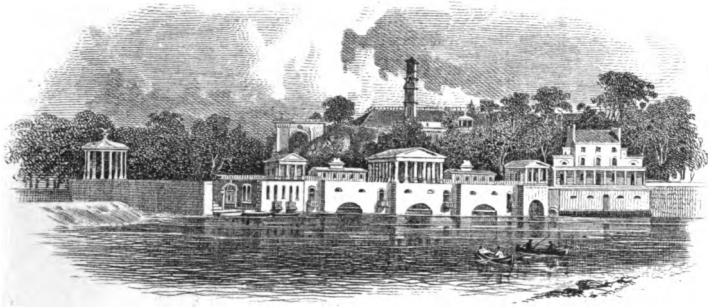


DEPARTMENT
FOR
SUPPLYING THE CITY WITH WATER.

ANNUAL REPORT

OF THE

Chief Engineer of the Water Department



OF THE

CITY OF PHILADELPHIA,

FOR THE YEAR 1877.

PRESENTED TO COUNCILS OCTOBER 8, 1878.

PHILADELPHIA:

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1878.

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1877
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COMMITTEE ON WATER WORKS, 1877.

C. THOMSON JONES, *Chairman.*

John W. Baker, Franklin Dundore, Samuel R. Marshall,
B. Frank Bonham, John Fullerton, John Rink,
George W. Humm, John Fox, Amos M. Slack,
John C. Bickel, J. C. Gilbert, M. D., Benjamin Saeltzer,
John G. Brooke, Isaac J. Griffiths, George A. Schaffer,
John Bardsley, George E. Hall, James C. Shedwick,
Samuel C. Collins, E. Hicks Hayhurst, Joseph H. Tatem,
Charles W. Weyman, Edward W. Patton.
GEORGE A. SMITH, *Ex officio.* JOSEPH L. CAVEN, *Ex-officio.*

OFFICERS.

Chief Engineer.—WILLIAM H. MCFADDEN.

Assistant Engineers.

JOHN L. OGDEN, CHARLES G. DARRACH, JOHN TRURAN.
JACOB HEROLD, *Surveyor.*

General Superintendent of Works.

ROBERT MCFADDEN.

Chief Clerk.—GEORGE F. KEYSER.

Samuel P. Ferree, *Assistant Clerk.* George W. Eckert, *Pipe Clerk.*
John E. Codman, *Draughtsman.* William L. Foreman, *Muster Clerk.*
Wm. H. Mettam, *Telegraph Operator.* Thomas J. Lister, *Messenger.*

Superintendent of City Shop.—JAMES F. NEALL.

Purveyors.

1st District—James Brown, 4th District—David A. Craig,
807 Reed Street. 810 Corinthian Avenue.
2d " Wilbur H. Myers, Germantown—D. B. Morrell,
918 Cherry Street. Main and Tulphocken Streets.
3d " Henry S. Myers, Manayunk—Henry Dawson,
1420 Frankford Road. Lyceum Building, Roxborough.

Engineers at Works.

Fairmount.—Joseph Moyer, A. C. Bonsall. *Belmont.*—Abraham Stott, C. Betzold.
Schuylkill.—Joshua Bartley, David Pyke. *Roxborough.*—J. Hughes, L. Culp.
Delaware.—John Penn, Joseph Thompson. *Chestnut Hill.*—William Gaffey.

REGISTRAR'S DEPARTMENT.

Registrar.—JOHN N. HAGEY.

CHARLES D. THOMAS, *Chief Clerk.* JAMES H. WATSON, *Receiving Clerk.*

Permit Clerks.

WILLIAM J. HALLIDAY, GEORGE KEARNEY.

General Clerks.

CHARLES ZELL, GEORGE MACAULEY, GEORGE BECK,
ISAAC R. MULLOCK, R. F. MUSTIN, JR., FRANK FREDERICKS.

Inspectors.

John F. Scheidt, William Stiles, James M. Rowe,
J. L. Warner, E. D. Thomas, Joseph Edwards,
H. M. Pfouts, Wm. H. Hergesheimer, Joseph B. Totten,
W. S. Stephenson, Jacob H. Boon, John H. Nevil,
Henry Marshall, William Erwin.

COMMITTEE ON WATER WORKS, 1878.

C. THOMSON JONES, *Chairman.*

John W. Baker,	Louis H. Donnelly,	John Kennedy,
George W. Bumm,	George Eno,	David Mouat,
John C. Bickel,	George S. Graham,	Charles K. Merkle,
John G. Brooke,	Isaac J. Griffiths,	Edward W. Patton,
Samuel C. Collins,	E. Hicks Hayhurst,	John Rink,
Hugh Copeland,	Joseph B. Hacker,	A. Seitz,
Henry C. Dunlap,	Robert A. Jamison,	Benjamin Saeltzer,
Joseph B. Vanduseu,	William Wright,	
GEORGE A. SMITH, <i>Ex-officio.</i>		JOSEPH L. CAVEN, <i>Ex-officio.</i>

OFFICERS.

Chief Engineer.—WILLIAM H. MCFADDEN.

Assistant Engineers

JOHN L. OGDEN, CHARLES G. DARRACH, D. MCN. STAUFFER

General Superintendent of Works.

ROBERT MCFADDEN.

Chief Clerk.—WILLIAM M. TAYLOR.

John S. Warner, <i>Assistant Clerk.</i>	George W. Eckert, <i>Pipe Clerk.</i>
John E. Codman, <i>Draughtsman.</i>	William J. Innes, <i>Master Clerk.</i>
William H. Mettam, <i>Telegraph Operator.</i>	Thomas J. Lister, <i>Messenger.</i>

Superintendent of City Shop.—JAMES F. NEALL.

Purveyors.

1st District—James Brown, Wharton ab. 11th St.	4th District—William Ewing, No. 810 Corinthian Avenue.
2d “ David A. Craig, No. 918 Cherry Street.	Germantown—D. B. Morrell, Main and Tulphocken Streets.
3d “ Henry S. Myers, No. 1420 Frankford Road.	Manayunk—Henry Dawson, Lyceum Building, Roxborough.

Engineers at Works.

Fairmount—Joseph Moyer, A. C. Bonsall.	Belmont—Abraham Stott, John Smith.
Schuylkill—Joshua Bartley, David Pyke.	Roxborough—William A. Smith, Lewis Culp.
Delaware—John Penn, Joseph Thompson.	Frankford—Chas. H. Douglass, Geo. Wright.
	Chestnut Hill—William Gaffey.

REGISTRAR'S DEPARTMENT.

Registrar.—JOHN N. HAGEY.

JOHN J. PRENTZEL, *Chief Clerk.* A. NEWLIN KEITHLER, *Receiving Clerk.*

Permit Clerks.

WILLIAM J. HALLIDAY, A. BUCKHEISTER.

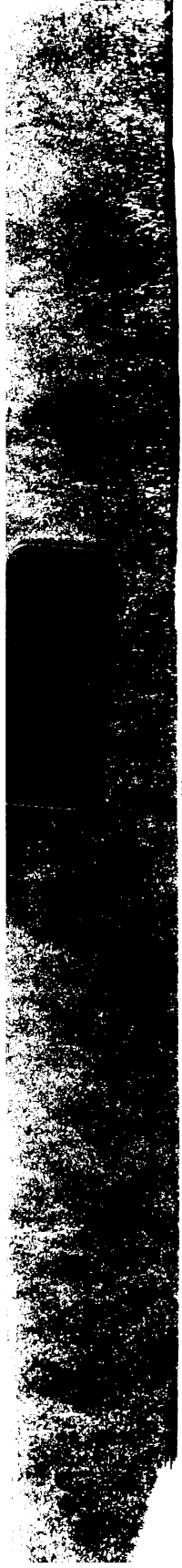
General Clerks.

CHARLES ZELL,	GEORGE MACAULEY,	R. F. MUSTIN, JR.,
JOSEPH FISHER,	J. M. STACKER.	JOHN CALDWELL.

Inspectors.

John F. Scheidt,	E. D. Thomas,	H. G. Butler,
J. L. Warner,	W. H. Hergesheimer,	J. H. Nevil,
S. D. Woodington,	J. H. Edwards,	H. Marshall,
J. F. Hickman,	Wm. A. Agnew,	Wm. Erwin,
	E. M. Rowe,	C. J. Lowry.

REPORT
OF THE
CHIEF ENGINEER.



REPORT.

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

GENTLEMEN:—For the fifth time I have the honor of submitting an Annual Report of the Philadelphia Water Department. This report is for the year ending December 31, 1877.

RECEIPTS.

The total receipts for the year amount to \$1,227,981.10. A comparison of the same with the receipts for 1876 is submitted; and the sources whence derived are as follows :

Collected at Registrar's Office in 1876 and in 1877.

	1876.	1877.
Delinquent rents.....	\$31,971 75	\$62,104 75
Penalties.....	4,324 91	7,957 45
Water rents.....	970,814 25	1,008,248 60
Penalties.....	17,202 85	16,309 65
Fractional rents.....	54,711 96	53,470 48
Water pipe.....	115,034 27	73,253 88
	1,194,059 99	1,221,344 81
Collected at Chief Engineer's office.....	5,694 98	6,636 29
	<u>\$1,199,754 97</u>	<u>\$1,227,981 10</u>
Returned for lien to City Solicitor.....	81,151 48	38,581 54
Amount Collected by City Solicitor.....	52,259 95	56,233 57
Receipts of 1877 in excess of those of 1876.....		28,226 13

EXPENDITURES.

From annual appropriations, - - - - -	\$484,613 87
From special appropriations, - - - - -	3,058 18
From loans (extension of Works), - - - - -	183,177 83
Total expenditures for 1877, - - - - -	<u>\$670,849 88</u>
Total receipts, - - - - -	\$1,227,981 10
Total expenditures, - - - - -	670,849 88
Receipts in excess of all expenditures, - - - - -	<u>\$557,131 22</u>
Total receipts, - - - - -	\$1,227,981 10
Less annual and special appropriations, - - - - -	487,672 05
Profits of the Department for 1877, - - - - -	<u>\$740,309 05</u>
Profits, - - - - -	\$740,309 05
Add amount collected by City Solicitor, - - - - -	56,233 57
Revenues in excess of expenditures, - - - - -	<u>\$796 542 62</u>

We are pleased to make such an exhibit which is not of record in the history of the Works.

The surplus receipts over expenditures for one year would place the City beyond a water contingency for ten years. The surplus for three years, would enable the Department to complete its recommendations, and to furnish an abundant supply of pure and wholesome water to every section of the City. The water then could be subsidized at small expense, and be equal in quality to any, without the necessity for the costly and uncertain process of filtration.

PUMPAGE.

The total pumpage of the year amounts to 17,877,144,792 gallons, an excess over 1876 of 403,836,753 gallons, or an increase of two and one-third per cent., a daily average increase of one and one-tenth million gallons.

The pumpage at Fairmount by water power was 9,492,419,433 gallons, the largest pumpage ever made at these Works, and an

increase over 1876 of 1,117,761,690 gallons, or 13½ per cent., an excess of 670,690,840 or 7½ per cent over the highest pumpage, which was in the year 1871. This result was obtained by the equable distribution of the rainfall.

This total pumpage of 17,877,144,792 gallons, when equated to a lift of one hundred feet high, amounts to 23,605,350,256 gallons, at an expense of \$3.07 by water power per million gallons one hundred feet high. This does not include the interest on the plant. The amount pumped by water power was 8,543,177,489, at a total expense of \$26,234.90.

The amount pumped by steam power, equated to a lift of one hundred feet, was 15,062,172,767 gallons, at an expense of \$8.48 per million per one hundred feet high, or at a total expense of \$127,784.20.

The total expense of pumpage for the year, amounts to \$154,019.10, at an average expense of \$6.52 per million gallons lifted one hundred feet high by steam and water power combined.

FUTURE MODE OF SUPPLY.

Sooner or later, in order to a future supply, the mode must be determined whether it shall be by water power, with impounding reservoirs, flooding large areas, and new water power works at Flat Rock Dam as suggested by some, or by gravity, involving a heavy outlay for the construction of an impounding dam, a conduit for the conveyance of the water, and a distributing reservoir of one billion gallons capacity, as recommended by others, or by steam power as at present, demanding means for the maintenance of the purity of the River Schuylkill and its protection from pollution.

A water power plan has to recommend it, the small expense of pumpage, but if the interest on the plant be added, the cost of pumpage is greater than by gravity or steam power. The Commission of Experts, in 1875, in their report pages 25, 26, and 27, determined the cost at \$12 per million gallons lifted one hundred feet high for storing water as a power, under the most

favorable circumstances, which was by means of a dam, impounding 2,000 acres in the valley of the Perkiomen, and using the water power twice, at Flat Rock and at Fairmount. This \$12 includes only the expense of providing the power, and does not embrace the expense of the pumpage by water power, which is \$3 per million gallons lifted one hundred feet high.

The lowest estimate for a gravity supply, including a basin of one billion gallons capacity, within the limits of the City, is 8,000,000 (eight million) dollars, the interest on which amounts to \$480,000, an average cost of \$10.85 per million gallons lifted one hundred feet high, on the basis of the completion of the work and in operation at present, with an average consumption of fifty million gallons per day,—seventy-five million gallons per day in 15 years, and one hundred million gallons per day in 30 years, besides involving the pumpage of the water above an elevation of 175 feet, City datum, under the best conditions, and above 135 feet the conditions assumed by others.

Thus, by elimination, we are forced to the last and only mode of supply, namely, by steam power, whereby we maintain intact our present works, which can be doubled in capacity by the introduction of improved pumping and steam machinery at a comparatively small outlay for any needed reconstruction of the engine and boiler houses.

While I might prefer a gravity supply for the purity of source, or a water power supply for the small expense attending water power pumpage, yet a commercial and financial consideration compels my preference for steam power pumpage as the cheapest mode of water supply, especially when an offer is pending to furnish and donate in five years, all the machinery necessary to do the work, and maintain it in as good order and condition as when first made, and do the pumpage at \$7.14 per million gallons lifted one hundred feet high.

Therefore, I have the same recommendations to make which have been repeated year after year, except such as have been consummated by your orders and instructions. Unless the means

are provided to place the City beyond a water contingency, there will be nothing to prevent a water famine in the second system dependent for its supply upon the Belmont Works. I have earnestly labored to avoid such a possibility, and I both hope and trust Councils will understand and appreciate the true conditions, and furnish the means to prevent such a calamity, rather than to effect a cure at much cost and anxiety.

The offers which have been made by some of the manufacturers of the best pumping machinery are worthy your careful consideration and prompt decision. The Department would prefer an appropriation to provide for the recommendations contained in the Report, and to obtain by advertisement the best pumping machinery, for the least money which, after a twelve months actual operation by the makers, subjected to the approval of the Department, would insure the best results.

RECOMMENDATIONS REPEATED.

1. At the Belmont basin, such an arrangement as will separate the inlet and outlet pipes from the same chamber, which could be done at small cost, and avoid supplying the water direct from the river to the consumers, affording the benefit of subsidence before delivery.

2. At the Belmont Works, such an arrangement as will separate the pumping from the distributing main, which causes riley water to be furnished after every shower, and is gradually filling with mud the submerged main which carries the water to the east side of the river Schuylkill.

3. The erection of a basin, at such an elevation that it will supply the second system east of the river, and at the same time, by means of a stand pipe, furnish water to the Belmont basin.

4. A pumping main from the Spring Garden Works to the proposed basin.

5. A distributing main from said basin to Broad Street.

6. An engine at Spring Garden Works, to pump into the proposed basin, located to supply the second system; the estimated cost of the above is \$600,000 and can never be done cheaper.

7. An engine at Roxborough Works, the 30 inch main having been provided, and the only necessity for the engine, an accident to the largest engine at the period of maximum demand, when the smaller engine would be inadequate to keep up the supply.

8. Another engine at Frankford, as provided in said loan, and for reasons as per No. 7.

9. Suggestions on pages 9, 11, 12, 26, of Report for 1876.

10. A rearrangement of the distribution districts, whereby the low levels could be furnished from the Fairmount and Kensington basins, and the Spring Garden and Corinthian basins supply the old City proper, thus affording an additional head of 26 feet upon its 30 miles of small pipes, which would benefit it at a very small outlay, and answer a useful purpose for many years to come.

These suggestions are based upon the completion of the recommendations made. They are parts of a general plan, whereby the unification of the works is consummated, and the whole coordinated into a symmetrical system, lacking only these to make it efficient and successful. The next step to be taken would be, the subsidence of the water in the East Park Reservoir. My reasons for not urging the completion of the East Park Reservoir at this time, are the same as those presented to His Honor, the Mayor, some five years ago, a few weeks after my first election. They were urged upon many members of Councils, and led to my communication of June 24, 1873, asking for a Board of Experts, with a view to its abandonment, because it was too low in elevation to supply the rapidly growing necessities which have yearly increased and can be met in no cheaper way than recommended. When the necessities are provided it might be well to complete the East Park reservoir and pump all the water from Fairmount and Spring Garden Works into it; then conduct the water filtered by subsidence to all the basins of the first system supplying as high an elevation as 60 feet above City datum

THE PUMPAGE DIAGRAM.

A careful study of this graphic description, will impart more information than pages of print. The daily rain-fall, the noon-temperature, the waste water over flash boards, the storage between the legal comb and the top of flash boards, the reliance placed upon, and the draught made upon this storage, the daily pumpage at each of the works, and the total pumpage by steam and water power of all the works, and above all, the small value of Fairmount in times of drought. Fairmount pumps on the average one-half of all the water, but it must be borne in mind that its lift does not exceed 120 feet, while the steam works, though only doing one-half in quantity, do twice as much work when the lift is considered.

THE WORKS.

