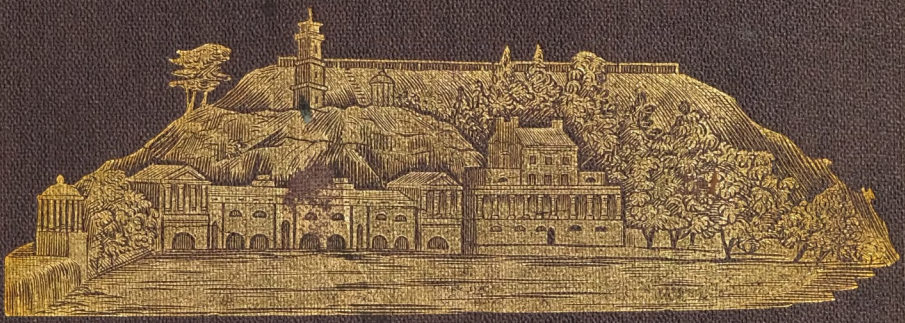
ANNUAL REPORT

OF THE



WATER DEPARTMENT

PHILADELPHIA

1882.

DEPARTMENT

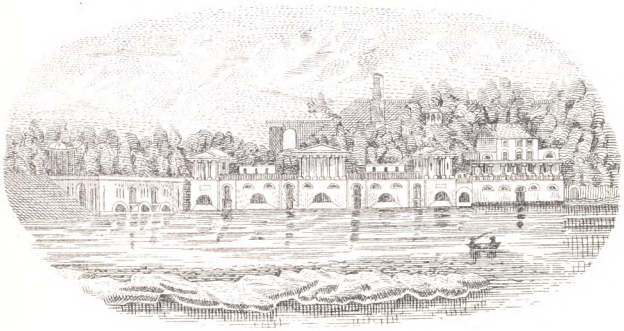
—FOR—

SUPPLYING THE CITY WITH WATER.

ANNUAL REPORT

—OF THE—

Chief Engineer of the Water Department



—OF THE—

CITY OF PHILADELPHIA,

FOR THE YEAR 1882.

Presented to Councils March, 1883.

PHILADELPHIA:

1883.

CONTENTS.

TABLES.

Committee on Water Works, 1882-83.

JOHN K. CUMING, *Chairman.*

Adam Albright, Chas. H. Banes, John T. Bailey,
Wm. B. Bement, John Brady, Henry Clay,
James Evans, Sam'l K. Felton, Thos. H. Green,
Fred. Halternan, †William B. Irvine, Henry Johnson,
*Chas. Thompson Jones, ‡Chas. Lawrence, John McCullough,
Geo. H. McCully, James McCormick, Geo. Roney,
Geo. R. Snowden, John T. Strickland, Sam'l F. Stringfellow.
John Taylor, Wm. Thornton,

WM. B. SMITH, *Ex-officio.* WM. HENRY LEX, *Ex-officio.*

* In place of John S. Davis, resigned.
† In place of Andrew J. Maloney, resigned.
‡ W. B. Irvine, resigned December, 1882.

CHIEF ENGINEER.

WILLIAM H. McFADDEN.

ASSISTANT ENGINEERS.

CHAS. G. DARRACH. JOHN L. OGDEN. JOHN E. CODMAN.

GENERAL SUPERINTENDENT OF WORKS.

ROBERT McFADDEN.

CHIEF CLERK.

JOB T. HICKMAN.

Wm. M. McFadden, *Draughtsman.* Wm. J. Innes, *Muster Clerk.*
John A. Hayes, *Assistant Clerk.* W. W. Widdifield, *Pipe Clerk.*
Geo. W. Eckert, *Telegraph Operator.* Thos. J. Lister, *Messenger.*

PIPE RECORDING CLERKS.

William Whitby. Allen J. Fuller.

SUPERINTENDENT OF CITY SHOP.

JAMES F. NEALL.

PURVEYORS.

1st District—John H. Holmes, Eleventh and Wharton Sts.; Residence, 1907 Fitzwater St.

2d " David A. Craig, 918 Cherry Street; Residence, 11 South Sixteenth Street.

3d " Chas J. Lowry, 1420 Frankford Avenue; Residence, 2423 North Sixth Street.

4th " Wm. Ewing, Corinthian Ave., and Poplar St.; Residence, 2440 Hamilton St.

5th " Henry Dawson, Lyceum Hall, Roxborough; Residence, 419 Martin Street, Roxborough.

6th " David B. Morrell, Town Hall, Germantown; Residence, 151 Chelton Avenue, Germantown.

ENGINEERS AT WORKS.

Fairmount—Jos. Moyer, A. G. Bonsall.

Schuylkill—Wm. H. Smith, David Pyke.

Delaware—John H. Penn, Jos. Thompson.

Belmont—Abram Stott, John E Smith.

Roxborough—Josh Bartley, Lewis Culp.

Frankford—Charles Douglass.

Chestnut Hill—James McClenahan, *Assistant Engineer.*

REGISTRAR'S DEPARTMENT.

REGISTRAR.

A. N. KEITHLER.

John S. Warner, *Chief Clerk.*
John F. Scheidt, *Permit Clerk.*
W. J. Halliday, *Receiving Clerk.*
A. Buckheister, *Registering Clerk.*

ENTRY CLERKS.

George Macauly. Chas. D. Birney.

BILL CLERKS.

Joseph Fisher, John M. Stacker. Chas. L. Hayden. Thomas Orr.

INSPECTORS.

E. S. Higbee,
Jas. H. Graham,
S. D. Woodington,
Louis Obermiller,
Edw. M. Rowe,
E. D. Thomas,
W. H. Hergesheimer,
James Carr,
Wm. A. Agnew,
James Cameron.
John H. Haines,
Thomas Shaffer,
Henry Marshall,
William Erwin.

RECEIPTS AT OFFICE

OF THE

CHIEF ENGINEER

AND

DETAILED EXPENDITURES

OF THE

WATER DEPARTMENT

FOR

1882.

REVENUE AND EXPENDITURES FROM ANNUAL AND SPECIAL APPROPRIATIONS AND LOANS.

