or communication whatever with said pipes, or break ground for that or any other similar purpose, in the public streets or alleys; or if any person or persons shall introduce or use a ferrule of a larger diameter than is specified in his or their permits, he, she or they so offending, shall forfeit and pay for each and every such offence, the sum of *twenty dollars*, and for every day's continuance of the use of such pipe, after conviction, the further sum of *one dollar*.

Penalty for using ferrule in making attachments without permit.

Ordinance, April 28th, 1814.

SECTION 3. That all persons who may intend to discontinue the use of the Schuylkill water, shall give notice thereof to the Register, at the office of the Register of Water Rents, on or before the 30th day of November in any one year, and on their failure so to do, shall be chargeable with, and pay the whole rent for the year next ensuing.

Notice to be given discontinuing use of water.

TRANSFERS MADE AT THE OFFICE OF THE REGISTER FREE OF CHARGE.

Ordinance, May 21st, 1818.

Persons supplied with water from a branch connected with a private pipe, to have a stop cock affixed to said branch.

SECTION 1. Every person who, on or after the first day of November next, may be supplied with water from a branch connected with a private pipe, shall have a sufficient stop-cock affixed to the said branch, as near as conveniently may be to the private pipe aforesaid, so as to stop the supply of water through the said branch, when requisite, and not interrupt the supply to other persons having a right to use the pipe with which such connection may be formed; and every person who may be supplied with water from a private pipe, having a branch or branches connected therewith, as aforesaid, shall, in like manner, have a sufficient stop-cock affixed to such private pipe, above the said branch or branches, for the purpose aforesaid; and in case of neglect or refusal to have such sufficient stop-cock affixed, as aforesaid, every person so offending shall forfeit and pay the sum of *five dollars*.

Penalty for neglect.

Duty of plumbers to affix such stop-cocks.

SECTION 2. All plumbers or other persons who may hereafter be employed to lay branch pipes, communications with private pipes, or private pipes having a branch or branches, as aforesaid, or to alter or repair such branch pipes or private pipes, as aforesaid, are hereby required and enjoined to affix to such branch pipes and private pipes, sufficient stop-cocks, with proper openings to the same, walled up and covered as herein mentioned, under the penalty of *ten dollars* for every neglect thereof.

Ordinance, April 29th, 1830.

Persons shall notify intention to discontinue, and pay to the Register the charge for detaching ferrule or cutting off pipe.

SECTION 3. Whenever any person shall notify his intention to discontinue the use of water, agreeably to the Ordinance aforesaid, he shall pay to the Register of Water Rents, for the charges of detaching the ferrule from the pipe of conduit, and the expense of repaving over the water pipe, as follows, to wit: where the ferrule is detached from a public iron conduit, one dollar and seventy-five cents; where it is detached from a private pipe, one dollar; and where it is detached from a public wooden conduit, one dollar and fifty cents; and until such payment is made, he shall not

be permitted to discontinue the use of the water as aforesaid, anything in any other Ordinance to the contrary notwithstanding.

Ordinance, December 9th, 1847.

SECTION 2. That if the said water is used for any other purpose, or through a ferrule of any greater size, or by means of any other fixtures and attachments than are expressed in such permit aforesaid, it shall be the duty of the Chief Engineer of the Water Department to stop off the supply of water authorized to be used by such permit, notwithstanding the water rent for the same may have been paid.

Penalty for using water without a permit.

Ordinance, June 20th, 1850.

SECTION 1. That from and after the passage hereof, no permit shall issue for the introduction of the water into, or for the extension of any pipe used for the conveyance of such water in any premises within the City of Philadelphia, until the owner of such premises, or his or her authorized agent, shall have given his or her consent thereto in writing.

No permit to be issued for the use of water without written consent of owner.

Ordinance, December 29th, 1854.

SECTION 1. That all water rents shall be payable to the Register of Water Rents, at his office, annually, in advance, on the second Monday of January; and upon all water rents unpaid upon the first day of May in any year, there shall be charged the sum of *five* per centum, and upon all rents unpaid on the first day of July in any year, there shall be charged an additional sum of *ten* per centum; and if any such rent, with the said additional charges, shall remain unpaid on the first day of September in any year, the said Register shall notify the Chief Engineer of the Water Department of the name of such delinquents, who shall cause the ferrules of all such delinquent water tenants to be detached from the pipe of conduit, and suit be instituted for the recovery of such rent; and after such ferrules shall have been detached, the water shall not again be supplied or furnished to the said premises, except upon payment of all arrears of water rent, and the sum of *two* dollars for expenses incurred; and a printed notice containing the first section hereof, shall be left upon the premises.

Water rents, how payable

Per centage added.

If unpaid after Sept. 1st in any year, ferrules to be detached and suit instituted.

Printed notice to be left on premises.

Register to give notice of time and place where payable, &c.

SECTION 2. The said Register shall cause notice to be inserted in two or more of the daily newspapers of the city, and published in posted handbills, of the time and place, when and where the water rents are payable, and the penalties for delay in, and for the non-payment thereof.

Ordinance, October 16th, 1858,

Water Tax to be levied against each dwelling in front of which water pipe has been laid.

SECTION 2. That hereafter there shall be levied a tax, to defray the expenses of the Water Department, to be styled a Water Tax, against each and every dwelling-house situate on any street, lane, alley, court, or other place where the water pipe is laid; and, as fast as it may be laid along the line of any such property as aforesaid, it shall be the duty of the Chief Engineer to assess a rate of tax of such amount against every dwelling-house as is now charged where the water is introduced. And the Register of Water Rents is hereby authorized and directed to collect the same at the time water rents are collected by law; and in the event of any owner or owners of such property neglecting or refusing to pay the same on or before the thirtieth day of September in each year hereafter, the same shall be registered against his or their property, and be collected as other registered taxes are now collected by law: *Provided*, That the owners of such properties cannot show that the said property obtains water from other sources than the Water Department of the City of Philadelphia.

How collect- ed.

Proviso.

How wash-paves shall be construct- ed.

SECTION 3. That hereafter no permit shall be issued for the construction of wash paves, except such permit shall contain a proviso that the same shall be constructed so that the water may be checked from stop in the street, and any person who shall construct, or cause to be constructed, a wash pave without having a cock that may be used from the street, shall be liable to a penalty of twenty dollars for such and every such offence, to be recovered as sums of like amount are now by law recoverable.

Penalty.

ISAAC S. CASSIN,
Chief Engineer of Water Department.

CHARLES L. WOLFF, *Register*.