FAIRMOUNT.

New steps and brass tell-tale pipes were made for Turbines Nos. 3, 8, and 9, and new valves and stems for Nos. 7, 8, and 9. The Worthington Engine was repaired—new connections were placed on the feed pump, and an attachment made to fill the main and pump.

SPRING GARDEN.

The Cornish Engine (No. 5) was repaired, and provided with new springs for cylinder and strainer for induction pipe.

The Simpson Engine (No. 6) has been remodeled—steam pipes, poppet valves, cams, and adjustable cut-off substituted for the old slide-valve gearing. A new valve box for pump and pump rod has replaced those broken last year, and the lost motion in the bucket taken up. This engine is now in good condition, pumping full capacity with a better duty.

The Cramp Engine (No. 7). Self-feeding oil cups and lubricators were placed on every bearing and journal, and brass caps on the pump-valves. The steam pipes were arranged to supply this engine, and manifold heaters placed between the pumps.

BELMONT.

The engines received but slight repairs; the constant demand upon the works prevented the stopping long enough to give them proper attention. New brasses were placed on the air pumps, and the rubber valves protected by sheet brass caps. The rubber valves for the Worthington Engine have been so modified that they can be used a second time.

A single eight-inch steam pipe, on compensating iron columns, with stop and six-inch supply pipes to each engine, has replaced the old line of steam pipe. The feed-pump was repaired as well as all the valves, stops, and gauges, and two-inch surface blows placed on the Merrick boilers. The want of adequate boiler power is a source of great expense, as well as danger; the increased demand upon these works has exhausted their capacity.

ROXBOROUGH.

New foot valves and stud bolts were put on the Cornish Engine. The valves and valve-seats of the Worthington Engine were planed and finished; a new spring on the low-pressure cylinder, new brasses on links, and new studs and seats in the pumps provided. The feed-pump was repaired, a relief-valve placed on the pipe, and arranged to supply the boilers from the hot well. The boilers received extensive repairs.

CHESTNUT HILL.

Slight repairs to the pumping engine. New connections, including a check-valve, were made between the Knowles pump and the main, and the Knowles pump refitted with new valves and brass bolts. A lignum-vitæ packing ring was put in this pump.

DELAWARE.

Slight repairs to Engine No. 1 (high pressure), and extensive repairs made on the Worthington Engine.

BUILDINGS AND GROUNDS.

Manifold steam heating apparatus was put in the engine rooms at the Spring Garden, Belmont, and Roxborough Works. At Spring Garden, the improvements spoken of in last report were completed. At Belmont, an excavation was made for new coal sheds, and the material put into the road bed of a new siding, which, when completed, will do away with the excessively sharp curvature of the siding in use. The new sheds when finished will have a storage capacity of about 2,500 tons, and thus obviate the trouble incident to the present insufficient storage.

At the Belmont Basin, the gratings covering the openings of the stop house were cut to fit flush with the stone coping.

During the severe rain storm of October 4th, the entire west bank of the Delaware Reservoir was denuded of about twelve inches of earth and the sodding; owing to a lack of funds, this has not yet been repaired.

At the Chestnut Hill Works, the fouling of the reservoir, by storm water washing refuse matter into it, has been prevented by laying six-inch and four-inch pipes direct from the spring to the pump well.

The boilers of all the works have received the usual annual inspection and cleaning.

THE TELEGRAPH.

There are now twenty-five miles of telegraph wires connecting the different works and Purveyors' offices with the main office.

During the past year 3,027 messages were sent from, and 2,080 received at the main office.

The First and Third District offices, the Chestnut Hill Works and the Frankford Works and Reservoir are without telegraphic communication, the need of which is daily felt and should be provided.

During the July riots the telegraph was placed under the control of the Police, who had their headquarters at Fairmount, and

were thus put into direct communication with the **Mayor at the Central Station.**

THE FRANKFORD WORKS.

The Reservoir.

R. A. Malone, contractor for the work on **Wentz Farm Reservoir**, finished the earthwork and brick lining in **September, 1877.**

The fences surrounding the stop-house and the **Reservoir**, and the brick inlet basin, were constructed by the **Department** in **October and November, 1877.**

The Pumping Main.

The 30-inch pumping main extends from the works at **Lardner's Point**, 20,250 feet, to the northeast corner of the **Reservoir.** It follows the undulations of the street grades on the routes indicated in the last Report, air-cocks being placed at the **summits.** It was completed in **June, 1877.**

That portion of the main crossing the valleys of the **Wissanoming and Tacony Creeks**, on wooden trestle-work, was protected by a wooden boxing put in place in **June and July, 1877.**

The Distributing Main.

That portion of the distributing main lying between the intersection of **Comly Street** and the **Oxford Pike** and the **Reservoir**, which was not laid at the time of making last Report, was finished early in the **Spring** of this year.

The Pumping Station.

Prior & West, the contractors for building the engine and boiler houses, handed over their work complete in **July.**

The contract for the wharf, inlet, conduit, and foundations of engine and boiler houses, awarded to **R. A. Malone**, **April 25, 1876**, was completed by him in **October, 1877.**

In **September**, work was commenced by the **Department** on the coal sheds, and in **December**, seven bins were completed and filled

with 900 tons of coal. Five more bins are provided for, and can be added when necessary, increasing the storage capacity to 1,500 tons.

After some delay in making connection between the pumping engine and the air vessel, the pumps were started December 1st, 1877, and the forebay was soon pumped dry, when it was found that some malicious person had placed bulkheads in the wooden conduit, which prevented the flow of water into the forebay in the engine house. They were removed, and the pumps were again started December 10th at 10.30 A. M., and at 12.03 P. M. water was delivered into the Reservoir at Wentz Farm, and the people of Frankford at once supplied.

GENERAL RECAPITULATION, FRANKFORD WORKS.

Pumping Station.

Engine house, boiler house, stack, wharf, and coal sheds,	\$75,962 66	
Inlet conduit,	10,735 89	
Engine,	46 000 00	
Engine foundation and piling,	8,854 03	
Inlet pipes, &c.,	1,941 39	
Department labor, machine work, &c.,	3,853 71	
Boilers,	13,995 00	
	<hr/>	\$161,342 68

Thirty-inch Pumping Main, 20,250 feet long.

Air-vessel and foundations,	\$2,756 94	
Main complete, trestles, stops, &c.,	208 890 42	
	<hr/>	211,647 36

Reservoir.

Reservoir proper, brick lining, &c.,	\$99,818 68	
Stop-house complete, with stops, gates, pipes, &c.,	30,136 62	
Inlet complete,	2,933 25	
	<hr/>	132,888 55

Twenty-inch Distributing Main.

Main complete, 11,964 feet long, with stops, branches, &c.,	\$60,208 45	
	<hr/>	60,208 45

Land Damages.

Property at Lardner's Point,	\$19,152 00	
Unloading coal, and general labor,	\$1,388 00	
	<hr/>	19,152 00
		<hr/>
		1,388 00

Total cost of Frankford Works,		\$586,627 05
Deduct on reservoir, not paid,	\$11,069 82	
" boilers, " 	5,598 00	
	<hr/>	16,667 82

Amount paid on Frankford Works, January 1, 1877, \$569,959 23

RECEIPTS AND EXPENDITURES

OF THE

Water Department

FOR

1877.

Receipts of the Department and sources whence derived, as exhibited by statement of John N. Hagey, Registrar,	-	\$1,221,344 81
Receipts at Chief Engineer's office, as per statement,	-	6,636 29
		<u>\$1,227,981 10</u>

RECEIPTS AT CHIEF ENGINEER'S OFFICE FOR 1877.

For old iron,	-	-	-	-	-	-	\$1,827 67
For rents,	-	-	-	-	-	-	1,125 00
For brass scraps and turnings,	-	-	-	-	-	-	400 73
For phosp. bronze scraps,	-	-	-	-	-	-	114 92
For ice,	-	-	-	-	-	-	90 00
For stone,	-	-	-	-	-	-	88 10
For gravel,	-	-	-	-	-	-	111 35
R. D. Wood & Co., branch, etc.,	-	-	-	-	-	-	447 99
Northern Market Company, attachment,	-	-	-	-	-	-	401 15
Alhambra Theatre, attachment,	-	-	-	-	-	-	309 40
Girard Trust, attachment,	-	-	-	-	-	-	298 03
W. Sellers & Co., attachment,	-	-	-	-	-	-	163 55
Pennsylvania Railroad Company, attachment,	-	-	-	-	-	-	150 24
Good Intent Mills, attachment,	-	-	-	-	-	-	135 70
Brown & Son, attachment,	-	-	-	-	-	-	124 52
H. Kitchenman, attachment,	-	-	-	-	-	-	120 76
West Philadelphia Passenger Railway Company, attachment,	-	-	-	-	-	-	120 05
W. P. Oglesby, attachment,	-	-	-	-	-	-	112 56
Commissioners Fairmount Park, lowering pipe,	-	-	-	-	-	-	104 46
H. Bower, attachment,	-	-	-	-	-	-	98 43
Charles S. Close, repairs,	-	-	-	-	-	-	87 29
Platt & Bro., attachment,	-	-	-	-	-	-	65 31
Continental Passenger Railway Company, resetting plug,	-	-	-	-	-	-	52 66
William Ashmead, resetting plug,	-	-	-	-	-	-	35 24
S. Solms, attachment,	-	-	-	-	-	-	20 00
Repairs,	-	-	-	-	-	-	25 28
Old lead,	-	-	-	-	-	-	5 90
							<u>\$6,636 29</u>

Receipts and Expenditures since Consolidation.

YEARS.	RECEIPTS.				Yearly in- crease of receipts.	EXPENDITURES.				Annual profits.
	REGISTRAR'S OFFICE.		At Chief	Totals.		From annual appropriation	From special appropria- tions.	From loans for construction.	Totals.	
	For water rents.	For pipe laid.	Engineer's							
			Office.							
1855...	\$360,059 16	\$21,351 01	\$626 55	\$382,036 72		\$168,765 22	\$82,130 15		\$250,895 37	\$131,141 35
1856...	320,013 88	31,922 61	960 11	352,896 60	Decrease.	139,293 60	21,174 42		160,468 02	192,428 58
1857...	395,298 36	30,373 58	802 20	425,964 14	\$73,067 54	177,459 93	23,145 96		200,605 89	225,358 25
1858...	420,372 57	37,145 91	129 75	457,648 23	31 684 09	175,016 86	12,961 23		187,978 09	269,670 14
1859...	484,879 06	63,249 13	3,051 89	551,180 08	93,531 85	194,828 44	30,258 59	\$180,650 06	411,737 09	326,093 06
1860...	494,824 22	62,297 64	1,409 77	558,531 53	5,941 68	193,528 64	4,767 74	54,209 85	232,506 23	300,235 15
1861...	498,589 40	34,496 36	885 30	533,980 06	Decrease.	161,277 58	1,447 36	76,264 60	238,989 54	371,255 12
1862...	516,602 94	28,164 31	1,025 82	545,793 07	11,813 01	156,023 43	21,099 81	40,842 94	217,966 18	368,669 83
1863...	536,025 58	30,715 02	937 69	569,678 29	23,885 22	187,486 49	23,273 43	2,989 28	213,749 20	358,918 37
1864...	586,978 71	22,278 57	855 29	610,112 57	40,434 28	251,831 13	21,325 68		273,156 81	336,955 76
1865...	595,746 40	34,141 07	6,500 95	636,388 42	26,275 85	270,404 83	13,857 80	138,074 95	422,337 58	352,125 79
1866...	634,263 84	32,031 11	3,927 18	670,222 13	33,833 71	273,606 24	4,552 93	338,553 73	616,712 92	392,062 96
1867...	684,621 06	76,938 39	5,891 44	767,450 89	97,229 76	322,935 30	37,584 24	215,324 95	575,844 49	406,931 35
1868...	707,646 73	64,859 03	4,404 83	777,009 59	9,558 70	361,595 23	86,777 44	413,844 79	862,217 46	388,637 92
1869...	747,443 17	61,065 06	4,962 30	813,470 53	36,461 24	388,742 15	52,499 47	468,526 46	969,768 28	372,229 21
1870...	810,716 83	117,319 12	7,335 01	935,370 96	121,900 13	445,947 54	2,657 29	695,488 06	1,144,073 51	486,766 13
1871...	858,939 06	96,110 98	7,184 04	963,234 08	27,863 12	439,406 38	5,857 85	623,929 20	1,081,103 43	517,969 85
1872...	911,790 15	131,822 96	10,668 40	1,054,281 51	81,047 43	471,219 80	10,218 35	582,138 13	1,063,576 28	572,843 36
1873...	961,296 78	116,997 17	4,891 06	1,082,985 01	28,703 50	532,686 89	1,663 56	1,030,068 03	1,564,418 48	648,634 56
1874...	1,023,989 81	198,896 99	6,994 58	1,229,881 38	146,896 37	689,506 89	1,018 92	534,576 27	1,225,102 08	839,358 47
1875...	1,037,066 61	123,258 53	9,321 14	1,169,666 28	Decrease.	674,693 51	35,139 50	228,503 67	938,336 74	459,933 21
1876...	1,079,025 72	115,034 27	5,894 98	1,199,754 97	30,068 69	713,518 02	11,129 83	376,375 96	1,101,023 81	475,107 12
1877...	1,148,093 93	73,253 88	6,636 29	1,227,981 10	28,226 13	484,613 87	3,058 18	183,177 83	670,849 88	740,309 05
Totals	\$15,817,300 97	\$1,603,821 60	\$94,396 87	\$17,515,519 44	.....	\$7,814,387 97	\$507,599 79	\$6,189,519 60	\$14,511,507 30	\$9,193,531 68

EXPENDITURES OF THE DEPARTMENT FOR 1877.

FROM ANNUAL APPROPRIATION.

Salaries of Chief Engineer, Assistants, Purveyors, and Clerks,	\$31,220	46
Salaries of Engineers, Firemen, &c., at works,	59,500	00
Salaries of Registrar and Clerks,	27,073	00
Stationery, advertising, and office expenses,	9,287	86
Supplies to works:		
Coal and wood,	\$58,768	49
Tallow, oil, and gas,	7,480	77
Small stores, packing, &c,	3,985	23
		<u>70,234 49</u>
Repairs to works:		
Fairmount,	\$8,958	26
Delaware,	1,260	66
Schuylkill,	1,891	83
Belmont,	1,517	63
Roxborough,	1,367	40
		<u>14,998 78</u>
For drilling and making new attachments:		
Wages, First District,	\$2,285	31
“ Second “	2,376	25
“ Third “	2,391	75
“ Fourth “	2,429	75
“ Germantown,	812	50
“ Manayunk,	1,700	25
		<u>11,998 81</u>
For keeping pipes, plugs, stops, and fixtures in good order:		
Wages, First District,	\$3,548	12
“ Second “	3,790	25
“ Third “	5,270	13
“ Fourth “	4,874	47
“ Germantown,	2,505	26
“ Manayunk,	2,520	19
“ Pressure Inspector,	859	75
Paving around plugs,	1,404	25
Plumbing,	108	70
Plug valves,	77	60
		<u>\$24,958 72</u>
Amounts carried forward,	\$224,313	40

Amounts brought forward,	\$24,958 72	\$224,313 40
Sundries,	23 29	
Dressing tools,	16 67	
	<hr/>	24,998 68

For labor in laying pipes, setting and fitting fire-plugs, stop-cocks, &c.,

Wages, First District,	\$7,538 07	
“ Second “	12,741 73	
“ Third “	5,657 74	
“ Fourth “	11,503 81	
“ Germantown,	2,267 02	
“ Manayunk,	2,657 88	
“ Shop,	23,583 67	
“ Assistant Engineer's roll,	2,716 37	
Hauling,	3,234 39	
Measuring over pipe,	1,633 76	
Inspecting pipe,	733 10	
Plumbing,	369 58	
Paving,	292 95	
Wharfage,	33 78	
Blasting,	21 00	
Tool dressing,	7 98	
Oil,	3 50	
Valves,	3 00	
	<hr/>	74,999 33

For keeping buildings, grounds, and reservoirs in good order:

Wages,	\$42,280 35	
Lumber,	1,875 07	
Hardware,	1,024 71	
Seeds and plants,	618 91	
Repairs to portable engines,	549 23	
Cement,	485 27	
Paint, glass, etc.,	431 08	
Roofing,	423 43	
Paving,	322 39	
Tin work,	309 72	
Bricks,	210 50	
Repairs to track,	272 91	
Terra cotta pipe,	138 03	

Amounts carried forward,	\$18,941 60	\$324,311 41
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Amounts brought forward,	\$48,941 60	\$324,311 41
Paper hangings,	94 18	
Lime,	87 25	
Cleaning cess-pools,	86 00	
Curbing,	76 02	
Iron castings,	73 53	
Hauling,	72 50	
Sand,	61 30	
Gum hose,	54 88	
Fittings,	58 04	
Sewer,	54 52	
Repairs to heater,	49 85	
Machine work,	40 35	
Packing,	35 81	
Repairs to scales,	30 80	
Matting,	31 00	
Plumbing,	29 71	
Gas fixtures,	24 25	
Brooms,	23 00	
Salt hay,	19 62	
Iron and steel,	15 07	
Transportation,	10 00	
Lustre,	9 00	
Bolts and nuts,	8 49	
Coal,	7 00	
Wire,	2 63	
		49,996 40
For the purchase of iron pipes, fire-plugs, stop-		
cocks, lead, brass, iron castings, &c.		
Iron pipe,	\$55,482 26	
" castings,	6,834 28	
Brass "	2,725 99	
Phosphor bronze,	1,638 84	
Lumber,	1,778 30	
Pipe reports,	1,228 36	
Hardware,	1,160 58	
Meter,	960 00	
Coal,	841 75	
Plug valves,	792 34	
Bolts and nuts,	655 36	
Iron and steel,	497 18	
Packing,	359 25	
Amounts carried forward,	\$74,954 49	\$374,307 81

Amounts brought forward,	\$74,954 49	\$374,307 81
Sponge cloths,	851 00	
Oils,	333 77	
Gasket,	243 42	
Rent,	235 00	
Powder and fuse,	174 00	
Repairs,	153 34	
Wood,	134 00	
Gum goods,	125 00	
Machine work,	83 73	
Coke,	82 43	
Shovels,	70 50	
Paints,	62 74	
Fittings,	55 92	
Ice,	48 40	
R. C. pipe,	44 65	
Soap,	32 50	
Cement,	30 60	
Brooms,	28 35	
Sundries,	14 78	
Plumbing,	18 00	
Belting,	12 37	
Hauling,	12 00	
Tool dressing,	10 50	
Wharfage,	6 00	
	<hr/>	
	\$77,817 49	

For the 30-inch main on Jefferson Street.