Engineers.	Year.	Receipts Itemized—Registrar's Department.											Expenditures.				Per cent. of Expenditures on Basis of Revenue.	Revenue in Excess of Expenditures.	Expenditures in Excess of Revenue.	Revenue less the Annual and Special Appropriations, considered as Profits.
		Delinquent Water Rents.	Delinquent Penalties.	Water Rents.	Penalties.	Fractional Rents.	Water Pipes.	Total.	Chief Engineer's Office.	Total.	Liens for Water Pipe collected by the City Solicitor as per Controller's Reports.	Total Revenue.	Annual Appropriations.	Special Appropriations.	Loans for Construction.	Total Expenditures.				
Frederick Graff	1855	$1,053 49	.....	$327,383 75	$7,734 60	$24,262 54	$20,975 79	$381,410 17	$626 55	$382,036 72	.....	$382,036 72	$168,765 22	$79,460 87	.....	$248,226 09	65	$133,810 63	.....	$133,810 63
Samuel Ogden	1856	$1,214 18	.....	$350,329 78	$7,136 52	$24,279 63	$31,405 69	$414,365 80	$960 11	$415,325 91	.....	$415,325 91	$139,293 60	$21,174 42	.....	$160,468 02	39	$254,857 89	.....	$254,857 89
	1857	3,785 75	$554 61	363,262 72	6,966 88	20,229 88	30,676 27	425,476 11	302 20	425,778 31	.....	425,778 31	177,502 04	23,150 96	.....	200,653 00	47	225,125 31	.....	225,125 31
	Total	$4,999 93	$554,61	$713,592 50	$14,103 40	$44,509 51	$62,081 96	$839,841 91	$1,262 31	$841,104 22	.....	$841,104 22	$316,795 64	$44,325 38	.....	$361,121 02	43	$479,983 20	.....	$479,983 20
Henry P. M. Birkenbine	1858	$10,323 20	$1,444 77	$381,740 31	$8,086 30	$18,793 83	$37,130 07	$457,518 48	$129 75	$457,648 23	.....	$457,648 23	$175,016 86	$12,961 23	.....	$187,978 09	41	$269,670 14	.....	$269,670 14
	1859	4,824 21	723,63	450,083 52	7,132 48	17,537 29	67,834 04	548,135 17	3,051 89	551,187 06	.....	551,187 06	194,828 44	30,258 59	$186,650 06	411,737 09	75	139,449 97	.....	326,100 03
	1860	6,806 81	1,021 02	461,836 15	7,468 26	17,291 98	62,697 54	557,121 76	1,409 77	558,531 53	.....	558,531 53	193,555 24	4,767 45	54,209 85	252,532 54	45	305,998 99	.....	360,208 84
	1861	4,792 16	718 82	471,562 25	8,552 47	12,973 70	34,495 36	533,094 76	885 30	533,980 06	.....	533,980 06	161,200 36	1,485 90	76,342 11	239,028 37	45	294,951 69	.....	371,293 80
	Total	$26,746 38	$3,908 24	$1,765,222 23	$31,239 51	$66,596 80	$202,157 01	$2,095,870 17	$5,476 71	$2,101,346 88	.....	$2,101,346 88	$724,600 90	$49,473 17	$317,202 02	$1,091,276 09	52	$1,010,070 79	.....	$1,327,272 81
Isaac S. Cassin	1862	$10,751 62	$1,110 92	$483,482 39	$6,564 76	$14,693 24	$28,164 31	$544,767 24	$1,025 82	$545,793 06	*	$545,793 06	$156,408 08	$20,863 61	$40,694 49	$217,966 18	40	$327,826 88	.....	$368,521 37
	1863	11,476 50	1,338 55	500,940 15	6,179 03	18,091 35	30,715 02	568,740 60	937 69	569,678 29	$16,544 21	586,222 50	193,691 38	17,069 54	2,989 28	213,750 20	36	372,472 30	.....	375,461 58
	Total	$22,228 12	$2,449 47	$984,422 54	$12,743 79	$32,784 59	$58,879 33	$1,113,507 84	$1,963 51	$1,115,471 35	$16,544 21	$1,132,015 56	$350,099 46	$37,933 15	$43,683 77	$431,716 38	38	$700,299 18	.....	$743,982 95
Henry P. M. Birkenbine	1864	$18,448 88	$2,165 25	$542,226 06	$6,679 42	$17,459 10	$22,278 57	$609,257 28	$855 29	$610,112 57	$13,535 22	$623,647 79	$253,975 75	$10,380 85	$15,393 72	$279,750 32	45	$343,897 47	.....	359,291 19
	1865	10,730 75	1,230 03	562,451 64	7,024 91	14,309 07	34,141 07	629,887 47	6,500 95	636,388 42	7,564 68	643,953 10	274,765 20	13,857 80	133,093 87	421,716 87	65	222,236 23	.....	355,330 10
	1866	17,737 30	2,125 92	584,197 78	9,167 02	21,035 82	32,031 11	666,294 95	3,927 18	670,222 13	12,190 21	682,412 34	267,425 25	10,572 53	453,086 18	731,083 96	107	.....	$48,671 62	404,414 56
	Total	$46,916 93	$5,521 20	$1,688,875 48	$22,871 35	$52,803 99	$88,450 75	$1,905,439 70	$11,283 42	$1,916,723 12	$33,290 11	$1,950,013 23	$796,166 20	$34,811 18	$601,573 77	$1,432,551 15	73	$566,133 70	$48,671 62	$1,119,035 85
Frederick Graff	1867	$18,228 62	$2,279 55	$621,740 55	$11,532 31	$30,840 03	$76,938 39	$761,559 45	$5,891 44	$767,450 89	$7,892 28	$775,343 17	$322,935 30	$37,571 12	$215,324 95	$575,831 37	74	$199,511 80	.....	$414,836 75
	1868	9,364 50	986 14	647,491 30	11,149 04	38,655 75	64,959 03	772,605 76	4,404 83	777,010 59	18,549 86	795,560 45	301,845 27	86,777 44	413,844 75	802,467 46	101	.....	$6,907 01	406,937 74
	1869	17,656 50	1,929 10	670,698 75	12,184 94	44,973 88	61,065 06	808,508 23	4,962 60	813,470 83	16,389 90	829,860 73	388,744 29	52,499 47	468,521 35	909,765 11	110	.....	79,904 38	388,616 97
	1870	21,777 00	2,511 45	724,881 13	14,727 10	46,820 15	117,319 12	928,035 95	7,335 01	935,370 96	11,959 82	947,330 78	445,949 54	2,657 29	695,448 67	1,144,055 50	121	.....	196,724 72	498,723 95
	1871	21,276 25	2,467 37	769,206 00	15,917 99	51,071 45	96,110 98	956,050 04	7,184 04	963,234 08	14,764 47	977,998 55	439,406 35	5,857 85	623,929 20	1,069,193 40	109	.....	91,194 85	532,734 35
	1872	22,138 00	2,188 59	815,982 50	17,014 05	54,467 01	131,822 96	1,043,613 11	10,668 40	1,054,281 51	20,921 96	1,075,203 47	471,219 80	10,218 35	582,138 13	1,063,576 28	99	11,627 19	.....	593,775 32
	Total	$110,440 87	$12,362 20	$4,250,000 23	$82,525 43	$266,828 27	$548,215 54	$5,270,372 54	$40,446 32	$5,310,818 86	$90,478 29	$5,401,297 15	$2,370,100 55	$195,581 52	$2,999,207 05	$5,564,889 12	103	$211,138 99	$374,730 96	$2,835,615 08
Wm. H. McFadden	1873	$22,705 50	$2,824 93	$865,696 50	$18,095 73	$51,974 12	$116,997 17	$1,078,293 95	$4,691 06	$1,082,985 01	$26,601 71	$1,109,586 72	$532,598 62	$1,663 96	$1,030,068 03	$1,564,330 61	141	.....	$454,743 89	$575,324 14
	1874	31,064 25	4,483 02	909,899 50	18,434 48	60,108 56	198,896 99	1,222,886 80	6,994 58	1,229,881 38	31,130 17	1,261,011 55	688,006 89	2,518 92	534,576 27	1,225,102 08	97	$35,909 47	.....	570,485 74
	1875	23,106 25	3,329 93	938,357 25	17,625 52	54,667 66	123,258 53	1,160,345 14	9,321 14	1,169,666 28	65,870 28	1,235,536 56	674,693 51	35,139 56	228,503 67	938,336 74	76	297,199 82	.....	525,703 49
	1876	31,971 75	4,324 91	970,814 25	17,202 85	54,711 96	115,034 27	1,194,059 99	5,694 98	1,199,754 97	52,259 95	1,252,014 92	713,518 08	11,189 83	376,375 96	1,101,083 87	88	150,931 05	.....	527,307 01
	1877	62,104 75	7,957 45	1,008,248 60	16,309 65	53,470 48	73,253 88	1,221,344 81	6,636 29	1,227,981 10	56,233 57	1,284,214 67	484,613 87	3,058 18	183,177 83	670,849 88	52	613,364 79	.....	796,542 62
	1878	136,123 31	19,759 24	1,085,838 41	25,915 19	49,391 90	55,631 89	1,372,660 56	3,871 49	1,376,532 05	40,113 80	1,416,645 85	414,955 45	3,770 66	63,946 38	482,672 49	35	933,973 36	.....	997,919 74
	1879	118,234 15	17,439 36	1,186,001 69	22,931 31	40,516 70	31,235 92	1,416,359 13	2,819 94	1,419,179 07	46,445 94	1,465,625 01	438,884 72	4,808 96	.....	443,693 68	30	1,021,931 33	.....	1,021,931 33
	1880	112,728 37	16,783 11	1,218,925 66	19,002 35	48,038 07	26,077 90	1,441,555 46	4,786 07	1,446,341 53	38,015 53	1,484,357 06	386,962 12	2,568 14	1,170 35	390,700 61	26	1,093,656 45	.....	1,094,826 80
	1881	84,591 40	12,627 66	1,256,662 00	19,234 38	53,451 56	47,489 11	1,474,056 11	5,549 01	1,479,605 12	29,936 22	1,509,541 34	438,486 50	126,862 41	18,038 83	583,387 74	39	926,153 60	.....	944,192 43
	1882	78,543 01	11,479 18	1,295,419 87	18,016 23	49,529 90	34,979 52	1,487,967 71	7,515 88	1,495,483 59	21,421 05	1,516,904 64	564,044 34	53,834 02	43,080 09	660,958 45	44	855,946 19	.....	899,026 28
Receipts in 10 years	Total	$701,173 36	$101,008 79	$10,735,863 73	$192,767 69	$515,860 91	$822,855 18	$13,069,529 66	$57,880 44	$13,127,410 10	$408,028 22	$13,535,438 32	$5,336,764 10	$245,414 64	$2,478,937 41	$8,061,116 15	60	$5,929,066 06	$454,743 89	$7,953,259 58
Receipts in 18 years previous to 1873		$212,385 72	$24,795 72	$9,720,496 73	$171,218 08	$487,785 70	$980,760 38	$11,606,442 33	$61,058 82	$11,667,501 15	$140,312 61	$11,807,813 76	$4,726,527 97	$441,585 27	$3,961,666 61	$9,129,779 85	77	$3,101,436 49	$423,402 58	$6,639,700 52
Receipts in 28 years since 1855		$913,559 08	$125,804 51	$20,465,360 46	$363,985 77	$1,003,646 61	$1,803,615 56	$24,675,971 99	$118,939 26	$24,794,911 25	$548,340 83	$25,343,252 08	$10,063,292 07	$686,999 91	$6,440,604 02	$17,190,896 00	68	$9,030,502 55	$878,146 47	$14,592,960 10

* The liens for pipe frontage collected by the City Solicitor previous to 1873, are not obtainable.

REPORT.

—o—

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

GENTLEMEN:—For the tenth time I have the honor to submit the Annual Report of the Water Department, wherein will be found the operations of the works for the year ending December 31, 1882, their condition and the extensions so much needed to maintain an ample supply of water, and to make provision looking towards a future supply.

These demand your immediate and prompt attention and your earnest co-operation to avoid the calamity of a short supply.

In my judgment, one million dollars would not compensate for the loss sustained by one day's suspension of the City's industries for want of an adequate supply, not to speak of the inconveniences of a domestic and sanitary character, and its importance for safety in case of fire. Is it not, therefore, better to prevent by the proper use of the means at *your* command, than to remedy at such a fearful sacrifice?

Are not the people, who have paid during the last ten years a surplus over all expenditures of $5,474,322.17, entitled to an abundant supply of water, of an acceptable quality, which could be obtained by reservoirs at the proper elevation and of capacity for subsidence?

This surplus has been utilized in maintaining other departments and lessening the tax rate, while in my judgment the receipts should be appropriated so as to extend the present works and provide for the future.

In view of the large expenditures involved in the present and a future water supply, I would suggest that Councils associate four eminent citizens of experience and ability, in conjunction with the Chief Engineer, as an advisory Board, with

the functions of the Committee on Water in carrying out whatever may be determined upon by your legislative action.

These citizens could serve as a matter of honor or under a salary, and should combine official, legal, and commercial experience conjoined to that of civil and mechanical engineering.

RECEIPTS.

The receipts for 1882 were $1,495,483.59, of this sum $1,487,967.71 was collected at the office of the Registrar, and $7,515.88 at the office of the Chief Engineer.

The increase over 1881 is $15,878.47, of which sum $13,911.60 was collected under the Registrar, and $1,966.87 under the Chief Engineer.

REVENUE.

The revenue for 1882 was $1,516,904.64, which includes the above receipts of $1,495,483.59 and $21,421.05 collected by the City Solicitor from liens for water-pipe, as per his weekly and monthly returns reported to this Department. The amount of water-pipe liens collected for 1882 was $8,515.17 less than for 1881. The revenue for 1882 was $7,363.30 greater than for 1881.

The itemized table of revenue and expenditures from annual and special appropriations and loans, shows—

		Expenditures.
Total revenue in 28 years, 1855–1882, was	$25,343,252.08	$17,190,896.00
" " " 18 " 1855–1872, "	11,807,813.76	9,129,779.85
" " " 10 " 1873–1882, "	$13,535,438.32	$8,061,116.15

The average per centage expenditures on the basis of receipts in 28 years, 1855–1882, 68 per cent.

The average per centage expenditures on the basis of receipts in 18 years, 1855–1872, 77 per cent.

The average per centage expenditures on the basis of receipts in 10 years, 1873–1882, 60 per cent.

The revenue since 1872 has been increased over 41 per cent.,

or from $1,075,203.47 in 1872, to $1,516,904.64 for 1882. The expenditures since 1872 have been decreased nearly 39 per cent., or from $1,063,576.28 in 1872, to $660,958.45 for 1882. Of this there was expended $75,510.75 for new work, construction or additions to the plants, while in 1872 there was expended for new work, for construction, or additions to plants, $547,153.20.

EXPENDITURES IN 1882.

Annual appropriation of January 5, 1882			$567,990 00
October 1, 1882, transfer from Item 1, Lighting City, Gas Department			5,000 00
			$572,990 00
June 15, 1882, transfer to Ice Boats and Coroner			250 00
			$572,740 00
From annual appropriation for maintenance		$379,646 94	
" " " Item 18, "		4,502 53	
" special " refunds		1,544 72	
			$385,694 9
" annual " for distribution		$161,245 68	
" special " " "		43,611 35	
" " " " "		2,009 99	
" Loans		12,534 67	
		$219,401 69	
Less Item 18, wages, Cherry street shop, to maintenance	$4,502 53		
And construction for distribution	12,881 84		
" " " works	2,263 81		
		19,648 18	199,753 51
From annual appropriation for construction	$23,151 72		
From special appropriation for construction	6,667 96		
From loans appropriation for construction	30,545 42		
	$60,365 10		
From Item 18, annual appropriation	15,145 65		
			75,510 75
Total expended in 1882			$660,958 45

Total receipts for 1882	$1,495,483 59
" expenditures for 1882	660,958 45
Receipts in excess of expenditures	$834,525 14
Total receipts for 1882	$1,495,483 59
Less expended from annual and special appropriat'ns.	617,878 36
Profit for 1882	$877,605 23
Add water-pipe liens collected by City Solicitor	21,421 05
Revenue in excess of expenditures	$899,026 28

SUMMARY OF EXPENDITURES FOR 1882.