Wages,	\$9,112 44
Iron pipe,	5,209 77
Hauling,	561 25
Repairs,	293 97
Inspecting pipe,	139 25
Hardware,	120 23
Plumbing,	64 75
Lumber,	55 67
Pump,	15 00
Brass casting,	4 95
	<hr/>
	15,577 28

Amounts carried forward,	\$93,394 77	\$374,307 81
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Amounts brought forward	\$93,394 77	\$374,307 81
For the 12 inch main through Fairmount Park to connect with the old pumping main of the West Philadelphia Water Works.		
Wages,	\$6,577 75	
Lumber,	20 36	
	<u>6,598 11</u>	99,992 88
For carriage hire and keep of horses for Superintendent and Assistant Engineers,		750 00
For carriage hire and keep of horse for Chief Engineer,		589 00
For the care and maintenance of the Chestnut Hill Water Works,		2,995 29
For expenses of public fountains of the Philadelphia Foun- tain Society,		999 58
For repairs to the Simpson Engine,		4,979 31
		<u>\$484,613 87</u>

SPECIAL APPROPRIATIONS.

(Appropriation approved October 12, 1875.)

For new boilers, settings, and connections at
Chestnut Hill Works; for relining south
division of the Roxborough Reservoir; for
repairing the Wissahickon Aqueduct, and to
extend the 10-inch main on Ridge avenue:

Iron pipe	\$1,024 61	
Wages,	1,541 49	
Hauling,	84 50	
Lumber,	39 68	
Tool dressing,	13 50	
	<u>\$2,703 78</u>	

Appropriation approved July 6, 1877.

To refund twice paid and overpaid water rents, and pipe laying bills,	354 40
	<u>\$3,058 18</u>

EXTENSION OF WORKS.

AMOUNT PAID FROM WATER LOANS.

(Appropriation approved April 7, 1870, under transfer June 19, 1875.)

Item 10.

For bursting of mains or other emergency:

Wages,	\$226 74
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(Appropriation approved November 6, 1871.)

Item 1.

For new engine No. 3, at Schuylkill Works:

Building engine,	14,685 87
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*Item 8.*For mains to connect large storage reservoir,
East Fairmount Park, with engines at Schuyl-
kill Works, :

Wages,	142 50
Shear poles,	10 00
	<hr/>
	152 50

Item 9.

For incidentals:

Hauling, etc.,	94 75
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(Appropriation approved May 19, 1873.)

*Item 1.*For engine house and stack, at Harrison's Land-
ing, Frankford Works:

Malone's contract,	\$7,159 10
Prior & West's contract,	6,569 05
Lumber,	1,464 56
Brick work,	1,033 45
Connecting conduit,	477 02
Iron castings and rails,	288 16
Lightning rods,	271 90
	<hr/>
Amounts carried forward,	\$17,263 24
	<hr/>
	\$15,159 86

Amounts brought forward,	\$17,263 24	\$15,159 86
Wages,	270 00	
Stone,	176 40	
Terra cotta pipe,	122 70	
Coal buckets,	121 80	
Hardware,	74 91	
Gum hose,	53 00	
Sundries,	35 00	
Plumbing,	32 70	
Fittings,	29 54	
Machine work,	16 37	
Advertising,	11 70	
Brushes,	11 55	
Incidentals,	10 35	
Repairs to fence,	3 90	
	<hr/>	18,233 16

Item 2.

For new engines and boilers, and setting same.

(Frankford Works):

Cramp's contract,	\$12,403 32	
Neafe & Levy's contract,	8,397 00	
Malone's contract,	6,385 21	
Wages,	1,346 53	
Flagging,	423 36	
Scales,	270 00	
Tubing,	225 92	
Advertising,	202 10	
Valves,	150 16	
Iron castings,	62 02	
Hauling,	57 00	
Instruments,	56 10	
Transportation,	55 00	
Grindstone,	40 50	
Hardware,	40 32	
Paint, etc.,	37 90	
Bolts and nuts,	37 13	
Belting,	35 66	
Packing,	32 19	
Iron and steel,	32 17	
Pulley,	5 50	
	<hr/>	30,295
Amount carried forward,		\$63,688 11

Amount brought forward,		\$63,688 11
<i>Item 3.</i>		
For submerged main and inlet (Frankford Works):		
Malone's contract,	\$2,952 30	
Iron and steel,	13 64	
Machinist's work,	5 75	
Iron castings,	5 61	
Wire screen,	3 06	
		2,980 36
<i>Item 4.</i>		
For reservoir (Frankford Works):		
Malone's contract,	\$24,311 00	
Wages,	5,495 25	
Stone and flagging,	2,062 87	
Transportation,	399 00	
Keep of horse,	399 47	
Cement,	474 00	
Mason work,	413 75	
Bricks,	331 25	
Fittings,	243 33	
Painting, etc.,	200 00	
Iron castings,	182 72	
Sundries,	127 09	
Lumber,	128 39	
Iron and steel,	126 05	
Machine work,	126 41	
Hardware,	117 61	
Brass castings,	85 99	
Rent,	72 00	
Hauling,	56 00	
Bolts and nuts,	33 59	
Valves,	33 00	
Sand,	3 75	
		35,422 52
<i>Item 6.</i>		
For 30-inch ascending main, stop-cocks, fixtures, &c. (Frankford Works):		
Wages,	\$30,503 28	
Malone's contract,	8,137 20	
Amounts carried forward,	\$38,640 48	\$102,090 99

Amounts brought forward,	\$38,640 48	\$102,090 99
Iron pipe,	5,326 55	
Lumber,	3,363 64	
Air vessel,	2,000 00	
M. O'Rourke's contract,	1,812 02	
Hauling,	991 59	
Pile driving,	706 00	
Painting,	442 50	
Hardware,	268 30	
Stone,	218 00	
Iron castings,	204 91	
Grading,	190 00	
Sundries,	156 88	
Bolts and nuts,	137 31	
Bridge building,	128 47	
Rigging,	110 75	
Advertising,	102 05	
Transportation,	90 00	
Lime,	88 77	
Bilge pump,	75 00	
Paving,	45 50	
Spars,	45 00	
Storage,	34 50	
Connecting conduit,	32 00	
Iron and steel,	20 70	
Packing,	18 26	
Mason work,	15 00	
Repairs,	13 70	
Coke,	8 00	
Cement,	5 00	
Tubing,	3 82	
Wire,	1 20	
Inspecting pipe,	4 79	
	<hr/>	
	\$55,290 69	

For 30-inch main to utilize Worthington and
Cornish Engines at Roxborough Works.

Iron pipe,	\$2,236 41	
Land damages,	1,300 00	
	<hr/>	
		58,827 10
Amount carried forward,		<hr/>
		\$160,918 09

Amount brought forward, \$160,918 09

Item 7.

For 20-inch descending main (Frankford Works):

Wages,	\$4,885 62
M. O'Rourke's contract,	2,100 11
Hauling,	946 54
Iron pipe,	546 48
Lumber,	34 69
Stone,	31 53
Packing,	13 20
Sand,	10 90
	<hr/>
	\$8,569 07

For 30-inch main to utilize the Worthington and
Cornish Engines, Roxborough Works:

Iron pipe,	\$12,111 93
Land damages,	1,200 00
Inspecting pipe,	206 58
Grade stakes,	10 00
	<hr/>
	13,528 51

22,097 58

Item 13.

For incidentals:

Sundries,	\$147 16
Chair,	8 00
Hauling,	7 00
	<hr/>
	\$162 16

\$183,177 83

RECAPITULATION.

Expended from annual appropriation,	\$484,613 87
" " special " 	3,058 18
" " loans (extension of works),	183,177 83
	<hr/>
Total expenditures for 1877,	\$670,849 88

Receipts at office of Registrar,	\$1,221,344 81
" " Chief Engineer,	6,636 29
	<hr/>
	\$1,227,981 10

Expended, as per annual and special appropriations, 487,672 05

Profits, \$740,309 05

OPERATIONS
OF THE
REGISTRAR'S DEPARTMENT
FOR
1877.

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER.

REGISTRAR'S OFFICE,

N. W. cor. Thirteenth and Spring Garden Sts.,

Philadelphia, January 1, 1878.

DR. WM. H. MCFADDEN,

Chief Engineer.

DEAR SIR:—I respectfully submit the following report of the receipts at this office for the year 1877, amounting in the aggregate to \$1,221,344.81, which has been paid daily, as received, into the office of the City Treasurer; this is an increase over the previous year of \$27,284.82.

The collections from the water rents for the year 1877, amounted to \$1,008,248.60, an increase over the previous year of \$37,434.35, and the receipts from delinquent rents amount to \$62,104.75, an increase of \$30,133.00.

The receipts from fractional rents, penalties, and other sources, amounted to \$77,737.58, an increase over the previous year of \$1,497.86.

The receipts from water pipe amount to \$73,253.88, a decrease of \$41,780.39.

Pipe bills to the amount of \$38,581.54 were returned to the City Solicitor for lien, and the amount collected by him was \$56,233.57, as appears of record in that department.

Respectfully referring to the annexed itemized tables, I remain,

Yours, very respectfully,

JOHN N. HAGEY,

Registrar.

Receipts at the Registrar's Office for the year 1877.

	DELINQUENT RENTS.	PENALTIES.	RENTS OF 1877.	PENALTIES.	FRACTIONAL RENTS.	WATER PIPE.	TOTAL.
January.....	\$17,994 75	\$2,257 13	\$37,884 25	.....	\$3,271 00	\$9,499 78	.....
February.....	7,195 50	794 72	60,497 00	.....	1,636 10	1,191 31	.....
March.....	4,658 00	600 85	182,990 25	.....	4,217 20	6,045 83	.....
April.....	7,528 00	880 37	561,632 00	.....	7,161 45	4,721 69	.....
May.....	3,570 50	441 03	22,981 50	\$1,049 96	5,327 32	3,802 35	.....
June.....	2,590 75	358 61	45,693 75	1,993 07	3,995 05	2,002 33	.....
July.....	3,074 75	413 12	12,378 25	1,617 47	3,763 67	4,625 77	.....
August.....	4,305 50	637 43	18,127 00	2,494 30	3,732 35	4,472 39	.....
September.....	3,323 00	479 89	21,218 75	3,041 98	6,076 93	7,369 39	.....
October.....	3,500 50	485 68	27,111 75	3,694 84	3,896 04	12,183 99	.....
November.....	1,911 00	251 89	11,049 85	1,526 36	5,446 46	7,586 66	.....
December.....	2,452 50	356 73	6,684 25	891 67	4,946 91	9,752 39	.....
	\$62,104 75	\$7,957 45	\$1,008,248 60	\$16,309 65	\$53,470 48	\$73,253 88	\$1,221,344 81

Amount of claims for Water Pipe returned for lien in 1877.....\$38,581 54

Amount of claims for Water Pipe collected by City Solicitor in 1877..... 56,233 57

Comparative Statement of Receipts for the years 1876 and 1877.

	Delinquent Rents.	Penalties.	Water Rents, 1877.	Penalties.	Fractional Rents.	Water Pipe.	Totals.
1877.....	\$82,104 75	\$7,957 45	\$1,008,248 60	\$16,309 65	\$53,470 48	\$73,253 88	\$1,221,344 81
1876.....	31,971 75	4,324 91	970,814 25	17,202 85	54,711 96	115,034 27	1,194,059 99
Increase.....	\$30,133 00	\$3,632 54	\$37,434 35				\$27,284 82
Decrease.....				\$893 20	\$1,241 48	\$41,780 39	

Items of Receipts under head of "Fractional Rents."

	Rents.	Ferrules.	Repaving.	Repairs.	Totals.
1877.....	\$36,812 86	\$8,504 00	\$6,864 50	\$1,289 12	\$53,470 48
1876.....	38,420 71	8,180 00	6,633 25	1,478 00	54,711 96
Increase.....		\$324 00	\$231 25		
Decrease.....	\$1,607 85			\$188 88	\$1,241 48

Estimated receipts in statement to City Controller.....	\$1,475,000 00
Actual receipts, as above.....	1,221,344 81
Decrease of estimate.....	\$253,655 19

List of Dwellings, Factories, Horse-power, &c., as charged on Registers of 1877.

	WARDS.																															Total.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
Dwellings.....	8250	4478	2297	2219	2419	2792	3794	2847	2337	3203	1535	1918	2974	3315	6441	2233	2170	4575	7061	7058	2214	2423	1287	5670	4277	5403	2015	3810	6407	4887	5451	117760		
“ ½ & ¾..	216	1247	1135	1229	508	364	1315	443	386	636	726	554	529	539	1337	1185	1298	876	335	503	13	25	14	61	390	114	65	30	198	278	198	16747		
Baths	2667	1141	761	490	741	450	2274	2312	1060	2055	393	868	1859	1964	4104	600	515	1206	3324	5306	274	1604	340	3030	846	1929	1420	3093	4622	2364	1763	55285		
Wash-paves.....	973	500	419	210	559	328	1319	1507	870	1378	213	565	1203	1404	3032	382	370	671	2045	3730	501	696	356	1552	498	728	984	2365	3669	1314	1004	35345		
Water-closets, urinals, and bidets..	113	89	92	89	1612	2320	1575	3110	1885	1836	103	422	874	799	2308	86	83	65	248	2132	122	1375	50	1398	71	135	1244	1650	2254	431	82	28653		
Basins, sinks, and tubs.....	83	74	112	72	1537	2468	2088	3712	2028	1580	180	573	740	622	3315	91	78	91	219	1824	118	1211	24	1027	31	145	1289	1333	3447	84	55	30251		
Horse power.....	770	458	196	448	1052	2242	401	610	1276	519	489	379	532	1272	2129	1184	750	1131	2488	751	215	601	324	204	637	554	490	128	196	687	1263	24436		
Horse stalls.....	1115	847	301	690	494	370	911	1600	1597	930	740	753	821	1000	2413	572	615	1602	1515	1907	186	1140	226	1877	402	821	905	444	947	943	1136	29820		
Market houses.....	
Market stalls.....
Bars.....	153	141	104	209	281	275	134	108	152	67	207	132	119	112	211	143	154	152	297	192	64	22	45	156	138	129	98	77	108	134	295	4519		
Watering horses.....	27	9	8	8	18	3	2	3	12	11	17	5	5	7	17	10	11	22	40	13	7	5	11	49	30	26	14	17	15	12	34	468		
Factories.....	20	27	9	7	18	111	13	5	23	12	49	8	18	30	57	35	22	36	82	33	9	8	14	40	12	8	16	5	2	19	52	801		
Foundries.....	10	2	
Bakeries.....	50	49	38	29	16	21	29	19	20	25	29	24	26	32	42	32	36	46	65	57	5	11	7	14	27	36	4	12	35	28	50	914		
Dye-houses.....	2	2	1	
Dye tubs.....	6	3	
Meat packers.....	4	2	
Breweries.....
Sugar-houses.....	2	2	1	2	1	2
Hot and green houses.....	3
Fountains.....	5	2	3	1	12	7	9	29	20	11	3	8	8	13	28	6	1	9	6	24	6	15	4	26	3	4	27	10	22	10	6	1	171	
Distilleries.....
Slaughter-houses.....	50	2
Malt-houses.....
Brick-yards.....
Barber shops.....	30	18	18	18	20	28	13	20	24	10	15	12	18	22	14	33	16	24	37	22	4	5	6	18	15	15	6	7	15	16	24	543		
Photographers.....
Churches.....	6	6	9	7	7	8	12	14	14	10	3	4	6	14	18	14	10	15	14	21	6	2	5	14	4	8	11	5	14	8	15	304		
Drug stores.....	18	14	13	15	8	6	16	11	13	17	6	10	16	15	20	7	14	16	19	31	5	14	6	19	6	11	8	11	19	18	16	418		
Shops and offices.....	40	81	28	34	153	62	35	64	73	56	61	22	27	96	135	41	46	63	181	128	2	
Boilers and engines.....	44	27	15	10	79	187	21	39	82	40	53	34	43	45	99	58	49	44	103	42	12	
Miscellaneous.....	20	10	18	20	60	64	6	33	21	42	71	14	0	29	66	7	16	18	35	55	

Permits issued during the year 1877.