Salaries of engineering bureau		$18,400 00	
" " registry "		26,855 00	
" at pumping stations		60,564 76	
			$105,849 76
Supplies—coal and wood		$99,999 85	
" " " deficiency		39,999 96	
" tallow, oil, and gas		9,997 48	
" small stores		4,275 97	
			$154,273 26
Repairs—machinery at works for materials	$19,976 89		
Repairs — distribution pipes, plugs, etc., materials	995 51		
Repairs — buildings, grounds, and reservoirs	13,846 65		
		$34,819 05	
Repairs—machinery at works, for wages	$15,543 79		
Repairs—distribution pipes, etc., for wages	28,091 85		
Repairs — buildings, grounds, and reservoirs, for wages	7,331 74		
		50,967 38	
			85,786 43
Repairs—buildings, grounds, and reservoirs, salaries			22,389 27
Incidentals—books, stationery, printing, etc.		$5,005 06	
" fuel, ice, rents, etc., for office		4,943 16	
" carriage hire, Chief, assistant, and superintendent		1,400 00	
			11,348 22

Item 18, shop wages	$19,648 18	
Less for fitting up done for construction	15,145 65	
		$4,502 53
For maintenance, from annual appropriation		$384,149 47
" " " special " refunds		1,544 72
Total expended for maintenance		$385,694 19

DISTRIBUTION.

Drills	$9,476 37	
Pipes, castings, materials, and fittings, etc.	73,250 00	
Labor, laying pipes and shop roll (wages)	51,494 01	
Pipe laying, roll (salaries)	27,025 30	
		$161,245 68
From specials, for distribution	$25,973 16	
" loans, " "	12,534 67	
	$38,507 83	

CONSTRUCTION.

From annual appropriation		23,151 72
" special "	$6,667 96	
" loans	30,545 42	
		$570,091 59
Less expended from special appropriation, refunds	$1,544 72	
Less expended from Item 18, in maintenance	4,502 53	
		6,047 25
		$564,044 34
Amount merged from annual $5,873 42, and not merging Item 20, $2,822 24		8,695 66
Annual appropriation		$572,740 00

The expenditures for maintenance was $385,694.19, or nearly 25½ per cent. of the revenue of the Department, and the expenditure for distribution was $199,753.51, or a little over 13 per cent. of the revenue.

The expenditures are classified as follows:

For salaries fixed by Councils (salary rolls and B. G. and Res)	$155,264 33
For supplies coal, wood, incidentals, and repairs, pipes, etc., under contract	386,053 69
For wages, mechanics and laborers, rated by Councils (shops and repairs)	118,095 71
For refunds, paid by warrants	1,544 72
	$660,958 45

The surplus revenue has more than liquidated all loans provided for the use of the Department. If the water furnished gratuitously for all public purposes, including fire protection; and to charitable institutions at 15 per cent. of the schedule rates, was paid for at legal rates, these sums would meet the interest on the cost of the plant.

The water rates in Philadelphia are as low as any city in the world, and a greater quantity of water is pumped than in any city, London and Paris alone excepted.

These low rates for water inure to the benefit of the citizens in accordance with the theory upon which the Water Works were established.

This theory was not to make the Water Works a source of profit, but to be self-sustaining, and the application of the surplus revenue to extensions, in order to secure and maintain an abundant supply of the best quality, and in quantity equal to the rapidly-growing demands of such a municipality.

If legislation were such as to operate this Department within its own sphere of action, there would be ample means from its own resources to obtain the end in view. A so much needed supply of wholesome water subsided so as to be acceptable to the most fastidious. This would be carrying out the true and correct theory, but, of course, it would not enable other departments to draw their sustenance from this, nor would it permit of the reduction of taxation, which has been done to the extent of the surplus furnished by this Department, which has, in the last ten years, amounted to

$5,474,322.17, or an average of $547,432.21 per annum; ample for judicious extensions and construction if applied year by year.

COMPARATIVE STATEMENTS.

In 28 years, 1855–1882, Revenue.....	$25,343,252 08
In 18 years, 1855–1872, "	11,807,813 76
In 10 years, 1873–1882, "	$13,535,438 32
In 28 years, 1855–1882, Expenditures.....	$17,190,896 00
In 18 years, 1855–1872, "	9,129,779 85
In 10 years, 1873–1882, "	$8,061,116 15

In 28 years, 1855–1882, The expenditures on the basis of revenue was 68 per cent.
In 18 years, 1855–1872, The expenditures on the basis of revenue was 77 per cent.
In 10 years, 1873–1882, The expenditures on the basis of revenue was 60 per cent.

In 28 years, 1855–1882, The quantity of water pumped by steam power, 100 feet high, was.....	287,910,247,143
In 18 years, 1855–1872, The quantity of water pumped by steam power, 100 feet high, was.....	97,182,011,225
In 10 years, 1873–1882, The quantity of water pumped by steam power, 100 feet high, was.....	190,728,235,918
In 28 years, 1855–1882, The quantity of water pumped by water power, 100 feet high, was.....	182,393,609,671
In 18 years, 1855–1872, The quantity of water pumped by water power, 100 feet high, was.....	100,115,624,031
In 10 years, 1873–1882, The quantity of water pumped by water power, 100 feet high, was.....	82,277,985,640

In 28 years, 1855–1882, Cost to maintain the steam pumpage...	$4,408,398 08
In 18 years, 1855–1872, Cost to maintain the steam pumpage...	1,833,299 74
In 10 years, 1873–1882, Cost to maintain the steam pumpage...	$2,575,098 34

In 28 years, 1855–1882, Cost to maintain the water pumpage...	$1,541,371 04
In 18 years, 1855–1872, Cost to maintain the water pumpage...	897,318 34
In 10 years, 1873–1882, Cost to maintain the water pumpage...	$644,052 70

In 28 years, 1855–1882, Average quantity of coal per million, 100 feet high, for steam was 1.04 tons.
In 18 years, 1855–1872, Average quantity of coal per million, 100 feet high, for steam was 1.27 tons.
In 10 years, 1873–1882, Average quantity of coal per million, 100 feet high, for steam was 0.92 tons.

In 28 years, 1855–1882, The expense of pumpage by steam per million, 100 feet high, was....	$15 52
In 18 years, 1855–1872, The expense of pumpage by steam per million, 100 feet high, was....	18 92
In 10 years, 1873–1882, The expense of pumpage by steam per million, 100 feet high, was....	13 52
In 28 years, 1855–1882, The expense of pumpage by water per million, 100 feet high, was....	8 16
In 18 years, 1855–1872, The expense of pumpage by water per million, 100 feet high, was....	8 90
In 10 years, 1873–1882, The expense of pumpage by water per million, 100 feet high, was....	7 78

Previous to 1855 (Consolidation)

	Pounds.	Feet.	Miles.	Feet.
Pipe handled.....	58,195,359 =	1,314,230 =	248 —	4,790
Pipe taken out.....	94,530 =	6,302 =	1 —	1,022
Pipe added, in the ground	58,100,829 =	1,307,828 =	247 —	3,768

In 28 years, 1855–1882, Pipe handled.....	153,251,216	= 3,071,001	= 581 —	3,321
In 18 years, 1855–1872, Pipe handled.....	86,045,684	= 1,721,717	= 326 —	437
In 10 years, 1873–1882.....	67,205,532	= 1,349,284	= 255 —	2,884

In 28 years, 1855–1882, The cost per 100 pounds of pipe handled (153,251,216)..... ..... $4 54

In 18 years, 1855–1872, The cost per 100 pounds of pipe handled (86,045,684)..... 4 55

In 10 years, 1873–1882, The cost per 100 pounds of pipe handled (67,205,532)..... 4 52

In 28 years, 1855–1882, The cost (including Germantown and Chestnut Hill cost as pipe) to lay 153,251,216 pounds, and to maintain 58,195,359 pounds, $6,881,318.86, or $3.25 per 100.

In 18 years, 1855–1872, The cost (including Germantown) to lay 86,045,684 pounds, and to maintain 211,446,575 pounds, $3,915,706.11, or $1.31 per 100.

In 10 years, 1873–1882, The cost (including Chestnut Hill) to lay 67,205,232 pounds, and to maintain 297,492,259 pounds, $2,965,612.75, or 0.81 per 100.

In 28 years, 1855–1882, The cost per 100 pounds to lay was $3.25, and to maintain per 100 pounds, $1.29 = $4.54.

In 18 years, 1855–1872, The cost per 100 pounds to lay was $3.23, and to maintain per 100 pounds, $1.32 = $4.55.

In 10 years, 1873–1882, The cost per 100 pounds to lay was $3.59, and to maintain per 100 pounds, $0.93 = $4.52.

		Per mil. gals. 100 ft. high.
In 28 years, 1855–1882, Expense to maintain the works..	$5,949,769 12	$12 65
In 18 years, 1855–1872, Expense to maintain the works..	2,730,618 08	13 84

In 10 years, 1873–1882, Expense to maintain the works..	$3,219,151 04	$11 79
In 28 years, 1855–1882, Expenditures of all kinds, except interest.....	17,190,896 00	36 55
In 18 years, 1855–1872. Expenditures of all kinds, except interest.....	9,129,779 85	46 27
In 10 years, 1873–1882, Expenditures of all kinds, except interest.....	8,061,116 15	29 52
In 28 years, 1855–1882, Cost of distribution	6,702,866 31	
In 18 years, 1855–1872, " "	3,802,253 56	
In 10 years, 1873–1882, " "	2,900,612 75	
In 28 years, 1855–1882, Cost of machinery —construction— plant.....	1,520,315 15	
In 18 years, 1855–1872, Cost of machinery —construction— plant.....	1,155,985 86	
In 10 years, 1873–1882, Cost of machinery —construction— plant.....	364,329 29	
In 28 years, 1855–1882, Cost of buildings, grounds, and reservoirs.....	2,984,800 05	
In 18 years, 1855–1872, Cost of buildings, grounds, and reservoirs.....	1,425,943 11	
In 10 years, 1873–1882, Cost of buildings, grounds, and reservoir.....	1,558,856 94	
In 28 years, 1855–1882, Cost of incidentals..	33,145 37	
In 18 years, 1855–1872, " " ..	14,979 24	
In 10 years, 1873–1882, " " ..	18,166 13	

In 28 years, 1855–1882, Average price per ton of coal, $4.80 × 1.04 per cent. = $5.00 per million, 100 feet high.

In 18 years, 1855–1872, Average price per ton of coal, $5.32 × 1.27 per cent. = $6.76 per million, 100 feet high.

In 10 years, 1873–1882, Average price per ton of coal, $4.44 × 0.92 per cent. = $4.09 per million, 100 feet high.

CHERRY STREET SHOP.

I can only reiterate what I said in previous reports. The Cherry Street Shop is a valuable adjunct to the Department, in that it gives such control of the employees as enables to have done with promptness and despatch the repairs to the machinery at the Works, to the pipes, plugs, valves, etc., in the distribution, and in the fitting up of fire-plugs, stops, etc

This shop should be moved to the neighborhood of the Spring Garden Works, a location central to all the pumping stations, with railroad facilities to each of them. From this location, by the Pennsylvania Railroad, the Frankford Works can be easily reached by men, and with material; by the Philadelphia and Reading Railroad, the Belmont, and Roxborough, and Chestnut Hill Works, and Frankford, and Roxborough Basins; and the Delaware Works can be reached by the Girard Avenue Passenger Railway, and also the Delaware Basin; while Fairmount is but a short mile below on the River Schuylkill. An enlarged shop should be located on the north side of Girard avenue, extending to and bounded by the Philadelphia and Reading Railroad, with its level on the plane of the Philadelphia and Reading Railroad. An elevated railroad should be built over the ravine at the Spring Garden Works, and over the Philadelphia and Reading Railroad from Girard avenue to the high ground north of the Connecting Railroad, while the ground below could be utilized for shop and storage purposes, without being an eye-sore to the beauties of the Park. Instead of this mode, the ravine is to be filled up to a level with Girard avenue, of which I cannot approve. On this location, a propersized shop, with larger and better tools, and facilities should be provided for the constantly increasing demands made upon us to keep in repair and to maintain in good order the machinery and pipes under the care of the Department.

TELEGRAPH.

The number of messages sent from this office in 1882 was 2,596, and the number received was 2,483; a total of 5,079. Of these, 211 referred to leaks, breaks in pipe, and plugs out of order after service in a fire.

A year or so ago, I tried to have telephonic connections with all the works, basins, offices, etc., but this was denied me; though such facilities are a necessity, and should be provided as soon as possible.

THE SUPPLY.

The supply during 1882 has been very good, though the machinery has been taxed to its utmost capacity. The equable flow of the Schuylkill River enabled a pumpage by water power 24 per cent. greater, and during the summer months three times as much as in 1881.

Germantown suffered until its citizens were requested to use the water only for household purposes, and not for irrigation.

The cause of the short supply upon the high grounds was the draught made upon the small mains by those living on the low grounds exhausting it for irrigation. When this was checked complaints ceased, though the supply was not such as consumers deserve, nor such as the City should furnish.

MACHINERY.

The machinery in the department is not capable of doing as good duty as that provided with the latest improvements.

The average amount of coal required the last ten years was ninety two hundredths of a ton, at an average of $4.44 per ton, to raise one million gallons 100 feet high.

The cost for coal consumed for steam pumpage in 1882 was $123,831.50, at an average of $4.48 per ton. This could be reduced to half a ton a million gallons 100 feet high by

the substitution of high duty engines, and the consumption of coal reduced in proportion.

This would save the interest on a million dollars on the present pumpage.

This proves that it would pay the City to make such improvements, although the high duty engines would command a greater first cost and demand higher salaries for the engineers to manage, whose pay is now lower than at any works with which they can be compared.

This reduction in the consumption of coal would make the ratio of the distribution of a million gallons 100 feet high for 1882, as $5.32 for water power is to $9.35 for steam power, excluding the interest on plant. The ratio for the past ten years is as $13.52 for steam is to $7.78 for water power.

THE SUBMERGED MAIN.

The submerged 36-inch main on the bed of the Schuylkill river, which connects the Belmont Pumping Station with the Spring Garden Works, and supplied the high ground east of the river, is out of use. A leak was discovered early in January, and an examination of the pumping records point to the commencement of the trouble about the middle of December.

New stops were put in on each side of the river, and as soon as possible the pipe must be repaired, as the machinery at Belmont will be needed to supply east of the river.

The new boilers at the Roxborough works will enable both engines to be run and provide more water to Mount Airy basin and Germantown.

PUMPAGE.

The items, excluding interest on plant, entering into the expense of pumpage, common both to that by water power and by steam, have never heretofore been recognized in any

of the reports of the department, they including only those items wherein steam and water power pumpage differed, giving the impression that a water power pumpage supply was cheaper than by steam power in the ratio of one to four for steam, whereas by the above method, now introduced for the first time, those items of expense common to both water power and steam pumpage are included, and is treated as would any manufacturer in determining the expense of producing any article.

The interest on the plant is alone excepted, which when included, being so much greater in a plant operated by water power than one by steam, that a ratio of equality is established beyond a doubt, and steam has the advantage of reliability, not being subject to the variations of rainfall, and consequent droughts and floods.

THE GREAT STORM

of September 20th–23d, caused slides in the banks at the Fairmount, Delaware, and Frankford basins. There was no money to make these repairs. Councils were asked to appropriate $5,000, which was done by transfer to Item 15, buildings, grounds, and reservoirs, from Gas Department, Item 1, for furnishing gas to and lighting the City.

After advertising and receipt of proposals, the contract for the repairs at the Fairmount and Delaware basins was awarded to H. Brocklehurst, not to exceed $3,000, subject to a less sum if the measurement at the specific rates in his bid justified.

It was contemplated to repair the Frankford basin with House of Correction labor, the department to sustain, shelter, and transport the men weekly to and fro. When the department proposed to put up a shanty and called for carpenters they had not the men to furnish, meanwhile it became too late to do such work and the small amount involved, it was deemed best to postpone it until the spring of 1883, and it

was thought it could not be done with advantage to the City, under the circumstances, with the labor of the House of Correction. An effort was made to have a specific item for this work, but this was not approved by Councils, and none has been provided in the appropriation for 1883.

RAINFALL.

Heretofore the rainfall, as noted at the Pennsylvania Hospital, Eighth and Pine streets, has been taken as the measure of the water power of the Schuylkill. This must be abandoned, as most of the rainfall of Philadelphia drains into the Delaware and the Schuylkill below the dam at Fairmount.

No better illustration can demonstrate this than the rainfall of September 20–23, 1882, which was 11.765 inches at Philadelphia, while the rainfall of September 21st and 22d at Pottstown was 3.84, Reading 2.09, and Lebanon 0.65, an average for these places of only 2.19 inches. Also, the rainfall in October, November, and December, at Philadelphia, gave a monthly average of 1.44 inches, while the monthly average at Lebanon was 1.52, at Reading 1.76, and Pottstown 1.41.

The rainfall for the first half of 1881 was 23.31 inches at Lebanon, 25.95 at Reading, and 25.34 at Pottstown, which cities are in the valley of the Schuylkill, and is the measure of the value of the stream as a power to drive the wheels at Fairmount.

The rainfall for the last half of 1881 was 12.77 inches at Lebanon, 14.34 at Reading, and 14.12 at Pottstown. This gave the minimum flow of 1881, as determined by Edwin F. Smith, a careful observer, familiar and experienced with the subject, as 170,000,000 gallons per twenty-four hours as against 245,000,000 in 1874.

This was proved correct by the amount pumped and that used for power, lockage, leakage, etc. as the entire flow was used.

The rainfall for the first half of 1882 was 24.93 inches at Lebanon, 24.50 at Reading, and 24.82 at Pottstown.

For the last half of 1882 it was 16.06 inches at Lebanon, 15.39 at Reading, and 17.72 at Pottstown, an average of 2.55 inches more, or nearly 20 per cent. greater for the last six months of 1882 than the last six of 1881.

The average of these places for the first six months of 1882 was 24.75 inches as compared with 24.87 inches in 1881; yet the average pumpage for the first half of 1882 was greater than any in the history of the Department, and amounted to two-thirds of the greatest pumpage of any year, being over six billion gallons. This was due to the equable flow of the river, which depends upon the rainfall in the water shed of the Schuylkill, and we have only the rainfall of these three places whereby to judge, though fuller data would be desirable, yet this is a sufficient guide for such comparisons.

While the rainfall for the first half of 1881 was a little greater than for 1882, yet the water power pumpage for the first half of 1882 was 20 per cent. greater, the number of rainy days about the same; but the equable flow of the river explains this phenomenon.

THE POLLUTION OF RIVERS.

To prevent is better and cheaper than to cure. The dry climatic condition of the Atlantic slopes warns us to cease sowing the seeds of our own destruction, which we are rapidly doing in not passing legislative enactments compelling the utilization of the sewage, the refuse of the factories, and thereby prevent the pollution of streams upon which we are are and must be dependent for our supplies of water.

Water courses are to the planatary body what the arteries are in the human body.

Who would think of injecting into our blood impurities? Why then throw impurities into the streams? All the reme-

dies suggested in the different methods of getting rid of sewage are but temporary and expensive expedients. The costly improvements of the Thames embankment are already failing to do what was intended. The tide is carrying the sewage up to the City again, when the embankment was constructed to carry it out to sea, with the hope that it would not return. But the most injurious particles being of a lighter specific gravity than sea-water, are brought back by the returning tide.

This case should warn us that art in remedying is a costly mistress, while nature, our good mother, craves us to utilize the sewage and with it enrich her, and directs us not to waste nor pollute, but to nourish and restore the worn out and barren places. The introduction of the method of utilization may not be economic at first, but it is in the right direction and will become cheaper year by year, and the product will grow more valuable as a fertilizer.

QUALITY.

In July, 1882, the citizens of Pottstown, 40 miles from Philadelphia, became alarmed at the condition of the river, whence comes their supply of water; its color varying between a marine green and a marine blue, with white soap-sudsy splotches floating on its surface. Fish in great numbers, both large and small, died, and those living escaped by heading down stream, and seeking the rivulets entering the river.

As this condition of the river is of yearly occurrence above Reading, no apprehension was caused, yet it was a matter of much interest to allay the alarm of the inexperienced, and, if possible, determine the reason for such a condition of the water, on which so many people and industries depended.

A personal examination was made at Pottstown and at Pottsville, when the causes and the reasons therefore were soon ascertained.

Through the courtesy of the Philadelphia and Reading Railroad Company, much valuable time was saved. Important facts were obtained from the officers of the company and citizens of Pottsville, especially from Messrs. Whiting, Chief Engineer Reading Coal and Iron Company; H. Nichols, Civil Engiņer; Messrs. Zulich & Hewes, the latter with his thirty-five years' experience in the coal measures, and Edwin F. Smith, Chief Engineer of the Schuylkill Canals, and his father, James F. Smith, Consulting Engineer, with his experience of over twenty-five years on the Schuylkill river.

In the last half of 1881, there was a small average rainfall, 13.74 inches. The consequent dry atmosphere comminuted the cubes of iron pyrites, increased their surfaces, and exposed them to the heavy rainfall, 24.75 inches of the first half of 1882. This heavy rainfall in the coal measures compelled greater pumpage of the mines, and the acidulated water, in the Little Schuylkill especially, was thereby increased. The comparatively small rainfall in the lime measures did not permit the neutralization, which usually takes place at Reading, until the acidulated water reached a point not lower than Stony Creek. The increased acid made the water softer, and the iron in solution made it a tonic, and not less potable, but in no sense injurious. So much for the condition of the river in July.

The ten dams and canals connected with them, from No. 7, at Schuylkill Haven, to No. 16, at Blue Mountains, were drawn by opening sluices between December 18th and 23d. The six dams between Blue Mountain dam and No. 22, North Reading, were not drawn.