	WARDS.																															Total.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
Dwellings	390	17	12	5	5	6	21	28	14	7	4	8	5	7	187	21	11	54	212	224	136	154	65	729	272	407	102	619	527	79	90	4418		
“ ½ and ¼	4										2								5													12		
Baths	248	15	4	2	5	29	46	4	6	2	10	10	10	175	3	3	36	143	225	37	100	10	485	126	255	83	498	452	65	15	3142			
Wash paves	59	7	2	3	4		17	30	7	10	2	3	18	12	123	8	5	1*	71	169	20	39	10	328	59	33	62	375	191	25	15	1725		
Wash closets, Urinals and Bidets	4		2			19	43	17	119	42	35	3	7	43	12	163	5	4	3	22	140	9	46		353	5	17	98	332	20*	14	3	1768	
Basins, Sinks and Wash tubs	2				16	13	27	121	25	10		9	4	8	201	1		4	17	113	17	46	1	198	9	2	87	277	163	1		1372		
Horse power	2	15			118	63		14	7		41	8		20	8	22	8		91	16	23	12			48		22	15	5	5	95	658		
Engines and Boilers	1	2			5	11		2	2		3	1		1	1	2	1		12	1	2	1			5		2	2	1	1	5	64		
Bars			2	2	1	2	1	2	5	2		1	1	1	3	1	1	1	20	2	5	2	1	5		6	1	7	2	1	7	84		
Wash paves for watering horses			1			1			1	2	1	1	1		1	1	2	2	10				1	2		4			5	1		3	42	
Stores, Shops, and Offices	4	3	1		3	4	3	7	3	1	2		13	2	1	1	1	1	5	5	2			7	1	2	1	5	2		4	83		
Stables	1						1	2	2	3			1	1	1	1	1	1	10	3	3	1		13	1	3	4	4	3		2	61		
Slaughter houses	1																1		2				1	3	2			1			3	14		
Bakeries								1													2											1	6	
Fountains														1					1			1		2								1	11	
Factories, Mills, and Dye houses					2							2			3	2	3		9	1	5	1		1	5	1		1	1	1		4	41	
Hot and Green houses																		1					2	2		1							4	4
Public buildings			1				1															2	2		1								7	
Hotels and Restaurants						1					3	1												3									9	
Breweries						1												1	1	1				1									6	
Marble, Stone, and Brick yards			1																										2				3	
Market					1														1	1													5	
Photograph										1																				1			2	
Organ														1										2									3	
Sprinkling streets																																		22
Watering ships		44		6																1	1												50	
Building purposes	18	1		4		4	2	7	1	5		1	2		16	2	3	1	32	23	29	29	6	85	33	18	19	34	35	3	12	425		
Total	734	105	21	24	176	153	119	378	117	80	66	48	97	76	883	69	44	123	664	924	292	437	97	2217	570	744	485	2181	1596	195	300	14,037		

Amount of Duplicates for the years 1877 and 1878.

Wards.	January, 1877.	January, 1878.
First	\$60,419 75	\$59,322 25
Second	36,154 50	36,209 75
Third	21,687 00	21,744 75
Fourth	21,527 50	21,249 50
Fifth	35,240 00	35,061 00
Sixth	42,721 00	41,849 50
Seventh	41,444 25	42,074 25
Eighth	41,494 75	44,923 75
Ninth	36,429 25	36,348 95
Tenth	39,992 00	39,638 75
Eleventh	18,770 25	18,984 25
Twelfth	21,880 75	21,703 75
Thirteenth	29,075 25	32,123 75
Fourteenth	39,190 75	38,649 15
Fifteenth	77,339 50	79,498 00
Sixteenth	25,526 00	25,316 50
Seventeenth	24,020 25	24,015 75
Eighteenth	40,022 25	39,391 50
Nineteenth	67,838 75	70,591 25
Twentieth	73,459 25	76,207 75
Twenty-first	10,180 50	11,289 00
Twenty-second	25,921 50	27,341 50
Twenty-third	10,389 50	10,773 00
Twenty-fourth	44,121 00	53,789 00
Twenty-fifth	29,645 25	31,863 50
Twenty-sixth	38,044 75	40,704 75
Twenty-seventh	24,162 25	26,066 25
Twenty-eighth	34,210 00	42,044 50
Twenty-ninth	62,015 75	73,512 40
Thirtieth	42,954 50	44,008 00
Thirty-first	45,162 00	46,541 00
	\$1,161,620 00	\$1,212,837 00

Amount Collected by City Solicitor from Liens.

YEARS.	Feet of pipe laid.	Frontage collected by Registrar.	Returned for liens.	Collected by City Solicitor.
1863.....	56,916	\$30,715 02	\$14,350 70	\$16,544 21
1864.....	35,867	22,278 57	13,630 59	13,535 22
1865.....	46,994	34,141 07	11,970 42	7,564 68
1866.....	66,324	32,031 11	4,160 13	12,190 21
1867.....	84,171	76,938 39	22,830 11	7,892 28
1868.....	79,348	64,959 03	21,701 68	18,549 86
1869.....	118,044	61,065 06	24,866 43	16,389 90
1870.....	139,233	117,319 12	61,640 99	11,959 82
1871.....	158,972	96,110 98	62,341 24	14,764 42
1872.....	146,221	131,822 96	77,467 36	21,108 90
1873.....	210,736	116,997 17	75,882 09	26,601 71
1874.....	225,271	198,896 99	152,593 11	31,130 17
1875.....	179,388	123,258 53	122,533 39	65,870 28
1876.....	144,593	115,034 27	81,151 48	52,259 95
1877.....	84,624	73,253 88	38,581 54	56,233 57
Total.....	1,776,702	\$1,294,822 15	\$785,701 26	\$372,595 18

Public Institutions whose Water Rent was reduced by the Water Committee, and now Assessed at Regular Rates.

Name.	Location.	Amount assessed in 1878.	Amount paid for 1877.
Industrial Home.....	762 South Tenth Street.....	\$44 00	\$5 00
Temporary Home.....	S. E. Corner Twelfth and Fitzwater.....	29 75	5 00
Philadelphia Society for the Poor.....	714-718 Catharine Street.....	67 75	5 00
Apprentices' Library.....	500 Arch Street.....	23 00	5 00
Pennsylvania Hospital.....	Eighth and Pine Streets.....	357 50	50 00
Lincoln Institute.....	308-10 South Eleventh Street.....	100 00	5 00
Homeopathic Hospital.....	1114-1116 Cuthbert Street.....	38 00	5 00
Wills Eye Hospital.....	Race, west of Eighteenth Street.....	97 00	50 00
Northern Home.....	Brown, east of Twenty-third Street.....	74 00	5 00
Germantown Poor House.....	Rittenhouse Street, south side.....	61 00	5 00
Old Man's Home.....	Powelton Avenue, north side.....	155 00	50 00
Baptist Home, Twenty-fourth Ward.....	S. W. Corner Forty-fifth and Transcript Sts....	24 00	5 00
Home for Aged Colored.....	S. W. Corner Belmont and Girard Avenues....	64 00	5 00
Presbyterian Hospital.....	Thirty-ninth Street, east side.....	98 00	50 00
Educational Home.....	Forty-ninth and Greenway Streets.....	129 00	5 00
Pennsylvania University Hospital.....	S. W. Corner Thirty-fourth and Spruce Sts....	105 50	50 00
Baptist Home, Twenty-eighth Ward.....	S. E. Corner Seventeenth and Norris Streets...	155 00	5 00
Methodist Home.....	Lehigh Avenue, east of Broad Street.....	137 00	5 00
St. Joseph's Hospital.....	Girard Avenue, west of Sixteenth Street.....	379 00	50 00
German Hospital.....	S. W. Corner Girard and Corinthian Avenues.	135 00	50 00
University of Pennsylvania.....	Locust Street, south side.....	347 00	50 00
		\$2,620 50	\$465 00

Purposes for which water is supplied free of charge.

WARDS.	CITY PROPERTY.				FOUNTAINS.			
	School-houses.	Police Stations.	Fire Stations.	Other Buildings.	Fountain Society.	Society P. C. A.	Other Associations.	City.
First.....	8	1	1		1	1		
Second.....	7				2			
Third.....	6	1			2			
Fourth.....	5		1		2			
Fifth.....	5	2	2	2	11	1	1	
Sixth.....	2	1	1		5			1
Seventh.....	5	1	3		3			
Eighth.....	2	1	1		12			1
Ninth.....	3	1	1	1	8			
Tenth.....	5	1	1		1			
Eleventh.....	4	1	1					
Twelfth.....	6		1					
Thirteenth.....	3							1
Fourteenth.....	6	1	1	1	2			1
Fifteenth.....	8	1	3			1	3	
Sixteenth.....	4				1			
Seventeenth.....	3	1			2			
Eighteenth.....	8	1	1					
Nineteenth.....	8		3		3	1		2
Twentieth.....	7	1	1		2			
Twenty first.....	7	1	2					
Twenty second.....	7	2			1	1		
Twenty third.....	4	1	2					
Twenty fourth.....	10	1	1	2	7	1	1	1
Twenty fifth.....	11	1						
Twenty sixth.....	4		1	1	3			
Twenty seventh.....	10	1	1	1	4	1		
Twenty eighth.....	5	1						
Twenty ninth.....	8	1	1		3			
Thirtieth.....	5	1			1			
Thirty first.....	5	1						
	181	26	30	8	76	7	5	7

The City properties, classed under the head of other buildings, are:

Independence Hall and Annexes, New Court House, New Public Buildings Broad and Market streets; Spring Garden Hall, Park offices, Memorial Hall, Moyamensing Prison, and Philadelphia Almshouse. Water is also furnished, free of charge, for sprinkling Fairmount Park drives and supplying its fountains.

The following are the locations of fountains in **Fairmount Park** :

EAST OR OLD PARK.

- Two (2) new fountains on Flat Iron.
- Three (3), group of fountains near Brown Street entrance.
- Fish pond fountains near Brown Street entrance.
- Fountain in front of Art Gallery, near Green Street entrance.
- One drinking fountain near Lincoln Monument.
- Two drinking fountains near Lemon Hill Mansion.
- One drinking fountain near Grant's Cabin.
- One drinking fountain at Sedgeley Guard House.

WEST PARK.

- Catholic fountain, west end of Republic Avenue.
- One small drinking fountain on Lancaster drive, east side of Belmont.
- One small drinking fountain at Children's Play-ground, Sweet Briar.
- Three small fountains at Horticultural Hall.
- One inside the Hall in flower-bed.
- Two in flower-beds outside of the Hall, west side.
- Fountain in lake near Machinery Hall.

OPERATIONS
OF THE
DEPARTMENT SHOP,
918 CHERRY STREET.

STOCK ACCOUNT.

*Statement of the operations of Cherry street shops, from January 1, 1877, to
December 31, 1877.*

Dr.	
To stock on hand January 1, 1877,	\$15,636 70
386,593½ lbs. iron castings,	7,803 02
16,106½ lbs. brass castings,	2,790 37
993½ lbs. copper and tin,	311 70
3 390 lbs. phosphor bronze,	1,695 00
25,119½ lbs. wrought iron, (assorted),	603 33
1,636½ lbs. steel, (assorted),	217 17
135 tons coal,	776 00
207 bushels coke,	10 28
48,364 feet lumber (assorted),	1,560 02
11 cords of wood,	87 00
Bolts and nuts,	919 89
Gum rings and valves,	972 90
Wrought pipe and fittings,	975 66
Hardware,	1,845 52
Rope and gasket, 6,162 lbs.,	615 87
Powder and fuse,	114 00
Sponge cloths,	603 50
Paints, oils, &c.,	532 64
Water meters (assorted),	1,800 00
Railroad tickets,	936 50
Machine work,	578 45
Cartage,	25 00
Books and incidentals,	71 00
28,302 lbs. lead,	1,947 37
Wages paid hands,	27,602 79
670 stop-boxes,	2,010 00
Copper work and plumbing,	168 05
Brooms, brushes, &c.,	39 90
Leather belting,	68 32
Brass fitting, gauges, &c.,	1,023 17
Ditch pump,	75 00
Boiler work,	522 38
Repairs to shop roof,	139 08
	<hr/>
	\$75,077 58
Balance,	18,433 36
	<hr/>
	\$93,510 94

CR.			
By repairs and supplies,	First District,	.	\$5,420 97
"	"	Second "	13,163 63
"	"	Third "	5,864 67
"	"	Fourth "	11,397 67
"	"	Germantown,	3,350 31
"	"	Manayunk,	2,246 64
		30-inch pumping main,	1,919 06
		Buildings and grounds,	755 88
		Fairmount Works,	1,718 85
		Schuylkill Works,	6,047 87
		Simpson Engine,	1,610 97
		Belmont Works,	4,364 91
		Delaware Works,	3,181 78
		Roxborough Works,	3,882 09
		Chestnut Hill Works,	673 99
		Frankford Works,	4,558 53
		Frankford Reservoir,	3,752 91
		Portable engines,	1,147 71
		Water meters,	1,811 41
		Main office,	255 06
		Old metals,	986 39
		4,225 ferrules,	2,112 50
Stock on hand, as per inventory, January 1, 1878,		.	13,287 14
			<u>\$93,510 94</u>

INVENTORY OF STOCK ON HAND, January 1, 1878.

7	8 inch socket screws,	at	\$6 00	42 00	
36	11-inch	"	6 50	234 00	
15	10-inch	"	7 00	105 00	
19	12-inch	"	8 00	152 00	
21	13-inch	"	8 00	168 00	
13	14-inch	"	8 00	104 00	
10	15 inch	"	9 00	90 00	
13	16 inch	"	9 00	117 00	
10	17-inch	"	10 00	100 00	
				<hr/>	\$1,112 00
16	4 inch square top screws,	"	5 00	\$80 00	
14	6 inch	"	5 00	70 00	
9	20 inch	"	14 00	126 00	
10	16-inch	"	12 00	120 00	
8	12-inch	"	10 00	80 00	
7	10-inch	"	8 00	56 00	
10	8-inch	"	6 50	65 00	
5	30 inch	"	20 00	100 00	
2	36 inch	"	25 00	50 00	
				<hr/>	747 00
62	6 inch spindles,	"	5 00	\$310 00	
12	8-inch	"	5 00	60 00	
11	10-inch	"	8 00	88 00	
9	12 inch	"	10 00	90 00	
				<hr/>	548 00
1	30 inch copper and tin screws,	at		32 61	
5	20-inch phosphor bronze, old style,	"	30 55	152 75	
3	20 inch	"	31 25	93 75	
5	12-inch	"	20 88	140 40	
2	10 inch	"	19 50	39 00	
44	6-inch	"	6 00	264 00	
4	4-inch	"	5 10	20 40	
				<hr/>	742 91
106	frames and covers,	at	6 00	\$636 00	
4	steam plugs,	"	28 00	112 00	
17	steam plug cases,	"	7 50	127 50	
89	chisels, assorted,			97 50	
10	reamers,	"		50 00	
68	eye bolts,	"	30	20 40	
7	caulking hammers,	"	2 00	14 00	
				<hr/>	1,057 40
	Amount carried forward,				<hr/>
					\$4,207 31

Amount brought forward,			\$4,207 31
4,989 lbs. unfinished brass castings, at	17	\$848 13	
828 " finished "		414 00	
828 ferrules, assorted,	" 50	414 00	
189 brass plugs,	" 25	47 25	
34 brass waste valves,	" 50	17 00	
74 guard plates for pumps,	" 2 40	177 60	
144 brass springs "	" 50	72 00	
81 lbs. Muntz metal,	" 35	28 35	
335 lbs. brass scraps,	" 10	33 50	
		<hr/>	2,051 83
8 4-inch stop cocks,	" 22 00	\$176 00	
17 6-inch "	" 25 00	425 00	
9 8-inch "	" 55 00	495 00	
5 20-inch "	" 175 00	875 00	
4 30 inch "	" 337 55	1,350 20	
		<hr/>	3,321 20
220 dozens sponge cloths,	" 50	110 00	
2,129 feet lumber, assorted,		137 16	
318 wood plugs,	" 50	159 00	
13 dozen pick handles,		34 45	
5 car jacks,	" 12 00	60 00	
4 kegs nails,	" 3 25	13 00	
27 stop boxes,	" 3 50	94 50	
3 3-inch water meters,	" 175 00	525 00	
1 1-inch "	" 35 00	35 00	
		<hr/>	1,168 11
1,986 lbs. bolts and nuts, assorted,	" 15	\$297 90	
12,792 lbs. wrought iron,	" 02	255 84	
600 lbs. steel,	" 15	90 00	
2 setts fire irons,	" 20 00	40 00	
44 pairs 6-inch bands,	" 5 50	242 00	
4 " 10 inch "	" 6 00	24 00	
15 " 12 inch "	" 7 00	105 00	
4 " 20-inch "	" 12 00	48 00	
		<hr/>	1,102 74
11 plug monkeys, complete,	" 8 00	88 00	
65 plug monkey frames,	" 3 00	195 00	
9 dozen stop monkey keys,		6 75	
1 drillers' crow,		15 00	
1,470 lbs. lead,	" 08	117 60	
		<hr/>	
Amounts carried forward,		\$422 35	\$11,851 19

Amounts brought forward, . . .		\$422 35	\$11,851 19
Hardware,		134 80	
2 sets of gearing for derrick,	at \$50 00	100 00	
2 sets for 36-inch stop cock,	" 16 00	32 00	
12½ dozen picks,	" 15 00	187 50	
Paints, oils, tallow, &c.,		105 30	
1,080 lbs. gasket,	" 10	108 00	
13 dozen pure gum joint rings,	" 12 00	156 00	
100 pure gum plug valves,	" 1 90	190 00	
		<hr/>	1,435 95
			<hr/> <hr/>
			\$13,287 14
			<hr/> <hr/>

Stop-cocks, Stop-cock Boxes, Frames and Covers, Fire plugs, Cases, Lead, and Gasket, delivered from Shop No. 918 Cherry Street, during 1877.