On Nos. 23 and 24, below Reading, there was little ice, when drawn December 29, 1882, and January 1, 1883; and the canal levels, one 22 miles in length, connected with them were emptied December 16th. The five-mile level at Royer's Ford, which receives the drainage of the Spring City Wood

Paper Works, was emptied December 23d, and the four-mile level at Phœnixville December 22d. Dams No. 24 to Fairmount were not drawn. The ice on them was 2 to 5 inches thick. Ice commenced to form November 26th, and the obstruction was completed December 4th.

Four facts explain this condition of the river in December.

First. The rainfall of October, November, and December was $4\frac{1}{2}$ inches, half the usual average.

Second. The discharge by sluices from the canals and dams of their accumulated vegetable sediment, refuse of factories, and sewage.

Third. The formation of ice on the river, converting it into a closed channel, and excluding—

Fourth. The ventilation of the water, retarding its flow, and concentrating its impurities, excluding the air, preventing its oxidation, and shutting out the sunlight, one of the most powerful agents in nature, whose influence we may not be able to determine; yet potent it must be as a purifier. We know that the oxygen of the air consumes the animal and vegetable impurities, and that the best test of the purity of water is the percentage of oxygen held in solution.

The chemical test for mineral and organic constituents must not be ignored, nor must we neglect the microscopic examinations to determine the fauna and flora, which differ in character, depending upon the percentage of oxygen held in solution.

The Delaware water supplied to Frankford from the Wentz Farm Reservoir during the latter part of September and October of 1882, was disagreeable both to taste and smell. The basin was drawn off, and the people supplied by direct pumpage without further complaint, though I am convinced, that the water contained decomposing vegetation causing the complaints, but immediate use and dilution did not permit its being perceptible. Had it been kept a few days it

would have developed the offensive odor and unpleasant taste which I attribute to a process, which though it may not be due to a ferment yet is due to oxydation, purifying the water. It becoming better and cooler after and perfectly safe as a potation. I deem it more injurious before than after the process whatever it may be.

Old sailors can tell of the working of Delaware water on ship board and of its superior quality after the process of fining.

Fishermen and gunners inform me that they can always detect when the vegetation of the marshes is decaying as the absorbed gases impregnate the water with the taste and smell complained of. May it be due to the decomposition of chlorophyle, the coloring matter of vegatation? Impounded water is liable from the vegetable and organic matter contained in it to what, to coin a term I would designate as "vegetable sewage" due to the decay and disintegration by oxydation of vegetation. In 1875, in company with the Board of Experts, when on a visit to Tumbling Run dam, near Pottsville, where the water is impounded for navigation purposes, upon entering the valley we were saluted with a most offensive smell and on drinking the water, with an unpleasant taste, the conclusion reached, was that the vegetation, such as leaves from the hill sides, accumulated in the water and settled to the bottom, and in time became water-logged and remained in this nascent condition until the oxygen of the air decomposed it and set free the sulphuretted hydrogen. No bubbles of gas were perceptible from the surface of the water. But may not this vegetable matter become so abundant at certain depths as to permit the oxygen held in solution to set up decomposition and the water to re-absorb enough of the gases generated to account for this taste and odor.

During the extreme hot weather of 1876, the water in the Delaware basin was of an impure character, doubtless im-

pregnated with the sewage from Gunner's Run, the foulest sewer in our city, and with the refuse of dung heaps stored on the adjoining wharves. A careful examination led to the conclusion that the impurities floated on the surface, and if excluded would remedy the trouble which was a jelly-like formation tinged with a greenish hue, though transparent as gelatine. In taste and smell exceedingly unpleasant and offensive, called by some the cucumber taste, by others earthy or putty taste.

To test this conjecture, a stout apron or hood made of plank well bolted together, was attached to the end of the wharf, and placed over the inlet to the forebay in which was the intake-pipe leading to the suction of the engine. This apron excluded the surface water, as it reached six feet below low tide, and from the bottom of the hood, a depth of twelve feet to rock bottom. This had a beneficial effect, for in a few days the water supplied was much better and all appearances of impurity vanished from the basin. While, perhaps, not justified in inferring this as cause and effect, yet I may claim the result as a consequent upon an antecedent. We have never since 1876, when the experiment was first made, had such complaints or trouble; though the hood does not exclude as perfectly as could be wished.

Water, like the earth, is a world in itself, with its mineral, vegetable, and animal constituents, subject to the same natural laws, such as specific gravity, etc., and that it will be found in strata on the vertical line, and the horizontal from shore to shore.

Matters in suspension are rarely infurious, though unsightly such as mud, silt, etc., these by the motion of water sink to the bottom and the injurious particles float on the surface, their specific gravity being lighter and they should be excluded.

The air oxydizes, consumes, and dissipates the gaseous exhalations degenerated from the impurities.

The oxygen in solution sets up decomposition. The germs of the zymotic diseases and of typhoid fever will be found on the surface of waters. The purest water is in the middle third of the depth. Wasting at the bottom of receptacles has a tendency to relieve the unpleasant taste and smell from decomposing vegetation, caused by water reabsorbing the gases, as it has a thirst for gases as solids have for liquids.

See appendix to Report of Experts, Water Supply, 1875, page 112, Booth & Garrets. As to what the ingredients are which contaminate drinking waters, I would not venture to say, inasmuch as our chemists and microscopists are unsettled upon this subject.

It is well worthy the highest attainments of science, and too serious not to deserve the most careful examination. The most critical and exhaustive efforts should be made to determine the causes, as upon our ability to remedy, and keep pure our supplies of water, depend not only the health, prosperity, and wealth of our largest cities, but also the determination of Engineering problems of the greatest importance. Many seek relief by going up stream, whereas in many instances the farther from home the worse they fare. Others seek relief in gravity supplies, yet with the costly experience of Boston New York, and Baltimore, it has become a mooted question both as to quantity for such a supply, and as to the quality of impounded water. January 3, 1883, the Baltimore supply from Jones' Fall was of such a character as to cause complaint, and Boston was in a condition no better, as her City Engineer and Water Board were seeking to know what could be done in the premises.

REDISTRICTING THE DISTRIBUTION.

That section of the City south of South street and west of Broad should be supplied by the Fairmount Basin.

That section south of South street and east of Broad should be supplied by the Corinthian Basin.

That section,—the old City proper,—between the rivers and Vine and South streets, and that north to Frankford creek, bounded eastwardly by the Delaware and northwestwardly by Broad street to Jefferson, thence east to Ninth street, thence north to Dauphin, thence east to Kensington avenue, and along it to Frankford creek, should be supplied by the Corinthian, Spring Garden and Delaware Basins—thus completing the first system or low levels.

The East Park Reservoir should supply these basins with subsided water.

That section—West Philadelphia—should be supplied by the Belmont Basin, and it should be restricted to that service.

That section east of the Schuylkill, bounded on the south by Spring Garden street, east by Broad, thence north to Jefferson, thence east to Ninth, thence north to Dauphin, thence east to North Pennsylvania Railroad, thence along the North Pennsylvania Railroad to the high grounds of Nicetown and Germantown, including the lower level of Manayunk, should be supplied by a basin located at Thirtieth and Cambria streets.

That section northeast of the North Pennsylvania Railroad, including Frankford, should be supplied from the Wentz Farm Basin, and connected with the other portion of the second system, completing the median levels.

That section comprising the high levels of Manayunk, Roxborough and Germantown should be supplied from the Roxborough and Mt. Airy Basins, completing the high level, or third system.

There are isolated areas at Frankford and Belmont in the median levels or second system, which in the future must be provided with auxiliary works similar to those at Chestnut Hill, Mt. Airy and Roxborough basins, which supply the isolated areas of the third system or high levels.

DIAGRAM Showing the DAILY PUMPAGE for the YEAR 1882.

JANUARY. FEBRUARY. MARCH. APRIL. MAY. JUNE. JULY. AUGUST. SEPTEMBER. OCTOBER. NOVEMBER. DECEMBER.

INCHES OF RAIN FALL

MILLION GALLONS PER DAY.

LEVEL OF FLASHBOARDS ON THE DAM

DEGREES FAHR.

LEGAL COMB OF FAIRMOUNT DAM

TOTAL OF STEAM AND WATER PUMPAGE

RED SHOWS AVERAGE WEEKLY PUMPAGE

AVERAGE DAILY PUMPAGE FOR THE YEAR 1882 67,647,782 GAL.

FAIRMOUNT PUMPAGE BY WATER

BELMONT PUMPAGE BY STEAM

DELAWARE PUMPAGE BY STEAM

FRANKFORD PUMPAGE BY STEAM

PUMPAGE DIAGRAM.

PUMPAGE DIAGRAM.

The Pumpage Diagram shows graphically the daily rainfall noted at the Pennsylvania Hospital, the noonday temperature at Fairmount, the number of days in which no water passed to waste over the flash boards, and the number of days when it did pass to waste. It shows also the daily pumpage at each of the works, the total daily pumpage of all the works, as well as the weekly average consumption of water, and the day and week of greatest and least pumpage, which is the only measure of the consumption of water that we have, and is good enough for all practical purposes. It contains data of great value, if understood. Taking the amount of water pumped at Fairmount, and equating into power that which runs to waste, it is not difficult to measure the flow of the entire river and its tributaries, and to determine the amount of water supplied by the water shed of the valley of the Schuylkill.

Engineers no longer calculate to utilize 40 per cent. of the rainfall, or 20 inches of what falls upon the water shed. The percentage basis of the rainfall for utilization misleads, and should be abandoned in such calculations. The assumption of English data and its application to this country has misled, however true and correct it may be in England, where a moist, humid atmosphere is due to the influence of the Gulf Stream. The oversight of the dry climatic influence operating upon the Atlantic slopes has misled American engineers heretofore; but the drought of 1881 awakened many to a realizing sense that in place of calculating upon 40 per cent. or 20 inches of rainfall as the amount that could be utilized, the most careful and closest observers and thinkers upon this subject have determined that only 20 per cent. or 10 inches can be relied on in years of minimum flow. Whether 20 inches or 10 inches of rainfall can be utilized, will solve the question of a gravity supply from the Perkiomen. My own judgment is

that the Perkiomen cannot furnish enough water for our City to justify the expense of a gravity supply. Although this may be true, yet it does not render impounding reservoirs on the Perkiomen valueless, as these could supplement the river in times of drought, and impurities excluded from the streams by legislation, nature would provide an aqueduct without cost in the channel of the river, and the steam works already and to be established would do the pumping at our doors. The water would be improved by its motion, subject to the influence of sun and air, and not liable to spoil in taste and smell, of which we have such complaints as come from Boston, Baltimore, and even New York, from impounded water. We have but to do our part in preventing the pollution of streams, and require legislation to restrain those so offending.

A gravity supply from the Delaware, 70 miles at least, in a direct line, would entail costly engineering difficulties, and when completed would leave us to contend with what every old sailor knows about, the "working" or "fining," when impounded, of the Delaware water, due to the vegetable and organic matter contained in it. It has three times as much organic matter as the Schuylkill, which has three times more mineral than the Delaware. The valley of the Schuylkill is like a chemist's laboratory, and by the processes of nature, furnishes an artificial water, as was illustrated July, 1882, by the chemical reaction of the mine water of the coal measures, and the lime water of the lime measures.

I had preferred not to give expression to these views until the experts had made their final report, when conjointly the authority might have been more impressive, but denied this privilege, I give them now for what they may be worth.

RECEIPTS AT CHIEF ENGINEER'S OFFICE.

Stone (Germantown District)		$5 00
Lead dross (Second District)		12 98
Old barrels, shop	$3 65	
Old barrels, Fairmount	29 30	
		32 95
Brass scrap and turnings, shop		605 30
Old iron, First District	$63 60	
Old iron, shop	1,240 98	
Old iron, Third District	269 47	
Old iron, Fourth District	831 13	
Old iron, Germantown District	55 00	
Old iron, Manayunk District	178 91	
Old iron, Spring Garden Works	126 27	
Old iron, Delaware Works	44 71	
		2,810 07
Overdrawn warrants		62 62
Rents		900 00
J. B. Lukens, privilege of cutting ice		25 00
Knickerbocker Ice Company, privilege of cutting ice		475 00
Mr. Heyer, 6″ stop		30 00
W. Wood & Co., iron pipe		150 56
B. P. & P. Steamship Co., repairs to stop box		9 84
Allison's Car Works, repairs to pipe		1 00
Public Building Commission, repairs to pipe		50 02
John Wanamaker, removing fire connection		59 24
St. Mark's Church, motor attachment		72 01
D. B. Cummings, removing fire-plug		43 13
P. J. McIntyre, removing fire-plug		20 40
Samuel Hart, removing fire-plug		52 09
Brush Electric Light Co., water connections		62 70
Pennsylvania Railroad, water connections		273 91
Presbyterian Orphanage, water connections		20 13
Thomas Dolan & Co., water connections		25 91
James Smith, fire attachment		1 60
Charles Theis, fire attachment		96 83
American Life Insurance Co., fire attachment		96 17
Bridesburg Manufacturing Co., fire attachment		116 57
Pennsylvania Railroad, fire attachment		298 84
William Beatty, fire attachment		72 29
James Ketcherman, fire attachment		65 17

Horner & Bro., fire attachment	62 37
Patterson Mills, fire attachment	82 59
W. Wood & Co., fire attachment	445 71
Wetherill & Bros., fire attachment	216 04
J. & B. Allen, fire attachment	24 20
City Trust, repairing plugs	137 64
	$7,515 88

DETAILED EXPENDITURES

—OF THE—

WATER DEPARTMENT

—FOR—

1882.

Detailed Expenditures of the Department for 1882.

General appropriations.	Appropriated.	Expended	Balance merging
An ordinance making an appropriation to the Department for Supplying the City with Water for the year 1882, approved January 5, 1882 ..... $567,990			
Oct. 1, 1882. Transfer from Item 1, Gas Department 5,000			
$572,990			
June 15, 1882. Transfer to Ice Boats and Coroner 250			
	$572,740 00		
Item 1—Engineering—Salaries	18,400 00		
Salary of Chief Engineer		$4,500 00	
" Chief clerk to Chief Engineer ...		1,800 00	
" Assistant " " ...		1,080 00	
" Three assistant engineers		5,400 00	
" Draughtsman		1,350 00	
" General superintendent of works		1,800 00	
" Clerk to general superintendent of works		850 00	
" Muster clerk		810 00	
" Telegraph operator		810 00	
		$18,400 00	
Item 4—Registering, collecting water rents, pipe frontage, etc.—Salaries	26,885 00		
Salary of Registrar		$2,500 00	
" Chief clerk of registrar		1,350 00	
" Receiving clerk		1,300 00	
" Permit "		1,080 00	
" Registering "		1,080 00	
" Two entry clerks		1,800 00	
" Four bill "		3,600 00	
" Pipe clerk (registering)		810 00	
" Fourteen inspectors		12,600 00	
" Messenger		765 00	
		$26,885 00	

General appropriations.	Appropriated.	Expended	Balance merging
PUMPAGE.			
Item 3—Salaries	$62,140 00		

Works.	Engineers.	Assistant Engineers.	Firemen.	Coal Passers.	Gaugemen.	Helpers.	Oilmen.			
Chestnut Hill	.....	1	1	.....	.....	.....	.....	.....	$1,275 00	
Frankford	1	1	2	.....	.....	.....	.....	.....	2,925 00	
Roxborough	2	.....	4	2	.....	.....	.....	}	6,345 00	
Aux. Manatawna	.....	1	.....	.....	.....	.....	.....			
Fairmount	2	9	.....	.....	.....	.....	.....	.....	7,849 12	
Delaware	2	.....	4	2	.....	1	4	.....	9,212 34	
Belmont	2	.....	10	4	2	.....	4	.....	15,219 23	
Schuylkill	2	.....	10	4	2	.....	8	.....	17,739 07	
									$60,564 76	$1,575 24

SUPPLIES.			
Item 9—Coal and wood	100,000 00		
Fairmount, 180 tons coal, at $4.75, contract	.....	855 00	
Frankford, 1,393.09 " " 4.60, "	.....	6,409 87	
Delaware, 1,745.10 " " 4.37, "	.....	7,627 82	
Roxbor'gh, 4,532.13 " " 4.39, "	.....	19,898 35	
Schuylkill, 5,900.08 " " 4.48, "	.....	26,433 79	
Belmont, 6,760.04 " " 4.23, "	.....	28,595 64	
Coal delivered in 1881.			
Roxbor'gh, 631.08 tons coal, at $4.33, contract	.....	2,753 96	
Schuylkill, 742.07 " " 4.44, "	.....	3,296 03	
Frankford, 623 " " 4.33, "	.....	2,697 59	
Fairmount, 176 " " 4.60, "	.....	809 60	
Chest. Hill, 135.04 " " 4.75, "	.....	642 20	
		$99,999 85	15

GENERAL APPROPRIATIONS.									Appropriated.	Expended.	Balance merging.
Lumber	19 61							138 12		157 73	
Repairs to jack		15 36								15 36	
Total	$475 83	$8,589 22	$3,835 42	$3,677 98	$177 31		$942 46	2,278 67		$19,976 89	
WAGES.											
Machinists and helpers	$991 23	$2,469 91	$2,557 47	$1,254 17	$88 75	$144 88	$851 37	$1,641 02		$9,998 80	
Bricklayers "	22 00	1,897 62	1,504 25	454 37			10 50	73 50		3,962 24	
Carpenters "				72 00						72 00	
Stone masons "		245 00		36 25						281 25	
Hauling		254 62	152 62	148 13				152 63		708 00	
Total	$1,013 23	$4,867 15	$4,214 34	$1,964 92	$88 75	$144 88	$861 87	$1,867 15		$15,022 29	
	$1,489 06	$13,456 37	$8,049 76	$5,642 90	$266 06	$144 88	$1,804 33	$4,145 82		$34,999 18	$0 82

General appropriations.	Appropriated.	Expended	Balance merging
Item 10—Tallow, oil and gas	$5,000 00		
20 lbs. lampblack, at 7c., contract		$1 40	
100 gals. castor oil, at 85c., contract		85 00	
291½ " lard oil, at 80c., contract		233 20	
2,983 " headlight oil, at 13c., contract		387 82	
2,494 " engine oil, at 18c., contract		449 10	
498½ " valvoline oil, at $1.25 contract		623 13	
2,480 " spermoleum oil, at 65c., contract		1,612 34	
7,361 lbs. tallow, at 8¼c., contract		607 32	
		$3,999 31	$1,000 69
Item 11—Gas at Works and Purveyor's office	6,000 00	5,998 17	1 83
Item 12—Small stores	5,000 00		
Leather, contract		2 75	
Repairs to wheelbarrows		13 25	
Pebbles, contract		26 94	
Gypsum		30 00	
Repairs to meters		35 39	
Tinware		46 74	
Lamps and lanterns, contract		79 20	
Paints, contract		297 61	
Brooms and brushes, contract		307 28	
Gasket, contract		472 68	
Cotton waste, contract		532 07	
Gum goods, contract		596 17	
Hardware, contract		711 56	
Packing, contract		1,124 33	
		$4,275 97	724 03

General appropriations.	Appropriated.	Expended	Balance merging
Item 14—Repairs to distribution	$30,000 00		
Lumber, contract		$29 41	
Plumbing		206 44	
Repaving around plugs, contract		759 61	
Wages—Works		521 50	
Shop pressure inspector		1,051 75	
Manayunk District		1,356 36	
Germantown "		1,530 99	
First "		4,793 75	
Second "		4,893 72	
Third "		6,190 21	
Fourth "		8,275 07	
		$29,608 86	$391 14
Item 15—Repairs to buildings, grounds, and reservoirs $18,500 00			
Transferred October 1, 1882, from Item 1, Gas Department 5,000 00			
	$23,500 00		
Transferred June 7, 1882, to new Item 23 1,000 00			
	$22,500 00		
Material—Repairs to scales		$29 75	
" Plumbing		33 30	
" Stone and masonry		42 58	
" Services of diver		60 00	
" Plate glass		76 11	
" Paper hanging		110 00	
" Iron wheelbarrows, contract		168 00	
" Calsomining at Delaw'e "		207 24	
" Hardware "		240 11	
" Tin roof, Schuylkill "		333 76	
" Repairs to roofs, spouts, etc		337 96	
" Lumber, contract		693 32	
" Bricks, lime and cement "		959 77	

General appropriations.	Appropriated.	Expended	Balance merging
Material—Repairs to tracks.....contract...	.....	$1,044 10	
" Coal bins at Belmont..... " ...	.....	1,245 05	
" Painting at works. ..... " ...	.....	1,484 10	
" Hauling ashes..... " ...	.....	1,836 00	
" Dredging..... " ...	.....	2,061 00	
" Repairs to Fairmount and Delaware basins.. " ...	.....	2,884 50	
		$13,846 65	
Wages—Engineer in charge, repairs to reservoirs	.....	110 00	
" Plasterer.....	.....	255 00	
" Painters.....	.....	683 50	
" Laborers	.....	791 00	
" Stone masons	.....	874 50	
" Carpenters.....	.....	1,214 00	
" Bricklayers..... ...	.....	1,534 74	
" Hauling supplies and coal to Roxborough aux	.....	1,864 00	
		$7,331 74	
		$21,178 39	$1,321 61
INCIDENTALS.			
Items 5, 6, 7, 8.			
tem 5—Books, stationery, advertising, etc...	$5,650 00		
Advertising.....	.....	$1,598 98	
Books and stationery, contract.....	.....	3,406 08	
		$5,005 06	$644 94
Item 6—Office expenses, fuel, etc.....	5,000 00		
Furnishing meals to workmen	....	4 55	
Digest of laws and ordinances	.....	6 00	
Telegraph supplies.....	.....	6 70	
Surveying.....	.....	8 00	
Repairing patent pavement.....	.....	8 50	
Atlas of Philadelphia	.....	10 00	