	3-inch stops.	4-inch stops.	6-inch stops.	8-inch stops.	10-inch stops.	12 inch stops.	16 inch stops.	20-inch stops.	23 inch stops.	30 inch stops.	36-inch stops.	Frames & Covers.	Fire-plugs.	Plug Cases.	Stop-boxes.	Lead.	Gasket.
First District.....			51			2						49	31	55	118	1,178	900
Second District.....	1	121	5	1								78	115	119	220	9,416	1,500
Third District.....		8	53									46	26	33	119		600
Fourth District.....		6	60		25	11				3		63	41	62	39		1,200
Germantown.....		7	19									12	36	36	106		200
Manayunk.....		4	17									13	5	3		984	200
30-inch Pumping Main.....																6,612	
Totals.....		26	321	5	26	13				3		261	254	308	602	18,190	4,600

Stop-cocks, Fire-plugs and Casings, Stop-cock Boxes, Frames, Covers, and Ferrules, made and fitted up at the City shop from the year 1867 to 1877, inclusive.

	3-inch stop-cocks.	4-inch stop-cocks.	6-inch stop-cocks.	8-inch stop-cocks.	10-inch stop-cocks.	12 inch stop-cocks.	16-inch stop-cocks.	20-inch stop-cocks.	23-inch stop-cocks.	30-inch stop-cocks.	36-inch stop-cocks.	Total stop-cocks.	New fire-plugs.	Fire-plugs, cases.	Stop-boxes.	Frames and covers.	½-inch ferrules.	⅝-inch ferrules.	¾-inch ferrules.	1-inch ferrules.	Total ferrules.
1867.....		34	108	1	4	5	5					157	148	227	433	164	1,770	460	137	117	2,484
1868.....	1	51	94	2	4	5			4	2	1	164	143	222	492	165	2,501	257	84	24	2,866
1869.....	8	71	175	4	6	8	2	4	2	2	4	286	202	291	600	279	3,700	431	50		4,181
1870.....	7	93	208	4	4	10	5			6	6	343	223	307	600	317	4,200	450	100	100	4,850
1871.....		113	218	9	13	17	7	6	2	6	4	395	176	254	641	459	5,025	100	25		5,150
1872.....	15	120	226	8	15	6				4	3	397	226	324	620	409	5,200	100	50	36	5,388
1873.....	12	108	406		7	29	8	10			17	597	333	423	920	692	4,400	170	104	31	4,705
1874.....	15	104	560	18	12	12	6	3	1	3	2	736	423	653	1,102	635	4,400	100	160	64	4,664
1875.....		15	397	16	38	19			1			486	308	379	693	566	4,100			41	4,141
1876.....		39	282	20	46	19		8		10	5	429	278	374	494	465	4,000		140		4,140
1877.....		25	282		10	6		5		10		388	214	328	670	370	4,100	100		25	4,225

Inventory of Articles Manufactured during year 1877.

25	4 inch stops, at	\$22 00,	-	-	-	-	\$550 00
282	6 " " at	25 00,	-	-	-	-	7,050 00
10	10 " " at	64 00,	-	-	-	-	640 00
6	12 " " at	75 00,	-	-	-	-	450 00
5	20 " " at	175 00,	-	-	-	-	875 00
10	30 " " at	375 55,	-	-	-	-	3,375 50
214	new fire-plugs at	28 00,	-	-	-	-	5,992 00
328	cases at	7 50,	-	-	-	-	2,460 00
670	stop-boxes at	3 00,	-	-	-	-	2,010 00
4,225	ferrules at	50,	-	-	-	-	2,112 50
Patterns,	-	-	-	-	-	-	403 42
							<hr/>
							\$25,918 42

OPERATIONS
OF
THE WORKS
FOR
1877.

Actual and comparative amount of coal used by the different pumping engines for the year 1877.

Engines.	Description.	Total gallons of water pumped.	Total tons of coal consumed.	Actual lift in feet.*	Tons of coal required to lift 1 million gallons to Reservoir.	Tons of coal required to lift 1 million gallons to the height of 100 feet.	Cost of coal to pump 1 million gallons to the height of 100 ft. coal being taken at \$4.50 a ton.	Cost of coal to pump 1 million gallons to height of 100 feet, coal being taken at the price at each "of the works for the year.	Hours run.	Remarks.
Delaware No. 1.....	Horizontal high pressure.....	2,149,106,828	2,948	119	1.37 100	1.18 100	\$5 17	\$3 49	12,305	Fires in continuous operation.
" " 2.....	Beam condensing.....			119						
" " 3.....	Duplex compound Worthington			119						
Chestnut Hill.....	Horizontal high pressure.....	58,427,850	354	125	6.10 100	4.88 100	21 96	17 03	2,783½	Fires banked every day.
Belmont No. 1.....	Duplex compound Worthington	567,310,430	1,284.3 100	210	2.37 100	1.08 100	4 86	3 48	2,834	Fires in continuous operation.
" " 2.....	" " "	328,541,994	702	202	2.18 100	1.08 100	4 72	3 39	1,492	" " "
" " 3.....	" " "	2,590,957,493	4,873.8 100	202	1.98 100	.88 100	4 18	3 00	7,523	" " "
Schuylkill No. 4...	Cornish.....	198,980,250	254	115	1.28 100	1.11 100	5 00	3 68	878½	Fires in continuous operation [during the time run.
" " 5..	"	225,847,890	277	115	1.32 100	1.06 100	4 77	3 51	881½	
" " 6..	Simpson compound.....	176,019,000	150.8 100	115	.85 100	.74 100	3 33	2 52	627	
" " 7...	Rotative "	1,128,963,240	788	115	.70 100	.61 100	2 75	2 02	1,584	
Roxborough No. 1.	Cornish.....									
" " 2.	Duplex compound Worthington	957,074,280	3,703	333	3.37 100	1.16 100	5 22	3 70	4 320	Fires in continuous operation.
Boxborough Aux..	" " "	3,496,100	136	80	38.88 100	48.60 100	218 70	155 03	1,666	Fires banked every day.

* Friction head not included.

Comparison of the Running Expenses of Steam and Water Power.

Water Power.			Steam Power.		Total Water and Steam.	
Salaries.....	\$12,050 00	Per cent..... 46	\$48,334 00	Per cent..... 38	\$60,384 00	Per cent..... 40
Coal.....	627 15	" 2	49,483 58	" 39	50,110 73	" 32
Lubricating oil, lights, &c.....	2,880 64	" 11	5,739 41	" 4	8,620 05	" 6
All repairs.....	10 677 11	" 41	24,227 21	" 19	34,904 32	" 22
	\$26,234 90	100	127,784 20	100	154,019 10	100
Gallons of water pumped into basins.....	9,942,419,433	Per cent. 53	7,384,725,351	Per cent..... 47	17,877,144,792	Per cent.....100
Cost per million.....	\$2 76	.....	\$17 30	.....	\$8 61	.....
Gallons of water pumped 100 feet high.....	8,543,177,489	Per cent.. 37½	15,062,172,767	Per cent.. 62½	23,605,350,256	.....
Cost.....	\$3 07	.....	\$8 48	.....	\$6 52	.....

Percentage of water pumped at each Station in the years 1876 and 1877.

Works.	1876.		1877.	
	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.
Fairmount water power.....	8,374,657,743	48.0	9,492,419,433	53.2
Fairmount steam power.....	172,505,781	.9		
Schuylkill steam power.....	2,179,733,340	12.5	1,729,810,384	9.2
Belmont steam power.....	3,749,651,469	21.5	3,486,809,917	19.6
Delaware steam power.....	2,011,301,469	11.5	2,149,106,828	12.2
Roxborough steam power.....	935,702,907	5.3	957,074,280	5.4
Roxborough auxiliary.....			3,496,100	0.02
Chestnut Hill steam power.....	50,754,850	.3	58,427,800	0.39
Total pumpage.....	17,473,308,039	100.0	17,877,144,792	100.0

Operations of the Fairmount Water Works for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total gallons of water pumped during the month.	Average gallons per day.	Coal consumed in heating mill house.		Tallow.	Lubricating oil.	From Penn'a Hos- pital Reports.		
	Days.				Lbs.	Lbs.			Qtz.	Rain fall during the month.	Mean tem- perature.
										Inches.		Degrees.
January.....	31	2,069,364	778,083,881	25,099,480	.....	24	98	2.89	28.61	
February.....	28	2,048,655	730,599,494	26,092,839	.....	.....	86	1.55	37.39
March.....	31	2,234,193	818,345,799	26,398,251	.....	29	81	6.00	39.94	
April.....	30	2,445,043	854,523,663	28,484,122	.....	.....	125	2.96	51.77
May.....	31	2,272,292	804,577,211	25,954,103	.....	18	116	1.21	62.81	
June.....	30	2,443,637	840,891,938	28,029,731	.....	13	239	5.55	74.13	
July.....	31	2,002,284	721,098,640	23,261,246	.....	.....	132	6.19	78.86
August.....	31	1,690,703	619,161,497	19,972,951	.....	.....	156	1.00	78.35
September.....	30	1,689,511	621,125,339	20,704,177	.....	20	82	3.88	69.76	
October.....	31	2,515,895	876,290,531	28,267,436	.....	10	223	6.96	58.71	
November.....	30	2,664,113	900,920,461	30,030,682	.....	32	125	6.50	47.05	
December.....	31	2,670,033	926,800,979	29,896,805	.....	.....	175	1.36	40.71
	Total.	Total.	Total.	Average.	Total.	Total.	Total.	Total.	Total.	
	365	26,745,723	9,492,419,433	26,015,985	414,400	146	1,638	46.67	

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	TOTAL HOURS.				Average water flowing over flash boards.	Average height of water in Fairmount reservoir.	Average height of water in Corinthian reservoir.
	Total number of hours.	Total hours run.	STOPPED.				
			For high or low water, or full reservoir.	For repairs.			
January	5,208	3,386	1,808	14	In. 3.3	Ft. In. 10 8	Ft. In. 22 9
February	4,704	3,364	1,340	.....	5.3	11 0	23 2
March	5,208	3,730	1,468	10	5.3	11 4	24 1
April	5,040	4,216	824	.....	0.23	11 6	23 6
May	5,208	3,813	1,377	18	0.38	11 4	24 1
June	5,010	4,039	1,001	.....	1.54	11 2	23 9
July	5,208	3,428	1,390	390	1.83	11 6	24 3
August	5,208	2,988	1,621	599	0.41	11 3	24 6
September	5,040	2,916	2,089	5	0.58	11 0	24 6
October	5,208	4,443	765	.....	3.28	11 2	24 6
November	5,040	4,628	412	.....	7.03	11 2	24 3
December	5,208	4,652	556	2.25	11 6	24 3
Total	61,320	45,633	14,651	1,036			
Average							
Revolutions	74	23	3			

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Operations of the Schuylkill Works for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating and cylinder oil.
	Days.				Pounds.	Pounds.	Quarts.
January.....	7	77,470	38 735,000	1,250,000	120,196	60	21
February.....						14	1
March.....						17	2
April.....							
May.....	13	214,030	150,709,860	4,893,866	274,624	197	137
June.....	19	245,471	167,105,570	5,570,185	337,120	246	117
July.....	29	447,343	302,674,494	9,763,693	541,632	416	165
August.....	30	671,070	442,145,710	14,295,023	757,354	512	198
September.....	27	690,839	402,767,430	13,425,381	778,332	563	348
October.....	26	279,822	160,773,780	5,218,509	337,008	240	108
November.....	18	127,381	64,126,640	2,137,554	145,600	156	73
December.....	1	930	771,900	24,900	1,332	10	2
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	170	2,754,356	1,729,810,384	6,297,697	3,293,198	2,431	1,172

Operations of the Delaware Water Works for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating and cylinder oil.
	Days.				Pounds.	Pounds.	Quarts.
January.....	31	446,651	123,506,593	3,984,084	476,969	.....	72
February.....	28	367,829	137,243,593	4,907,271	430,200	.....	56
March.....	31	548,616	170,909,770	5,513,218	593,083	.....	71
April.....	29	566,383	167,483,155	5,782,772	551,027	.....	88
May.....	31	699,411	199,963,865	6,450,447	576,636	.....	86
June.....	30	837,901	198,027,909	6,600,926	563,820	.....	94
July.....	31	745,478	205,657,134	6,634,101	564,775	.....	101
August.....	31	827,672	223,560,376	7,211,818	689,771	.....	101
September.....	30	751,793	203,860,693	6,795,306	551,834	.....	105
October.....	31	701,257	193,424,357	6,239,496	617,513	.....	128
November.....	30	618,424	173,357,208	5,778,540	552,709	.....	102
December.....	30	462,339	152,106,275	4,906,654	435,579	.....	121
	Total.	Total.	Total.	Average.	Total.		Total.
	363	7,576,084	2,149,106,828	5,865,390	6,003,956		1,123

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Operations of the Belmont Works for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating and cylinder oil.
	Days.				Pounds.	Pounds.	Quarts.
January	31	544,001	259,753,108	8,379,103	1,314,351	83	198
February.....	28	536,636	234,921,256	8,390,060	1,105,909	175	153
March.....	31	573,837	245,022,176	8,167,405	1,071,134	170	160
April.....	30	550,745	258,688,301	8,622,943	1,054,442	183	191
May.....	31	738,117	300,417,759	9,690,900	1,266,348	188	250
June.....	30	714,977	289,035,090	9,634,503	1,336,139	296	278
July.....	31	844,730	348,777,939	11,250,580	1,433,326	283	268
August.....	31	831,927	348,280,719	11,235,000	1,447,970	208	485
September.....	30	773,902	319,246,863	10,641,228	1,436,583	599	232
October.....	31	769,822	318,616,314	10,620,543	1,340,559	475	333
November.....	30	660,342	281,423,963	9,380,798	1,242,627	428	295
December.....	31	732,037	282,626,424	9,116,981	1,316,618	394	297
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	365	8,271,483	3,486,809,917	9,594,170	15,366,006	3,482	3,140

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Operations of the Roxborough Works for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating and cylinder oil.
	Days.				Pounds.	Pounds.	Quarts.
January.....	30	231,745	68,364,775	2,205,312	741,769	.....	62
February.....	28	212,685	62,742,075	2,240,790	601,195	.....	70
March.....	31	220,192	64,956,640	2,095,053	593,288	.....	63
April.....	30	212,736	62,757,420	2,091,903	535,018	.....	68
May.....	31	260,050	76,714,750	2,474,669	643,743	.....	60
June.....	30	318,188	93,865,460	3,128,848	725,536	.....	64
July.....	31	306,426	77,139,670	2,488,376	669,124	.....	54
August.....	31	329,105	97,085,975	3,131,805	725,307	23	70
September.....	30	327,681	96,665,895	3,222,196	807,149	.....	70
October.....	31	314,631	91,819,685	2,961,925	781,431	.....	65
November.....	30	287,810	84,903,950	2,830,132	703,543	.....	72
December.....	31	271,383	80,057,985	2,605,096	767,936	.....	71
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	364	3,292,632	957,074,280	2,648,008	8,295,039	23	789

Works for the year

MC	Capacity for plant 'g.	LUBRICANTS.		
		Gallons per hour.	Pounds Tallow.	Quarts Oil.
January	295 159	205,300	4	62
February	295 159	206,388	4	70
March	295 159	196,244	4	63
April	295 159	217,153	5	68
May	295 159	220,444	5	60
June	295 159	260,737	6	64
July	295 159	206,255	4	54
August	295 159	270,434	6 23	70
September	295 159	223,785	4	70
October	295 159	216,646	4	65
November	295 159	218,824	4	72
December	295 159	212,355	4	71
		Average.	Total.	Total.
		221,163	23	789

reduction whatever.

Practical Operations of the Auxiliary Works at Roxborough for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating and cylinder oil.
	Days.							Pounds.	Pounds.	Quarts.
January.....	31	17,240	258,600	8,322	24,640	.....	3
February.....	29	14,840	222,600	7,950	24,640	.....	3
March.....	31	17,240	258,600	8,322	24,640	.....	3
April.....	30	17,500	262,500	8,750	24,640	.....	3
May.....	31	22,960	344,400	11,109	24,640	.....	3
June.....	30	16,240	243,600	8,120	24,640	.....	4
July.....	31	20,440	306,600	9,890	22,400	.....	3
August.....	31	17,440	263,600	8,503	26,880	.....	3
September.....	30	21,300	304,500	10,150	26,880	.....	3
October.....	31	23,240	348,000	11,245	26,880	.....	3
November.....	30	22,540	338,100	11,270	26,880	.....	3
December.....	31	22,960	344,400	11,109	26,880	.....	3
	Total.	Total.	Total.	Average.	Total.		Total.
	365	233,140	3,496,100	9,578	346,640		37

Operations of the Chestnut Hill Works for the year 1877.

Months.	Running time.	Number of strokes during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal consumed.	Tallow consumed.	Lubricating oil.
	Days.				Pounds.	Pounds.	Quarts.
January	31	160,800	2,854,200	92,071	47,040	31	15
February.....	28	152,400	2,705,100	96,611	47,040	28	7
March.....	31	176,800	3,038,200	98,007	47,040	31	8
April.....	30	206,400	3,663,600	122,120	58,240	30	8
May.....	31	252,600	4,543,650	146,569	72,240	31½	8
June.....	30	342,000	6,070,500	202,350	71,680	30	4
July.....	31	366,600	6,571,150	209,908	89,600	31	8
August.....	31	367,800	6,620,400	213,240	98,000	46½	8
September.....	30	419,400	7,444,350	238,145	79,520	43½	7½
October.....	31	339,000	6,017,250	193,953	68,880	46½	8
November.....	30	253,400	4,497,850	149,928	61,600	45	5
December.....	31	253,400	4,465,600	144,051	52,240	31	5½
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	365	3,293,600	58,427,850	158,912	793,120	425	92

Gallons of Water pumped for each month of the year 1877.