General appropriations.	Appropriated.	Expended	Balance merging
Grass seed		12 25	
Messenger service		17 15	
City directories		20 00	
Brooms, etc		20 78	
Ventilators		22 20	
Repairs to range		23 65	
New towels		24 00	
Window awnings		25 00	
Ground rents		26 66	
Chairs		26 75	
Coin balance		28 00	
Binding books		31 20	
Moving safe		40 00	
Soap		40 38	
Speaking tubes		48 85	
Cleaning cesspools		61 40	
Hauling pipes		62 44	
Testing scales		63 25	
Gum goods		69 41	
Carpet		72 55	
Water meters		75 00	
Rent of offices		75 00	
Brass castings		80 42	
Row boats		84 00	
Hardware		89 89	
Washing towels		91 00	
Repairs to telegraph instruments		93 25	
Iron pipe		101 44	
Shop castings		110 37	
Gas fitting and plumbing		115 20	
Postage stamps		117 50	

General appropriations.	Appropriated.	Expended	Balance merging
Carriage hire		$143 40	
Furnishing meals Registrar's Department		150 80	
Inspecting pipe		174 09	
Repairs to tool-house, oil cans, etc.		161 85	
Paper hanging		174 78	
Ice		187 46	
Sundry small items		234 60	
Lumber		357 24	
Coal and wood		408 55	
Transportation, inspection and workmen		1,137 65	
		$4,943 16	$56 84
Item 8—Carriage hire and keep of horse, Chief Engineer	$650 00	650 00	
Item 7—Carriage hire and keep of horse, general superintendent and assistant engineers	750 00	750 00	
DEFICIENCIES.			
Item 21—To pay deficiency of bills for coal delivered in 1881	40,000 00		
Schuylkill, 3,695.02 tons, at $4.44		16,406 24	
Delaware, 1,093.00 " 4.34		4,743 62	
Belmont, 4,363.00 " 4.32		18,850 10	
		$39,999 96	04

General appropriations.													Appropriated.	Expended	Balance merging
Item 16—Salaries—Building of grounds and reservoirs													$22,478 00		
	Janitor.	Watchman.	Telegraph Lineman.	Policeman.	Foreman Bricklayer.	Foreman Stone Mason.	Foreman Rigger.	Foreman Carpenter.	Foreman Laborer.	Gardener.	Laborers.	Helpers.			
Spring Garden Hall	1	2	1											$2,598 00	
Fairmount		2		2	1	1	1	1	1	1	2			10,877 72	
Schuylkill		4										1		3,668 55	
Belmont		1									1	1		1,870 00	
Delaware		2												1,350 00	
Roxborough		1												675 00	
Frankford		2												1,350 00	
														$22,389 27	$88 73

Special appropriations.	Appropriated.	Expended	Balance not merging
REFUNDS.			
Special appropriation to refund certain twice paid and overpaid water-rent and pipe-laying bills, December 31, 1880. Balance January 1, 1882	$246 20	$60 45	$185 75
Special appropriation to refund certain twice paid and overpaid water-rent and pipe-laying bills, June 16, 1881. Balance January 1, 1882	888 30	334 55	553 75
Special appropriation to refund certain twice paid and overpaid water-rent and pipe-laying bills, March 10, 1882	728 82	582 62	146 20
Special appropriation to refund certain twice paid and overpaid water-rent and pipe-laying bills, June 7, 1882	1,532 45	567 10	965 35
Included in maintenance		$1,544 72	
GENERAL APPROPRIATIONS.			merging
DISTRIBUTION.			
Item 17—Drilling and making new attachments	$9,500 00		
Wages, First District		$1,623 50	
" Second "		1,653 49	
" Third "		1,600 75	
" Fourth "		1,620 25	
" Manayunk District		1,607 25	
" Germantown "		1,371 13	
		$9,476 37	$23 63
Item 19—Pipes, special castings, fire plugs, stop-cocks, lead, brass, iron, and other materials $65,000 00			
Transferred, September 28, 1882, from Item 18 8,500 00			
$73,500 00			
Transferred to Departments of City Ice Boats and Coroner, June 15th 250 00			
	73,250 00		

General appropriations.	Appropriated.	Expended	Balance merging
Wharfage		$5 00	
Headlight oil, contract		6 57	
Freight		7 86	
Blasting powder, contract		12 00	
Tubes, "		16 06	
Wood "		32 00	
Leather belting, "		36 88	
Trackage		37 00	
Repairs to planer		53 70	
Machine work		55 78	
Spars		60 00	
Coke		97 45	
Rent of shop		100 00	
Gasket, contract		100 27	
Hardware, "		133 00	
Galvanizing, "		137 04	
Malleable castings, contract		153 65	
Crane, "		154 88	
Repairs to barrows, pump, tool house, etc		157 38	
Gum goods, contract		247 33	
Water meters, "		348 05	
Cotton waste, "		433 09	
Inspecting pipe		548 86	
Coal for shop, contract		698 40	
Barton's patent valves, contract		1,500 00	
Brass fittings, contract		1,526 30	
Lumber, contract		2,036 20	
Brass castings, contract		2,230 43	
Patent plug valves, contract		2,100 00	
Hauling pipes, contract		2,432 46	
Iron and steel bolts and nuts, contract		3,777 37	
Lead, contract		3,976 22	

General appropriations.			Appropriated.	Expended	Balance merging
Shop castings, contract				$11,797 88	
Iron pipe and specials, contract				38,240 89	
				$73,250 00	
Item 18—Labor in laying pipes, setting and fitting plugs, stops, etc.		$60,000 00			
Transferred, September 28, 1882, to Item 19		8,500 00			
			$51,500 00		
Grade stakes				17 48	
Repairing sewers				163 57	
Measuring over pipes				1,517 44	
Wages, Manayunk District				1,226 55	
" Germantown "				2,379 84	
" First "				5,602 24	
" Second "				8,826 64	
" Third "				3,135 37	
" Fourth "				8,976 70	
" Shop		$19,648 18		19,648 18	
				$51,494 01	$5 99
Detailed to pump water at Spring Garden		$7 89			
Repairs to distribution		3,050 95			
Repairs to B., G. and R.		1,443 69			
Fitting up at shop for distribution		12,881 84			
Fitting up at shop for works		2,263 81			
		$19,648 18			
Item 2—Pipe laying—salary roll			27,037 00		
Salary of six purveyors				8,880 00	
" superintendent of City repair shop				1,440 00	
" clerk to superintendent of City repair shop				850 00	
" five clerks to purveyors				3,600 00	

General appropriations.	Appropriated.	Expended	Balance merging
Salary of two pipe recording clerks		$1,800 00	
" six general foremen		5,634 00	
" four foremen of repairs		2,796 30	
" three watchmen		2,025 30	
		$27,025 30	$11 70
Expended for distribution from annual appropriation	$161,245 68		
NEW WORK—CONSTRUCTION.			
(Paid from taxation.)			
Item 23—Transferred June 7, 1882, from Item 15.			
For fence at new yard, Fourth District, removal of office and sheds, and re-erection	$1,000 00		
New fence and sheds		973 96	26 04
Item 20—For the purchase and erection of two small engines, stand-pipe, and boilers at Mount Airy, and boilers at Roxborough	25,000 00		
Plate iron (Mount Airy Works)		7 05	
Steam fittings—Mount Airy, $39.75; Roxborough, $53		92 75	
Iron tubes—Mount Airy, $200.97; Roxborough, $329.35		530 32	
Remodeling school-house at Mount Airy buildings, grounds, and reservoir		3,592 56	
Boilers		4,313 08	
Engine		4,800 00	
Boilers (Roxborough)		8,842 00	
		$22,177 76	2,822 24
Annual and special appropriations	$576,135 77	$565,589 06	$10,546 71
Special appropriations (refunds)	3,395 77	1,544 72	1,851 05
Annual appropriation	$572,740 00	$564,044 34	$8,695 66

General appropriations.		Appropriated.	Expended	Balance merging
Merging and not merging	$10,546 71			
From specials (refunds), not merging	1,851 05			
Merging and not merging, from annual and special appropriations	$8,695 66			
Not merging from annual and special appropriations	2,822 24	$2,822 24		
		$569,917 76		
Merging from annual appropriations	$5,873 42	5,873 42		
Expended from annual appropriations		$564,044 34		
SPECIAL APPROPRIATIONS.				
DISTRIBUTION.				
(Paid from taxation.)				
Item 24—For the purchase of pipe, special castings and fittings, inspecting and hauling the same, and for labor necessary to lay a water-main on Market street, from Broad to Delaware avenue; a main on the east side of Broad, from Girard avenue to Callowhill street, and also a main on Broad, from Cambria to Erie avenue, and to relay with larger pipe on west side of Broad street, from Girard avenue to Poplar street. August 17, 1881. Balance January 1, 1882		$43,941 72		
Inspecting pipe			$520 29	
Hauling			761 32	
Special pipe castings			3,732 55	
Iron pipe			38,597 19	
			$43,611 35	$330 37
NEW WORK—CONSTRUCTION.				
(Buildings, grounds, and reservoirs.)				
Item 1—For the purchase of new boilers, setting and fitting the same, and the erection of a new boiler-house at Belmont Works, appropriated June 29, 1880. Balance January 1, 1882		01		01
Item 3—For the removal of two boilers from the Schuylkill Works, setting and fitting the same, and the repairs to machinery-house and tank, and the making of new connections at Chestnut Hill Works. Balance January 1, 1882		131 81		

General appropriations.	Appropriated.	Expended	Balance not merging
Coping stone. New work at County Line Spring.		$69 63	
Gypsum. New work at County Line Spring.		5 00	
Lumber. New work at County Line Spring.		50 46	
		$125 09	
(Machinery.)			
For the erection of new boilers at Delaware Works. Transferred from Item 2, June 7, 1882.	$6,500 00		$6,500 00
SPECIAL APPROPRIATIONS.			
FROM SURPLUS.			
(Buildings, grounds, and reservoirs.)			
For completion of small section of East Park Reservoir, extension of water mains, and relaying pipe, June 21, 1882.	$250,000 00		250,000 00
NEW WORK—CONSTRUCTION.			
Item 2—For the purchase of a new ten million gallons engine, fitting and setting the same. Stand pipe and connections, the erection of a new engine house, all to be located at the Schuylkill works, appropriated June 29, 1880. Balance January 1, 1882 $49,990 10; Transferred June 7, 1882 6,500 00	43,490 10		
(Buildings, grounds, and reservoirs.)			
For the erection of an engine house at Schuylkill Works.		4,467 00	
(Machinery.)			
For the erection of a stand pipe at Schuylkill Works.		2,075 87	
(Distribution.)			
For stand pipe connections.		2,009 99	
		$8,552 86	

Special appropriations.	Appropriated.	Expended	Balance not merging
PAID FROM LOANS.			
(Buildings, grounds, and reservoirs.)			
For the erection of an engine house at Schuylkill Works		$10,336 83	
For terra cotta cornice, new engine house at Schuylkill Works		1,470 00	
(Machinery.)			
For the purchase of an engine at Schuylkill Works		7,500 00	
For the erection of a stand pipe at Schuylkill Works		11,238 59	
		$30,545 42	$4,391 82
To defray expenses of test-trial of the Frankford engine, approved June 14, 1880	$4 85		4 85
(Distribution.)			
For the purchase of pipes, special castings and fittings and hauling the same. Inspection and expenses incident thereto, and for the labor necessary to the laying of the water mains, November 22, 1881. Balance January 1, 1882	$12,534 67		
Inspecting pipe		$489 00	
Hauling pipe		999 50	
Iron pipe		3,673 84	
Wages—Fourth District		7,856 44	
		$12,534 67	

RECAPITULATION.