Months.	Chestnut Hill Works.	Roxborough Works.	Roxborough Auxiliary.	Delaware Works.	Belmont Works.	Schuylkill Works.	Fairmount Works.	Total of all Works.	Average per day.	Highest number of gallons in one day.	Lowest number of gallons in one day.
January.....	2,854,200	68,361,775	258,600	123,506,593	259,753,108	38,735,000	774,083,881	1,271,556,157	41,017,940	53,703,340	34,917,975
February.....	2,705,100	62,742,075	222,600	137,243,593	234,921,256	.....	730,599,494	1,168,434,118	41,729,790	45,812,494	33,165,088
March.....	3,038,200	64,956,640	258,600	170,909,770	245,022,176	.....	818,345,799	1,302,531,185	42,017,135	50,238,788	31,761,374
April.....	3,063,600	62,757,420	262,500	167,483,155	253,698,301	.....	854,523,663	1,347,378,639	44,912,621	53,276,490	31,133,283
May.....	4,543,650	76,714,750	344,400	199,963,865	300,417,759	150,709,860	804,477,211	1,537,271,495	49,589,585	62,907,000	38,358,000
June.....	6,070,500	93,865,460	243,600	198,027,809	289,035,030	167,105,570	840,891,938	1,595,239,967	53,174,665	65,864,000	38,242,000
July.....	6,507,150	77,139,670	306,600	205,657,134	343,777,939	302,674,494	721,098,640	1,662,161,627	53,618,117	60,507,000	45,625,000
August.....	6,620,400	97,095,975	263,600	223,566,376	348,280,719	442,145,710	619,161,497	1,737,124,277	56,036,267	63,521,000	51,640,000
September.....	7,414,350	96,665,895	304,500	203,860,693	319,246,868	402,767,430	621,125,339	1,651,415,075	55,037,169	61,475,000	44,051,000
October.....	6,017,250	91,819,685	348,600	193,424,357	318,616,314	160,773,780	876,290,531	1,647,290,517	53,138,403	60,006,000	41,692,000
November.....	4,497,850	84,903,950	338,100	173,357,209	281,423,963	64,126,640	900,920,461	1,509,568,172	50,318,939	60,753,000	42,233,000
December.....	4,465,800	80,057,985	344,400	152,106,275	282,626,424	771,900	926,800,979	1,447,173,563	46,683,018	50,800,000	38,122,000
	Total.	Total.	Total.	Total.	Total.	Total.	Total.	Grand Total.	Average.	Average.	Average.
	58,427,850	957,074,280	3,496,100	2,149,106,528	3,486,809,917	1,729,810,384	9,492,419,433	17,877,144,792	48,983,958	57,412,926	39,161,726

Amount of Water pumped by all the Works from 1854 to 1877, inclusive, in U. S. Gallons.

YEAR.	FAIRMOUNT.		DELAWARE.		SCHUYLKILL.		TWENTY FOURTH WARD AND BELMONT.		ROXBOROUGH AND GERMANTOWN.		CHESTNUT HILL.		TOTALS.	
	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total for all the works.	Total daily average.
1854	2,286,402,222	6,264,116	618,173,121	1,693,625	1,366,011,559	3,742,497	.....	.....	.....	.....	.....	.....	4,270,586,902	11,700,238
1855	2,787,736,850	7,637,635	567,804,060	1,555,628	1,525,987,725	4,180,788	.....	9,538,170	26,132	.....	.....	.....	4,891,066,805	13,400,183
1856	2,867,188,965	7,833,850	769,566,040	2,102,639	1,980,637,500	5,411,378	.....	52,577,642	143,655	.....	.....	.....	5,669,970,147	15,491,722
1857	3,059,797,730	8,383,007	811,462,085	2,223,184	2,315,832,461	6,344,746	.....	121,948,840	334,106	.....	.....	.....	6,369,041,116	17,285,044
1858	3,058,418,667	8,379,229	767,187,690	2,074,487	2,819,641,992	7,725,047	.....	204,177,624	559,391	.....	.....	.....	6,839,425,973	18,738,153
1859	3,390,271,757	9,288,416	868,567,100	2,379,636	2,643,736,620	7,243,114	.....	265,456,170	727,277	.....	.....	.....	7,168,031,647	19,638,443
1860	3,612,919,17	9,871,555	872,144,980	2,382,910	2,696,960,210	7,368,744	.....	283,646,070	774,989	.....	.....	.....	7,465,740,227	20,398,197
1861	3,731,785,628	10,224,070	983,844,740	2,695,358	2,527,182,710	6,923,788	.....	353,313,900	967,983	.....	.....	.....	7,996,087,978	20,811,200
1862	3,564,724,753	9,766,369	909,126,440	2,490,757	3,038,527,420	8,324,733	.....	420,507,810	1,152,076	.....	.....	.....	7,932,886,423	21,733,933
1863	5,586,712,091	15,306,060	1,182,539,680	3,239,835	2,293,769,280	6,037,724	.....	525,734,090	1,440,422	.....	.....	.....	9,418,775,141	26,024,041
1864	5,970,901,329	16,313,665	1,090,884,060	2,980,558	1,725,444,660	4,714,330	.....	519,877,800	1,420,431	.....	.....	.....	9,307,067,849	25,428,985
1865	7,082,011,640	19,402,783	1,429,591,700	3,916,690	2,005,038,484	5,493,256	.....	535,923,360	1,468,283	.....	.....	.....	11,052,569,184	30,281,011
1866	7,721,817,582	21,155,665	1,271,841,020	3,484,496	947,652,428	2,596,308	.....	606,665,380	1,662,097	106,369,060	291,422	.....	10,654,345,470	29,189,987
1867	7,990,416,594	21,891,552	427,935,060	1,172,425	1,590,248,454	4,356,845	.....	677,717,190	1,856,559	177,104,200	485,217	.....	10,863,421,498	29,762,798
1868	8,024,549,911	21,924,948	705,442,350	1,927,438	2,337,365,642	6,386,245	.....	727,824,780	1,988,592	190,015,200	519,167	.....	11,985,178,883	32,746,390
1869	7,489,611,069	20,519,482	1,042,780,933	2,856,934	2,735,569,020	7,494,700	.....	928,561,494	2,544,004	218,229,800	597,890	.....	12,414,752,336	34,013,020
1870	8,134,983,170	22,287,631	1,186,131,144	3,249,674	3,003,737,196	8,229,417	.....	*850,011,192	2,328,798	227,946,600	624,511	.....	13,402,811,272	36,720,030
1871	8,821,728,593	24,169,065	1,007,378,521	2,759,941	2,201,294,172	6,030,943	.....	1,054,210,990	2,888,249	243,787,205	1,131,664	.....	13,498,399,481	36,981,916
1872	47,366,632,573	20,127,411	1,474,531,044	4,028,773	2,223,287,070	6,074,555	.....	1,456,756,728	3,980,210	3518,811,050	1,417,517	.....	13,040,018,461	35,628,465
1873	48,717,538,594	23,883,667	1,364,109,884	3,737,287	1,508,295,800	4,132,117	.....	1,959,966,670	5,369,772	673,287,495	1,844,623	.....	14,223,198,443	38,967,667
1874	47,749,007,798	21,231,158	1,558,518,765	4,269,914	1,536,505,220	4,209,003	.....	2,927,504	8,134,870	720,165,810	1,973,057	.....	14,553,425,097	39,817,603
1875	47,994,234,254	21,902,012	1,839,19,470	5,038,878	1,356,295,950	3,715,830	.....	5,507,870	8,371,254	818,339,525	2,242,026	.....	33,592,000	92,633
1876	48,547,163,24	23,352,906	2,011,31,489	5,495,359	2,179,733,340	5,955,556	.....	3,748,651,929	10,242,218	935,702,907	2,556,565	.....	50,754,850	138,674
1877	9,492,419,433	26,015,985	2,149,106,828	5,865,390	1,729,810,384	6,297,697	.....	3,486,809,917	9,594,170	960,670,580	2,648,008	.....	58,427,850	158,912

* The works at Belmont were started October, 1870, at which date Twenty fourth Ward Works were abandoned.

† Included in the Fairmount pumpage is that of the Worthington Engine, which, in 1872, was 146,540,888; in 1873, 9,711,208; in 1874, 166,984,376; in 1875, 324,225,056; in 1876, 172,505,781 gallons.

‡ The Roxborough Works commenced pumping December 21, 1870.

§ The Germantown Works were abandoned September 30, 1872.

DISTRIBUTION

OF THE

Water Department

FOR

1877.

DISTRIBUTION.

During 1877, Councils, by ordinance dated July 9th, directed the laying of a thirty inch additional pumping main, from the Roxborough engine house to the reservoir, in order to utilize both the Worthington and the Cornish Engines. By the same ordinance, authority was given to extend the ten inch pipe on Ridge avenue to the Summit, at Manatawna, and by storing in tanks obviate the expenses of daily pumpage.

The ordinance of June 5th, provided for the continuation of the thirty-inch main on Jefferson street, from near Twenty-first to Broad street, to provide a better supply for that section. It also authorized the laying of a twelve-inch main on Thirty fifth street to connect the pipe on Girard avenue with the old West Philadelphia pumping main, and thereby afford collateral circulation in case of accident to the supply main on Belmont avenue. By other ordinances, during the year, 72,984 feet of service pipes were directed to be laid. At the close of the year 1876, there were of record, ordinances for the laying of 188,178 feet, or more than thirty-five-and-one-half miles.

Three thousand two hundred feet of thirty-inch supply main on Jefferson street; 2,162 feet of twelve-inch pipe on Thirty-fifth street; 966 feet of ten-inch pipe on Ridge avenue, and 68,127 feet of service pipes have been laid, which with 5,832 feet of the pumping, and 4,080 feet of the supply mains for the Frankford Works, and the connections at Twenty-second and Poplar streets, make a total of 184,624 feet, or sixteen miles 244 feet during the year 1877.

The Roxborough pumping main has been purchased from the Loan for the Frankford Works, and is now on the ground.

Connections have been made at Twenty-second and Poplar both with the forty-eight-inch communicating main between the Spring Garden and Corinthian avenue basins, and the three distributing mains from the latter, by which means it can be maintained at

its maximum level, and in case of accident thereto the districts supplied by it can be furnished with water direct from the Spring Garden Reservoir.

For connecting dead ends 911 feet of six-inch pipe were used.

Ordinances to the end of 1877 for streets not yet laid amount to 250,588 feet, or nearly forty-seven and one-half miles.

The attention of Councils was called by a communication dated April 5th to the large number of small pipes in the old City proper. They have been in service many years, and are now too small for the increased demands upon them. The last supply main provided for this district was laid in 1850, since which time the demand has quadrupled.

It was suggested that the proper time to substitute larger pipes was when the streets were being repaved. An Ordinance was accordingly passed and approved June 5th, giving the Chief Engineer authority to relay Dock and all other streets he may deem necessary previous to their being repaved. Under this ordinance 3,575 feet of six-inch have been substituted for three-inch pipe. More than 150,000 feet of pipes still remain, of four inches and less in diameter, which, with the increased demands thereon, occasion many complaints, especially at Nineteenth and Walnut, which is the highest ground in the old City proper. In the neighborhood of Sixth and Lehigh avenue, and east of the Germantown road, owing to the high ground, there is an inadequate supply, to remedy which it is proposed to change the eighteen-inch main into a supply main by connecting it with the distribution at Huntingdon, Cumberland, York, and Dauphin streets. This will nearly double the supply, while, if necessary, it can be used for pumping either directly into the distribution, or into the reservoir by closing the valves at these branches.

Four of the pumping mains from the Spring Garden engine-house are laid on Thompson street through a tunnel, commencing 253 feet east of Thirty-first street, and running east 755 feet. The opening of Twenty-ninth and Thirtieth streets leaves these above grade.

It will be necessary either to lower them or change the grade of the streets. The former is a difficult and costly operation under the most favorable circumstances, but here there are two eighteen-inch pipes lying beneath a twenty and a thirty-six-inch in a tunnel through rock.

If Thompson street were opened, the twenty and the two eighteen-inch could be removed, and a thirty-six inch substituted.

The Survey Department is respectfully requested to call the attention of the District Surveyors to the Ordinance of Councils, dated January 29th, 1855, by which they are required, *within ten days* after notification of the laying of water pipe, to make out the bills for frontage against the several owners of ground, and return them to the Chief Engineer of the Water Department. The failure to comply with this Ordinance, and with that one which provides for the allowance on corner lots, is a source of trouble to the Department, and of loss to the City. This Ordinance provides that such corner allowance shall be always, and only on the street or highway running at an angle to the street or highway in which pipes have been previously laid and paid for. The District Surveyors have not the data to make a correct reduction, and as all the bills require our examination, and some demand correction, it would be better for the District Surveyors to make out the bills against the several owners according to their respective fronts, and allow all deductions to be made at this office.

Some explanation is necessary in regard to the extraordinary number of repairs to fire-plugs and stop cocks, as reported by the Purveyors. There were more than three thousand plugs erected before steam fire engines were introduced, and they were not constructed to resist the greater strain, which has thus been thrown upon them. The Department has decided, where these require repairing, to substitute the new steam plug, and thus gradually remove all of the unsuitable pattern. The new plug and goose-neck are flanged with rubber joint between, and bolted together, instead of the socket and stirrups with lead joint, as in the old ones.

Many of the stop-cocks, of English pattern, constructed with a single face, have corroded so that it is impossible to close them. New ones, with a double face, have been substituted for a large number of the old.

The connection of intersections commenced in 1876, will be continued. Such omissions are quite numerous in West Philadelphia, where they impede the circulation, and permit the fouling of the water.

The pipe plans, owing to age and their inconvenient size, are in a dilapidated condition. New ones are being prepared, which will be carefully compared with all data in our possession, and revised as occasion requires. The reports of the plug and pressure inspectors afford one means of verification. By them the exact location of plugs and stops are obtained. The Purveyors are also required to carefully prepare their reports of pipe laid, giving exact distance in all cases. By comparing the total of pipe laid as shown by the annual reports, with the alphabetical list, a considerable difference (93,307 feet) will be noticed. The latter was carefully prepared from Chief Engineer's reports, the old pipe plans in the department, and from personal investigation. Some typographical errors have, however, been found, as well as several occasioned by change of street names. In the annual reports, the principal errors are omissions, occasioned by carelessness in reporting pipe laid, and the inability to obtain a correct account of the pipe owned by the districts previous to consolidation or purchased since from the water companies. For instance, the amount of pipe belonging to the Germantown Water Company is stated in the reports to be 124,362 feet, while it may vary as seen by the following reports:

Total as per measurement of map,	-	-	99,661
“ “ reference of map,	-	-	129,596
“ “ report of secretary,	-	-	110,817
“ “ “ “ D. B. Morrell,	-	-	124,362

A table has been prepared and is kept of record, in which errors and corrections, both in the reports and alphabetical list,

are noted, by which an accurate statement will eventually be obtained.

It will be noticed by referring to the table "Purposes for which pipes were laid during 1877," that there was laid 84,624 feet of pipe, of which 62,326 feet were for supply mains, from which must be deducted for intersections 9,453.37 feet, leaving 52,872.63 proper for frontage, which in several instances is only charged against one side of a street. The total amount of the bills against property owners was \$101,356.76, the corner reductions from which amounted to \$10,695.22, leaving \$90,661.54 the amount to be paid. Of this amount, \$45,924.15 has been paid, \$5,548.20 has been sent to lien, and \$39,189.19 still remain on the books, the time allowed for payment not having expired. In addition to the above there has been received on account of pipe laid in 1876, the sum of \$24,554.95, and on deposit for frontage for attachments where pipe has not been laid \$2,772.51, making the total receipts from pipe bills \$73,251.61.

DISTRIBUTION.

SERVICE AND SUPPLY MAINS LAID IN 1877.

FIRST DISTRICT.

Iron Pipes laid in the First, Second, Third, Fourth, Twenty-sixth and Thirtieth Wards.

Street.	Location.	Size. Inches.	Distance Feet.
Cantrell,	From Seventh to Ninth,	6	852
"	" 214 feet west of Tenth to Twelfth, .	6	676
Dickinson,	" Broad to Sixteenth,	6	922
"	" Twentieth to Twenty-first,	6	521
Eighth,	" Snyder to Jackson,	6	444
Eighteenth,	" Passyunk to Jackson,	6	131
Federal,	" Twenty third to Twenty-fifth,	6	1,022
Fernon,	" Eighteenth to Nineteenth,	6	448
Getz,	" Mifflin to McKean,	6	450
Gerritt,	" Eighteenth to Twentieth,	6	884
Gray's Ferry R'd,	" Newport to Thirty-fourth,	6	257
Jackson,	" Seventh to Eighth,	6	439
"	" Seabold to Eighteenth,	6	284
Juniper,	" Dickinson to Tasker,	6	439
Kater,	" Seventeenth (east),	6	135
Lingo,	" Reed (north),	6	138
Mary,	" Seventh (east),	6	234
Moore,	" 197 feet west of Thirteenth (west), .	6	48
Moyamensing,	" Seventh to Eighth,	6	555
"	" Ninth to Tenth,	6	484
Nineteenth,	" Reed to 161 feet south of Tasker, .	12	1,091
Passyunk Road,	" Sixteenth to Eighteenth,	6	971
Seabold,	" Jackson to Passyunk Road,	6	242
Snyder Av., both sides,	from Sixth to Eighth,	6	1,766
"	" " " Ninth to Twelfth,	6	2,652
Taylor.	from Effingham to Seventh,	6	298
Twelfth,	" Snyder to Cantrell,	6	136
	Amount carried forward,		16,519

Street.	Location.	Size. Inches.	Distance. Feet.
	Amount brought forward,		16,519
Washington Av.,	south side, from Thirteenth to Broad,	6	577
Wilder,	from Eighteenth to Nineteenth,	6	448
Winton,	" Seventh to Eighth,	6	427
Connections,	Seventh with Moyamensing,	6	19
"	Eighth " Cantrell,	6	34
"	" " Winton,	6	13
"	Ninth " Moyamensing,	6	31
"	Eleventh " Snyder, north side,	6	55
"	Sixteenth with Passyunk,	6	43
"	for Brown's mill,	4	3
"	for plugs,	4	244
For repairs,		3	3
"	"	4	97
"	"	6	36
Total number of feet of new pipe laid,			<u>18,519</u>

Number of feet of new 3-inch pipe laid,	3
" " 4 " "	344
" " 6 " "	17,111
" " 12 " "	<u>1,091</u>

18,549 Or 3 miles 2,709 feet.

Raised pipe at Second and Snyder Avenue,	6	21
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SECOND DISTRICT.

Iron Pipes laid in the Fifth, Sixth, Seventh, Eighth, Ninth, Tenth, Twenty-fourth, and Twenty-seventh Wards.

Street.	Location.	Size. Inches.	Distance. Feet.
Aspen,	From Union to Fortieth,	6	310
Curlew,	" Aspen to Oregon,	6	384
Douglass,	" Rockland to Haverford,	6	213
Eadline,	" North H. L. of Lancaster and Preston (east),	6	151
Edward,	" Rockland to Haverford,	6	213
Forty-third,	" Market to Chestnut,	6	551
Amount carried forward,			<u>1,822</u>

Street.	Location.	Size. Distance.	
		Inches.	Feet.
	Amount brought forward, . . .		1,822
Forty-sixth,	From Haverford to Aspen, . . .	6	1,052
Forty seventh,	" Westminster to Lancaster, . . .	6	910
Forty-eighth,	" Seneca to Oregon, . . .	6	417
Fifty-third,	" Westminster to Wyalusing, . . .	6	506
Hamilton,	" Haverford to Sixty-third, . . .	6	1,638
Haverford,	" Thirty-second to Thirty-third, . . .	6	409
Holly,	" Lancaster to Myrtle, . . .	6	860
Hudson,	" Market street (south), . . .	6	150
Kent,	" Twenty-fourth to Twenty-fifth, . . .	6	316
Market,	" Fifty-third to west H. L. of Allison, . . .	10	1,238
Myrtle,	" Union to Preston, . . .	6	639
"	" Forty-first to Forty second, . . .	6	600
Oregon,	" Thirty-ninth to Lancaster, . . .	6	2,547
Pearl, see Smedley.			
Poplar,	" Thirty ninth to Fortieth, . . .	6	700
Preston,	" Lancaster to Story, . . .	6	288
Rockland,	" Thirty-second to Thirty-third, . . .	6	414
Sixty-fifth,	" Vine to Callowhill, . . .	6	563
Smedley,	" Thirty-second (west), . . .	6	260
Twenty-sixth,	" Spruce to Pine, . . .	6	550
Thirtieth,	" 150 feet north of Market (north), . . .	6	989
Thirty-sec'd (west side),	" Fairmount Place to Union, . . .	6	128
"	" Rockland to Haverford, . . .	6	213
Thirty-third,	" Sansom to Walnut, . . .	6	293
"	" Elm to Story, . . .	6	212
Thirty-fifth,	" Girard Av to 362 ft. north of Penn'a R. R., . . .	12	2,162
Thirty ninth,	" Locust to Walnut, . . .	6	423
Trinity Place,	" Twenty-second to Twenty-third, . . .	6	334
Union,	" Aspen to Oregon, . . .	6	384
Union Place,	" Thirty-second (west), . . .	6	382
Westminster Avenue, between Fifty-first and Fifty-second, over bridge,		12	72
Independence Square, drain pipe from Temperance Fountain,		6	140
Connections, Aspen with Holly,		6	24
" Oregon " Curlew,		6	24
" " Union,		6	24
" Preston " Lancaster,		6	44
" Twenty-sixth with Factory,		6	16
	Amount carried forward, . . .		21,743

	Location.	Size. Inches.	Distance. Feet.
Amount brought forward,			21,743
Connections, Thirty-third with Elm,		6	35
“ “ “ Story,		6	22
“ for plugs,		4	410
For repairs,		6	72
“		10	16
Total number of feet of new pipe laid,			<u>22,298</u>
Number of feet of 4-inch pipe laid,	410		
“ “ 6-inch “	18,400		
“ “ 10-inch “	1,254		
“ “ 12-inch “	2,234		

22,298 Or 4 miles 1,178 feet.

	Location.	Size. Inches.	Distance. Feet.
Relaid Comptroller, from Spruce to Union (formerly 1½-inch),		6	309
“ Dock, both sides, from Third to Delaware Avenue (formerly 3-inch),		6	2,785
“ Hudson, from 150 feet south of Market, to Chestnut (formerly 4-inch),		6	370
“ Lisbon, east of Sixth (formerly 1½-inch),		6	150
“ Market, north side, from Front to Delaware Ave.,		6	255
“ “ south side, “ “ “ “		6	288
“ Mattis, from Dock to Spruce (formerly 3-inch),		6	100
“ Second, from Pine, south (formerly 4-inch),		6	288
“ Torr, between Fifty-first and Fifty-second,		6	108
“ Tower, from Albion to Twenty-first (formerly 3-inch),		6	315
“ Thirty fifth, under Pennsylvania Railroad Bridge,		16	175
“ Urbanna, from Ninth, west, then north (formerly 3 inch),		6	225
“ Westminster Ave., between Fifty-first and Fifty-second,		12	65
Lowered Thirty-fifth, near Zoological Garden,		16	250
“ Forty-sixth, between Silverton and Aspen,		6	331
“ Story, west of Thirty-third,		6	44
“ “ “ “		10	10
			<u>6,068</u>
“			<u>6,068</u>
Took up on Thirty-fifth St., opposite Zoological Garden,		16	480

THIRD DISTRICT.

Iron pipes laid in the Eleventh, Twelfth, Sixteenth, Seventeenth, Eighteenth, Nineteenth, Twenty-third, Twenty-fifth, and Thirty-first Wards.

Street.	Location.	Size. Distance.	
		Inches.	Feet.
Cambria,	From Boudinot (west),	6	150
Cemetery Avenue,	" Frankford to Emerald,	6	480
Chatham,	" Allegheny to Westmoreland,	6	719
Collar,	" Girard Avenue (southeast),	6	275
Eighth,	" Lehigh to Somerset,	6	550
Fillmore,	" 492 feet N. of H. L. of Lehigh Avenue to Somerset,	6	50
Hockley,	" 120 feet S. W. of H. L. of Emerick to Orange,	6	144
Lawrence,	" Lehigh to Cambria,	6	1,091
Leithgow,	" York to Huntingdon,	6	1,097
Manor,	" Montgomery to Berks,	6	556
Mercer,	" Wellington to Westmoreland,	6	441
Somerset,	" Front to Fillmore,	6	441
"	" Sixth to Germantown Avenue,	6	1,608
Thurlow,	" Indiana to Hart Lane,	6	342
Westmoreland,	" Frankford Avenue to 71 feet E. of Amber,	6	365
Wentz Farm Reservoir,		10	588
Pumping main, Frankford,		30	5,832
Supply " "		20	4,080
Connection, Girard Avenue with Norris Street,		6	36
" Cambria with D Street,		6	40
" Kensington Avenue with Somerset,		6	70
" Germantown Avenue with Thompson,		6	90
" Farmers' Northern Market, Sixth and Columbia Avenue,		4	160
" Kitchenman's mill, Jasper and Huntingdon,		6	92
" for plugs,		4	349
For repairs,		4	87
"		6	80
"		10	39
"		12	4
Total number of feet of new pipe laid,			<u>19,856</u>

Number of feet of 4-inch pipe laid,	596
“ “ 6-inch “	8,717
“ “ 10-inch “	627
“ “ 12-inch “	4
“ “ 20-inch “	4,080
“ “ 30-inch “	5,832
	<u>19,856</u> or 3 miles 4,016 feet.

	Location.	Size. Inches.	Distance. Feet.
Relaid Somerset,	From Gunner's Run to Coral,	6	2,019
“ D,	“ Kensington Avenue to Cambria,	6	559
“ Hart Lane,	“ Cambria to Indiana,	6	641
“ over gas main,	“ “ “ “	6	45
			<u>3,264</u>

FOURTH DISTRICT.

Iron Pipes laid in the Thirteenth, Fourteenth, Fifteenth, Twentieth, Twenty-eighth, and Twenty-ninth Wards.

Street.	Location.	Size. Inches.	Distance. Feet.
Art,	From Thirteenth to Park Av.,	6	262
Aubrey,	“ Diamond to Art,	6	421
Camac,	“ Master to Jefferson,	6	516
Carolina,	“ Dauphin to N. of Hermann,	6	252
Darien,	“ Norris to Diamond,	6	554
Fletcher,	“ Twenty sixth to 432 feet west of Twen- ty-ninth,	6	1,757
Franklin,	“ Berks to Norris,	6	553
Huntingdon,	“ Thirty-fourth to Ridge,	6	194
Judson,	“ Ridge to Montgomery,	6	390
Kenuset,	“ Germantown Road to Eleventh,	6	385
Lambert,	“ Columbia to Montgomery,	6	552
Marston,	“ Master to Jefferson,	6	500
Mervine,	“ Diamond to Susquehanna,	6	525
Mervine,	“ Summerville to Somerset,	6	334
Nassau,	“ Twenty-third to Twenty-fourth,	6	444
North College Avenue,	“ Twenty-fourth Twenty-fifth,	6	474
Ogden,	“ Twenty-ninth to Thirtieth,	6	460
Oxford,	“ Twenty-eighth to Twenty-ninth,	6	469
Poplar,	“ Twenty-ninth to Thirtieth,	6	435
Stiles,	“ Twenty-ninth to Thirty-first,	6	919
	Amount carried forward,		<u>10,396</u>

Street.	Location.	Size. Inches.	Distance. Feet.
	Amount brought forward,		10,396
Sydenham,	" Columbia to Montgomery,	6	542
Taylor,	" Thompson to North College Avenue, 6	6	384
Thompson,	" Twenty fifth to Twenty-sixth,	6	457
Twentieth,	" D. E. S. of Susquehanna to 36 feet N. of H. L. of Dauphin,	6	648
Twenty-sixth,	" Thompson (south),	6	88
Thirtieth,	" Girard Avenue to 24 feet N. of the H. L. of Stiles,	6	305
Thirtieth,	" Pennsylvania Av. to Girard Av.,	10	803
"	" Dauphin to Hermann,	12	221
Willington,	" 192 feet N. of the H. L. of Mont- gomery Av. (north),	6	84
Jefferson,	" east of Twenty first to Broad,	30	3,200
Connections, with Jefferson Street main,		8	4
" " " " " " " "		6	92
" " " " " " " "		4	33
" " " " " " " "		3	3
"	Broad with Girard Avenue,	6	94
"	Twenty-second and Poplar,	30	228
"	Twenty-fifth with North College Avenue,	6	28
"	Thirtieth with Cambridge,	6	15
"	" " Ogden,	6	14
"	" " Poplar,	6	36
"	Thirty-fourth with Huntingdon,	6	57
"	Thompson with West College Avenue,	6	25
"	Jewish Synagogue, Mt. Vernon below Broad,	4	31
"	St. Mark's Lutheran Church, Spring Garden west of Thirteenth,	4	34
"	Wm. Sellers & Co., Seventeenth below Hamilton,	6	30
"	" " " " " " " "	4	5
"	for Girard College,	6	83
"	" " " " " " " "	4	25
"	for Park fountain,	6	74
"	" plugs,	4	283
For repairs,		3	25
" "		4	45
" "		6	87
" "		10	6
" "		30	29
			18,514

Number of feet of new 3-inch pipe laid, .	28
“ “ “ 4-inch “ .	456
“ “ “ 6 inch “ .	13,539
“ “ “ 8-inch “ .	4
“ “ “ 10-inch “ .	809
“ “ “ 12 inch “ .	221
“ “ “ 30-inch “ .	3,457
	<u>18,514</u> or 3 miles, 2,674 feet.

GERMANTOWN.

Iron pipes laid in Germantown District.

Street.	Location.	Size. Distance.	
		Inches.	Feet.
Baker,	From Germantown Avenue to Nice, .	6	282
Hancock,	“ Mill (southeast), .	6	484
Nicetown Lane,	“ Twenty-second to first H. L. of Pacific,	6	530
Twenty-second,	“ Venango to Nicetown Lane, .	6	500
Winona,	“ 250 feet southwest of H. L. at Wayne to Pulaski,	6	360
Chestnut Hill Works,	pipe on bottom of pool,	6	312
“ “ “ “	Railroad to Spring,	4	567
Connection, Twenty-second with Nicetown Lane,	. . . . .	6	116
“ for plugs,	. . . . .	4	230
For repairs,	. . . . .	4	6
“	. . . . .	6	13
			<u>3,400</u>
Number of feet of new 4-inch pipe laid, .	803		
“ “ “ 6-inch “ .	2,597		
	<u>3,400</u>		

	Location.	Size. Distance.	
		Inches.	Feet.
Relaid Cumberland, from Armat to Mill,	6	667
“ High, from Morton (east),	6	3,175
Lowered Germantown Avenue, northeast of Franklin,	4	200
“ “ “ southwest of “	4	200
“ “ “ northeast of Upsal,	4	230
			<u>4,472</u>

MANAYUNK.

Iron pipes laid in Manayunk District.

Street.	Location.	Size. Inches.	Distance. Feet.
High,	From D. E., S. of Leverington to Walnut,	6	216
Krams Avenue,	" H. L. at Mitchell (east),	6	351
Ridge	" " Car Depot (north),	10	966
Robinson,	" " Main, toward the Canal,	6	246
For plugs,	. . . . .	4	48
" repairs,	. . . . .	4	48
" "	. . . . .	6	132
			2,007

Number of feet of new 4 inch pipe laid,	96
" " " 6 inch "	945
" " " 10-inch "	966
2,007	

	Location.	Size. Inches.	Distance. Feet.
Lowered Apple,	between Penn and Cedar,	6	348
"	Ridge, opposite Parker Avenue,	6	144
"	East Street, east of Cresson,	4	120
"	Queen,	6	432
			1,044

Recapitulation of Pipe laid in the several districts during the year 1877.

WARDS.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	20-inch.	30-inch.	Totals.
First District, 1, 2, 3, 4, 26, and 30.....	3	344	17,111			1,091			18,549
Second District, 5, 6, 7, 8, 9, 10, 24, and 27.....		410	18,400		1,254	2,234			22,298
Third District, 11, 12, 16, 17, 18, 19, 23, 31, and part of 25.....		506	8,717		627	4	4,080	5,832	19,856
Fourth District, 13, 14, 15, 20, 29, and part of 28.....	28	456	13,539	4	809	221		3,457	18,514
Germantown District, 22 and part of 25 and 28.....		803	2,597						3,400
Manayunk District, 21 and part of 28.....		96	945		966				2,007
Totals	31	2,705	61,309	4	3,656	3,550	4,080	9,289	84,624

	Feet.	Miles.	Feet.
Pipe as per last report.....	3,667,560	= 694	3,230
Pipe omitted in last report (Fifteenth Street, from Filbert to Cuthbert).....	134		134
Pipe laid during the year 1877.....	84,624	= 16	144
Total	3,752,308	= 710	3,508

Length of pipe laid previous to and since Consolidation, as per reports.

YEARS.	MILES.	FEET.
To 1855	242	1,162
1855	6	44
1856	10	2,079
1857	12	324
1858	13	3,484
1859	22	784
1860	19	224
1861	11	2,368
1862	9	954
1863	10	4,161
1864	6	4,287
1865	8	4,754
1866	12	2,964
*Germantown.	23	2,922
1867	15	4,971
1868	15	148
1869	22	1,884
1870	26	1,953
1871	30	572
1872	27	3,661
1873	39	4,816
*Chestnut Hill.	4	2,102
1874	42	3,511
1875	33	5,148
1876	27	2,033
Omitted in 1876.	...	134
1877	16	144
Total, - - -	710	3,508

*Purchased.

Purposes for which Pipes were laid during 1877.

	3-inch.	4 inch.	6-inch.	8-inch.	10-inch.	12 inch.	16 inch.	20-inch.	30-inch.	Total.
On streets for supply			58,973		2,041	1,312				62,326
Connections to close dead ends and complete circulation.....	3	33	1,185	4		72				1,297
Connections for fire plugs.....		1,564								1,564
Connections for fire purposes.....		193	205							398
Connections for organ motors.....		65								65
Connections for Park fountain.....			74							74
Repairs.....	28	283	420		61	4			29	825
Pumping and distributing mains with their connections.....		567	452		1,554	2,162		4,080	9,260	18,075
Totals.....	31	2,705	61,309	4	3,656	3,550		4,080	9,289	84,624
Pipe raised.....			21							21
Pipe lowered.....		750	1,299		10	250				2,309
Pipe relaid.....			9,035			65	175			9,275
		750	10,355		10	315	175			11,605

Statement of the number of fire plugs in the City, by Districts and by Wards, during 1877.

	First District.					Second District.					Third District.					Fourth District.				German-town.		Mana-yunk.		Total.							
	Wards.					Wards.					Wards.					Wards.		Wards.		Wards.											
	1	2	4	26	30	5	6	7	9	24	27	18	19	20	23	25	31	15	20	28	29	22	25		21						
Prior to 1877.....																															
					955						1455						1609					979		341		228	5567				
During 1877.....	7	4	1	14	1	27	8	2	3	1	26	4	44	2	1	1	4	7	1	16	3	2	7	8	20	14	1	15	4	4	126
						982					1499						1625					999		356		232	5693				

Number of attachments for fire purposes previously reported.....	165
Made during 1877—First District	1
Made during 1877—Second District.....	1
Made during 1877—Third District.....	2
Made during 1877—Fourth District.....	3
Total	172

Number of holes drilled for making new attachments to public mains during the year 1877.

Months.	$\frac{1}{2}$ -inch diam-eter.	$\frac{3}{8}$ -inch diam-eter.	$\frac{3}{4}$ -inch diam-eter.	1-inch diam-eter.	Totals.	Shut-offs.
January.....	25	3		3	31	24
February.....	52	2	1	2	57	21
March.....	308	4			312	39
April.....	477	7	5	2	491	31
May.....	431	5	4	5	445	44
June.....	337	4	6	3	350	32
July.....	296	8	1	4	309	31
August.....	384	13	3	9	409	34
September.....	411	20	4	7	442	43
October.....	497	7	2	3	509	32
November.....	606	20	4	2	632	33
December.....	212	3	3	3	221	36
Totals.....	4,036	96	33	43	4,208	400

Table of attachments in Wards and Districts.

Wards.	$\frac{1}{2}$ -inch diam-eter.	$\frac{3}{8}$ -inch diam-eter.	$\frac{3}{4}$ -inch diam-eter.	1-inch diam-eter.	Totals.	Shut-offs.
First District 1, 2, 3, 4, 26, and 30.....	843		1	2	846	62
Second District, 5, 6, 7, 8, 9, 10, 24, and 27.....	748	44	12	10	814	62
Third District, 11, 12, 16, 17, 18, 19, 23, 31, and part of 25.....	764	10	6	19	799	106
Fourth District, 13, 14, 15, 20, 29, and part of 28.....	1,326	39	10	6	1,381	130
Germantown, 22 and part of 25 and 28....	203	3	3	4	213	20
Manayunk, 21 and part of 28.....	152		1	2	155	20
Totals.....	4,036	96	33	43	4,208	400

Repairs to mains, stops, and plugs during 1877.

Districts.	To mains.	To stops.	To plugs.
First.....	63	171	598
Second.....	59	298	339
Third.....	94	149	254
Fourth.....	150	337	601
Germantown.....	24	148	106
Manayunk.....	31	92	108
Totals.....	421	1,195	2,006

Account of new stops and fire-plugs for 1877.

Districts.	No. of stops.	No. of plugs.
First.....	50	27
Second.....	77	44
Third.....	38	16
Fourth.....	55	20
Germantown.....	23	15
Manayunk.....	14	4
Totals.....	257	126

Number of valves raised in the different districts during the year 1877.

Districts.	3-inch.	4-inch.	6 inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	Totals.
First.....		2	13							15
Second.....	12		11					1		24
Third.....		4	26		1					31
Fourth.....										
Germantown.....										
Manayunk.....										
Total, 1877.....	12	6	50		1			1		70
" 1876.....	3	17	49		3			1		73
" 1875.....	17	55	120	4	12	2	4	1	2	217
" 1874.....	13	32	111	6	6	3	3			174
" 1873.....	5	16	51		3	1	6	2	2	86
Total for five years.....	50	126	381	10	25	6	13	5	4	620

Account of Service Pipes laid during 1877 and the receipts therefor.

	Pipe laid.	Frontage in feet.	Frontage, dollars.	Amount to be paid.	Amount accounted for.
Total feet of pipe laid.....	84,624.00				
Total feet of non-frontage.....	22,298.00				
Balance	62,326.00				
Intersections deducted.....	9,453.37				
Balance.....	52,872.63				
Single fronts, charged \$1 per foot.....		4,388.50	4,388.50		
Double fronts, charged \$2 per foot.....		46,484.13	96,968.26		
Amount of feet.....		52,872.63			
Amount of frontage.....			101,356.76		
Corner allowances deducted.....			10,695.22		
Nett amount of frontage to be collected.....				90,661.54	
Amount received by Registrar.....					45,924.15
Amount sent to lien.....					5,548.20
Amount remaining on books.....					39,189.19
Total					90,661.54

TABLE A.
Rain Fall at Philadelphia, from Pennsylvania Hospital Reports.

YEAR.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	
1810.....													32.66	
1811.....													34.97	
1812.....													39.30	
1813.....													35.63	
1814.....													43.14	
1815.....													34.67	
1816.....													27.95	
1817.....													36.01	
1818.....													34.13	
1819.....													23.35	
1820.....													39.61	
1821.....													32.18	
1822.....													29.86	
1823.....													41.85	
1824.....													39.74	
1825.....	0.84	3.26	4.63	.83	1.72	3.59	2.06	3.70	2.61	1.25	1.36	3.72	29.57	
1826.....	1.11	2.13	5.80	3.87	.19	4.655	3.68	2.75	2.00	5.83	1.85	1.28	36.145	
1827.....	2.86	3.55	1.23	2.83	2.50	2.09	2.97	5.75	.79	5.91	4.76	3.26	38.50	
1828.....	2.05	2.75	3.35	3.82	3.49	2.69	5.33	1.51	4.62	1.39	6.71	.26	37.87	
1829.....	5.37	3.75	2.87	4.99	2.68	3.44	4.35	4.61	2.01	2.30	3.97	1.51	41.95	
1830.....	1.63	2.06	4.115	1.815	3.75	5.99	4.07	3.87	2.93	4.31	5.35	5.18	45.07	
1831.....	6.22	2.44	3.97	5.20	1.07	3.56	4.17	5.39	5.33	4.51	1.88	1.20	44.94	
1832.....	4.58	2.66	1.90	2.98	5.40	1.55	2.62	5.69	1.40	3.41	2.59	5.09	39.87	
1833.....	3.97	1.24	2.22	.70	5.88	5.28	4.15	3.39	3.82	10.05	2.18	5.67	48.55	
1834.....	2.49	2.22	2.02	2.83	3.52	3.99	4.35	.62	3.57	3.29	3.01	2.33	34.24	
1835.....	2.75	1.81	3.83	4.33	1.99	6.27	6.55	2.05	2.63	1.22	3.19	2.68	39.30	
1836.....	7.62	2.95	1.75	3.47	2.28	7.31	2.91	1.97	1.82	3.69	3.34	3.61	42.66	
1837.....	2.50	3.58	3.76	2.83	4.86	2.83	5.89	4.06	2.28	.66	3.23	2.56	39.04	
1838.....	2.20	2.19	3.171	3.586	3.577	6.690	2.376	2.780	9.519	4.896	3.350	1.044	45.238	
1839.....	5.037	3.424	1.504	1.507	6.073	3.922	2.516	4.644	2.919	2.831	3.100	6.262	43.739	
1840.....	1.841	3.0	9	2.626	6.827	2.688	5.948	4.538	5.554	2.602	5.734	2.486	3.647	47.400
1841.....	7.837	1.387	5.821	6.456	3.269	3.114	3.280	9.102	1.895	3.198	4.224	5.917	55.500	
1842.....	1.358	4.265	2.835	5.307	5.865	3.192	11.805	3.786	1.269	1.712	3.487	3.657	48.538	
1843.....	1.440	2.540	4.415	4.723	2.045	1.686	4.543	9.255	4.856	3.220	4.148	4.041	46.912	
1844.....	4.0	2	1.449	4.430	1.354	3.091	3.351	5.284	2.399	4.034	5.025	2.951	2.753	40.173
1845.....	3.760	4.738	2.415	2.580	1.599	3.725	2.763	7.298	2.155	5.259	2.500	3.959	40.021	
1846.....	4.6	0	3.330	4.598	2.112	3.444	3.300	4.604	4.272	.249	2.444	7.970	3.437	44.39
1847.....	4.730	4.569	4.700	.585	1.567	3.365	2.765	3.182	8.070	3.000	2.836	5.785	45.094	
1848.....	2.030	1.443	2.756	1.541	4.902	4.433	3.281	1.714	1.805	3.747	2.343	5.907	35.002	
1849.....	7.30	2.610	5.470	1.752	3.995	2.195	2.933	6.975	1.404	5.695	2.600	5.836	42.095	
1850.....	4.770	2.870	4.750	2.665	6.500	2.030	5.970	8.329	7.732	1.092	3.320	4.515	54.543	
1851.....	1.230	3.110	3.475	4.565	4.817	3.438	2.524	2.555	1.130	3.025	3.356	2.275	35.500	
1852.....	2.011	2.710	4.270	6.445	3.034	4.030	4.060	4.400	1.293	2.267	6.065	5.174	45.749	
1853.....	1.845	4.440	2.462	3.835	5.173	1.100	6.296	3.088	4.463	3.470	2.320	2.165	40.657	
1854.....	2.331	4.203	1.615	7.750	6.935	2.390	3.024	.842	3.798	1.545	2.834	2.910	40.180	
1855.....	2.337	2.352	1.684	2.050	2.965	7.949	6.400	2.786	4.000	4.111	2.037	5.425	44.096	
1856.....	4.537	1.237	2.232	3.515	2.595	1.986	1.508	6.000	4.014	1.296	2.070	2.937	33.927	
1857.....	3.532	.790	1.831	6.786	5.547	7.500	3.915	7.590	1.105	2.690	1.450	5.550	48.286	
1858.....	2.595	2.285	1.087	4.640	5.015	4.495	1.345	4.941	1.492	1.842	6.615	4.500	39.852	
1859.....	6.675	3.660	6.985	5.610	2.250	6.013	4.071	4.736	7.681	3.132	3.820	3.490	58.123	
1860.....	3.225	2.755	1.415	3.800	3.817	2.885	.985	8.491	2.850	4.520	6.130	3.310	44.093	
1861.....	5.245	2.065	3.925	3.705	6.640	3.880	2.660	3.137	4.402	3.797	4.875	2.0	2	46.44
1862.....	4.795	4.640	3.553	4.160	2.308	6.975	2.465	.925	3.980	4.770	4.790	1.650	45.011	
1863.....	4.720	4.680	5.885	7.015	4.510	4.250	6.009	1.447	.875	2.465	2.700	4.633	49.189	
1864.....	1.705	.551	5.170	3.795	8.685	2.345	3.770	1.920	7.165	1.820	3.930	5.145	46.001	
1865.....	3.610	5.825	4.710	2.830	7.210	4.750	2.970	3.770	7.960	3.060	3.960	5.610	56.255	
1866.....	3.145	6.615	2.150	2.930	4.680	2.960	2.520	2.181	8.705	4.145	1.760	3.465	45.256	
1867.....	1.762	3.892	5.465	1.810	7.320	11.025	2.387	15.816	1.720	4.320	2.940	2.730	61.187	
1868.....	3.620	2.520	3.360	5.440	7.005	4.370	3.514	2.056	8.908	1.737	5.280	3.695	51.405	
1869.....	4.280	4.760	5.305	2.120	4.235	5.585	2.885	1.280	3.250	6.320	3.725	5.115	48.860	
1870.....	4.075	2.532	4.060	5.605	6.280	2.895	3.947	5.115	1.710	3.895	2.102	1.889	44.106	
1871.....	3.466	3.086	5.814	1.829	3.383	3.773	6.811	5.971	1.772	4.863	4.293	2.259	47.320	
1872.....	1.267	1.185	3.377	2.497	2.808	4.223	11.215	8.319	3.820	5.363	3.381	3.662	51.117	
1873.....	6.048	5.607	2.242	4.191	4.783	.887	5.553	12.289	4.045	5.889	4.995	1.757	58.286	
1874.....	4.218	2.823	1.595	7.509	2.697	2.664	2.759	6.531	3.987	1.660	2.229	2.249	40.911	
1875.....	2.360	3.284	3.925	1.360	1.575	5.258	4.174	6.584	3.035	1.827	5.544	2.918	41.844	
1876.....	2.023	3.680	5.605	1.993	5.189	2.209	6.223	1.215	7.776	1.210	9.025	3.169	49.323	
1877.....	2.893	1.550	5.097	2.962	1.215	5.512	6.196	1.007	3.882	6.963	6.507	1.363	45.147	

Height of gauge at Hospital, 50 feet above the level of the sea.
The observations from 1810 to 1824, inclusive, were taken at Spring Mills, Pennsylvania.

TABLE B.

Average daily height of water above the comb of the old dam and the average daily overflow over the flash boards.

	HEIGHT ABOVE THE LEGAL COMB OF DAM.												OVERFLOW OVER FLASH BOARDS.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1.	12	24	21	25	23	22	17	24	14	20	16	26	-10	2	-1	3	1	0	-5		-6	-2	-6	4	
2.	13	34	22	24	19	19	21	22	16	17	22	24	-9	12	0	0	-3	-3	-1	0	-5	-5	0	2	
3.	12	44	37	24	19	20	18	16	16	16	48	24	-10	22	15	8	0	-2	4	0	-6	-6	2	2	
4.	12	40	30	22	18	20	24	14	14	17	37	24	-10	18	8	0	-4	-2	2	2	-6	-5	15	2	
5.	12	40	28	21	15	17	22	19	14	62	30	24	-10	18	6	-1	-7	-5	0	0	-6	-4	8	2	
6.	12	36	24	20	14	25	31	20	16	31	37	38	-10	14	2	-2	-9	3	9	-7	-6	-5	15	16	
7.	24	32	23	19	14	39	27	15	16	24	29	34	2	10	1	-2	-4	17	5	-7	-6	2	7	12	
8.	38	33	21	18	14	33	22	17	20	28	26	31	16	11	-1	-4	-8	11	0	-5	-2	6	4	9	
9.	33	29	34	17	14	26	21	18	31	40	61	28	11	7	12	-5	-8	4	-1	-4	0	18	39	6	
10.	29	26	39	16	14	24	23	17	26	32	50	27	-7	4	17	-6	-8	2	-1	-5	4	10	28	5	
11.	27	26	31	16	13	24	23	15	24	29	37	26	5	4	9	-6	-9	2	1	-7	2	7	15	4	
12.	24	26	27	15	12	25	20	15	22	25	32	26	2	2	4	5	-7	-10	3	-2	-7	0	3	10	4
13.	23	25	27	14	11	23	17	17	22	24	30	25	1	3	5	-8	-11	1	-5	-5	0	2	8	3	
14.	24	20	28	13	11	22	15	16	19	23	27	24	2	2	6	-9	-11	0	-7	-6	-3	1	5	2	
15.	24	19	27	13	11	22	14	22	15	22	26	23	2	3	5	-9	-11	0	-8	0	-7	0	4	1	
16.	24	18	25	13	8	21	18	26	19	20	25	21	2	2	-4	3	-9	-14	-1	-4	-3	-2	3	-1	
17.	29	18	24	13	9	20	16	26	19	18	25	21	7	-4	2	-9	-13	-2	-6	4	-3	-4	3	-1	
18.	28	18	23	13	9	20	21	22	18	17	24	21	6	-4	1	-9	-13	-2	-1	0	-4	-5	2	-1	
19.	26	17	24	14	11	18	25	20	23	16	23	20	4	-5	0	-8	-11	-4	3	-2	1	-6	1	-2	
20.	26	17	24	17	8	21	23	17	21	16	22	20	4	-5	2	-5	-14	-1	1	-5	-1	-6	0	-2	
21.	31	15	20	22	14	18	23	18	18	23	21	20	9	-7	-2	0	-8	-4	1	-4	-4	1	-1	-2	
22.	27	15	21	18	12	23	22	21	15	25	20	22	5	-7	-1	-4	-10	1	0	-1	-7	3	-2	0	
23.	27	17	25	17	22	25	24	20	16	24	19	20	5	-5	3	-5	0	3	2	-2	-6	2	-3	-2	
24.	25	28	22	16	24	23	20	17	17	22	29	19	3	6	0	-7	2	1	-2	-5	-5	0	7	-3	
25.	24	31	22	14	24	20	17	17	15	20	26	20	2	9	0	-5	2	-2	-5	-5	-7	-2	4	-2	
26.	24	27	22	12	24	19	18	24	16	19	32	17	2	5	0	-10	2	-3	-4	2	-6	-3	10	-5	
27.	24	24	36	12	24	19	19	22	17	17	36	16	2	2	14	-10	2	-3	-3	2	0	-5	14	-6	
28.	23	22	46	12	23	16	29	23	17	17	30	16	1	0	24	-10	1	-6	-7	-1	-5	-5	8	-6	
29.	24	.....	35	13	24	15	27	19	15	16	29	15	2	.....	13	-9	2	-7	5	-3	-7	-6	7	-7
30.	24	.....	29	19	23	21	37	15	18	15	28	15	2	.....	7	-3	1	-1	15	-7	-4	-7	6	-7
31.	23	.....	28	.....	23	.....	28	14	.....	16	.....	18	1	.....	6	.....	1	.....	6	-8	.....	-6	.....	4

This table represents the height of the water above the comb of the old Fairmount Dam, or the legal comb, and the water wasted over the flash board on the new dam, which is now twenty-two inches above the old comb.

TABLE C.

Table showing number of days in each month when the inches of water wasted over the Flash Boards of Fairmount Dam were the same.

Inches.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1	3		2	4	3	4		1	2	1	1		21
2	10	2	3	2	5	2	2	2	1	3	1	5	38
3	1	1	2	1		3	1			2	2	1	14
4	2	3				1		2	1		3	3	15
5	3	1	3				2				1	1	11
6	1	1	3				1			1	1	1	9
7	1	1	1				1			1	3		8
8			1								3		4
9	1	1	1				1	1		1		1	7
10		1								1	2		4
11	1	1				1							3
12		1	1									1	3
13			1										1
14		1	1								1		3
15			1				1				3		5
16	1											1	2
17			1			1							2
18		2								1			3
22		1											1
24			1										1
26											1		1
28											1		1
39											1		1
40										1			1

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