The annual appropriation for 1882 was..		$572,740 00
Balances merging, $5,873.42, and balances not merging.....	$2,822 24	8,695 66
		$564,044 34
Expended for maintenance from annual appropriation.....	379,646 94	$379,646 94
Expended for maintenance from specials (refunds).....	1,544 72	
Total for maintenance from annual appropriation.....	$381,191 66	
Expended for distribution from annual appropriation.....	$161,245 68	161,245 68
Expended for distribution from special out of taxation.....	43,611 35	
Expended for distribution from special out of taxation.....	2,009 99	
Expended for distribution from loans...	12,534 67	
	$219,401 69	

Expended for Construction.

From annual appropriations, B., G., and R., Fourth District fence, etc.....	$973 96	
From annual appropriations, B., G., and R., remodeling Mt. Airy.....	3,592 56	
From annual appropriations, machinery at Mt. Airy.....	9,360 85	
From annual appropriations, machinery at Roxborough.....	9,224 35	
	$23,151 72	23,151 72
Total expended from annual appropriation for 1882.....		$564,044 34

From special appropriations from taxation for machinery, standpipe at Spring Garden	$2,075 87		
From special appropriations from taxation for buildings, grounds, and reservoirs. Chestnut Hill spring and engine-house, Spring Garden	4,592 09	$6,667 96	
From loans for buildings, grounds, and reservoirs, engine-house, Spring Garden	$11,806 83		
From loans for machinery (standpipe, Spring Garden)	18,738 59	30,545 42	
Total expended for construction		$60.365 10	
Expended for total maintenance			$381,191 66
" " " distribution			219,401 69
" " " construction			60,365 10
Total expended in 1882			$660,958 45
Balance appropriated and not merging			264,056 01
Total appropriated in 1882, less mergers ($5,873.42)			$925,014 46
Appropriation from surplus fund (use not allowed)			250,000 00
" specifically applied to use			$675,014 46
Balances not merging			14,056 01
Total expended in 1882			$660,958 45

Maintenance from all sources.

From annual appropriations	$379,646 94
" special " (refunds)	1,544 72
	$381,191 66

From Item 18—*Shop wages.*

Pumpage, salaries, detailed to Schuylkill	$7 89		
Repairs to distribution	3,050 95		
" " buildings, grounds, and reservoirs	1,443 69		
		4,502 53	
Total maintenance			$385,694 19

Distribution from all sources	$219,401 69	
Less Item 18—Shop wages	19,648 18	
		$199,753 51
Construction from all sources	$60,365 10	
From Item 18, fitting for distribution	12,881 84	
" " " " " works	2,263 81	
From loans, $30,545.42; and taxation, $44,965.33	$75,510 75	75,510 75
Total expended in 1882		$660,958 45

Item 1—*Engineering—Amount.*

Chief Engineer	$4,500 00
Chief clerk to Chief Engineer	1,800 00
Assistant clerk to Chief Engineer	1,080 00
Three assistant engineers	5,400 00
Draughtsman	1,350 00
General Superintendent of Works—buildings, grounds, and reservoirs	1,800 00
Clerk to General Superintendent of Works	850 00
Muster clerk	810 00
Telegraph operator	810 00
Total	$18,400 00

Item 4—*Registrar's Bureau—Amount.*

Registrar	$2,500 00
Registrar's chief clerk	1,350 00
Receiving clerk	1,300 00
Permit clerk	1,080 00
Registering clerk	1,080 00
Two entry clerks	1,800 00
Four bill clerks	3,600 00
Pipe clerk	810 00
Fourteen inspectors	12,600 00
Messenger	765 00
Total	$26,885 00

Item 2—Pipe Laying—Salary Roll—Amount.

Six purveyors	$8,800 00
Superintendent City repair shop	1,440 00
Clerk to superintendent City repair shop	850 00
Five clerks to purveyors	3,600 00
Two pipe recording clerks	1,800 00
Six foremen of pipe laying	5,622 30
Four foremen of repairs	2,808 00
Three watchmen at District yards	2,025 00
Total	$27,025 30

Item 17—Drills.

Days.	Wages.	
1,778½	$3 00	$5,334 75
603½	2 00	1,206 50
1,304½	2 25	2,935 13
Total		$9,476 38

Item 18, and Loans—Pipe Laying—Amount.

Days.	Wages.	
908	$3 00	$2,724 00
3,491½	2 25	7,855 88
365	2 00	730 00
13,861	1 75	24,256 75
1,625	1 50	2,437 50
Total		$38,004 13

Item 14—Repairs to Pipes—Purveyors' Rolls.

Days.	Wages.	
1,199½	$3 00	$3,598 50
103½	2 50	258 12
4,837¼	2 25	10,883 84
3,152½	2 00	6,305 00
1,984¾	1 75	3,473 29
1,681	1 50	2,521 50
Total		$27,040 25

Item 3—*Pumpage—Salary Roll.*

Fairmount, two engineers	$1,800 00
" nine assistants	6,049 12
Delaware, two engineers	1,800 00
" helper and telegraph operator	675 00
" two coal passers	1,346 39
" four oilers	2,698 20
" four firemen	2,692 75
Schuylkill, two engineers	1,620 00
" eight oilers	5,240 21
" ten firemen	6,335 92
" two gaugemen	1,332 18
" four coal passers	2,670 00
" two extra men	540 76
Belmont, two engineers	1,800 00
" four oilers	2,700 00
" ten firemen	6,750 00
" two gaugemen	1,313 74
" four coal passers	2,655 49
Chestnut Hill, assistant engineer	675 00
" one helper	600 00
Roxborough, two engineers	1,620 00
" one assistant engineer	675 00
" four firemen	2,700 00
" two coal passers	1,350 00
Frankford, one engineer	900 00
" one assistant engineer	675 00
" two firemen	1,350 00
Grand total	$60,564 76

FAIRMOUNT ROLL.

Item 13—*Repairs to Machinery.*

Days.	Wages.		
273	$3 50	$1,305 40	
308	3 00	924 00	
854	2 75	2,348 50	
74½	2 50	186 25	
503	1 75	880 25	
			$5,644 50

Obtained by Mandamus.

Days.	Wages.		
78	$3 50	$273 00	
28	3 00	84 00	
96	2 75	264 00	
			$621 00

Item 14—*Repairs to Pipes.*

Days.	Wages.		
82½	$3 50	$288 75	
33	3 00	99 00	
29	2 50	72 50	
35	1 75	61 25	
			521 50

Item 15—*Repairs to Buildings, Grounds, and Reservoirs.*

Days.	Wages.		
364	$3 50	$1,274 00	
1,160	3 00	3,480 00	
494½	2 50	1,236 25	
564	1 75	987 00	
273	1 50	409 50	
22	5 00	110 00	
			7,496 75

Obtained by Mandamus.

Days.	Wages.		
30	$3 50	$105 00	
25	3 00	75 00	
			180 00
Grand total			$13,662 75

SHOP ROLL—WAGES FOR MECHANICS.

Item 13.

Days.	Wages.		
330¼	$3 50	$1,155 88	
1,575¼	3 00	4,725 75	
1,206¾	2 75	3,318 55	
335½	2 25	754 87	
			$9,998 80

Item 14.

Days.	Wages.		
346	$3 00	$1,038 00	
5	2 75	13 75	
			1,051 75

Item 18.

Days.	Wages.		
3,047½	$3 00	$9,142 50	
2,294¾	2 75	6,310 56	
690½	2 25	1,553 62	
993½	2 00	1,987 00	
374	1 75	654 50	
			$19,648 18
Grand total			$30,698 73

DEFICIENCIES FOR 1882.

Item 6—*Incidentals.*

Matthew Hall, putting up stoves	$11 25	
Mary A. Levering, rent of office	25 00	
Chas. F. Lance, coal for office	76 65	
Butchers' Ice Co., ice	9 76	
American District Telegraph Company, messenger service	28 73	
Kirk & Nice, carriage hire	8 00	
Bruner & George, "	12 00	
Incidentals	26 80	
David Mullen, carriage hire	90 50	
		$288 69

Item 13—*Repairs to Machinery.*

Henry C. Newhouse, boiler fluid	$100 00	
James Moore, repairs to boilers	663 81	
Chas. Perkes, brass steam fittings	185 80	
Neafie & Levy, repairs to boilers	91 34	
		1,040 95

Item 19—*Purchase of Pipes, etc.*

Wright & Selby, wood	$16 00	
American Meter Co., repairs to meters	34 89	
Adams & Storie, shop castings	172 45	
F. J. Clamer, brass castings	137 49	
		360 83

Item 20—*Boilers, etc., Roxborough and Mt. Airy.*

Chas. J. Field, bar iron	$4 13	
		4 13

Item 13—*Repairs to Machinery.*

James Moore, repairs to boilers	$1,901 31	
		1,901 31

Item 10—*Tallow and Oil.*

Arthur Gate, tallow and oil	$625 72	
		625 72
		$4,221 63

OPERATIONS

—OF THE—

REGISTRAR'S DEPARTMENT

—FOR—

1882.

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER.

REGISTRAR'S OFFICE.

Philadelphia, January 2, 1883.

DR. WM. H. MCFADDEN,
Chief Engineer.

DEAR SIR:—I herewith submit the report of receipts at this office for the year 1882. The total receipts derived from all sources was $1,487,967.71, which has been paid daily, as received, into the office of the City Treasurer. This is an increase over the previous year of $13,911.60.

The collections from water rents for the year 1882 amounted to $1,295,419.87, an increase over the previous year of $38,-757.87, and the receipts from delinquent rents amounted to $78,543.01, a decrease of $6,048.39.

The receipts from fractional rents, penalties, and other sources amounted to 79,025.31, a decrease of $6,288.29.

The receipts from water-pipes amounted to $34,979.52, a decrease of $12,509.59.

Pipe bills to the amount of $34,546.18 were returned to the City Solicitor for lien, and the amount collected by him was $21,421.05, as appears of record in that Department as per his report to this one.

Respectfully referring to the annexed itemized tables, I remain

Yours, very respectfully,

A. N. KEITHLER.

Registrar.

Receipts at the Registrar's Office for the year 1882.

Months.	Delinquent rents.	Penalties.	Rents of 1882	Penalties.	Fractional rents.	Water-pipe.	Totals.
January	$3,869 65	$573 29	$72,509 58	.....	$2,541 67	$1,272 26	$80,766 45
February	2,707 00	406 16	104,754 99	.....	1,227 55	2,786 84	111,882 51
March	4,284 25	637 43	256,167 96	.....	6,201 11	1,947 34	269,238 09
April	16,879 42	2,296 43	681,751 04	.....	7,669 35	2,218 47	710,814 71
May	9,398 70	1,404 16	36,069 20	$1,796 75	4,365 34	2,726 36	55,760 51
June	18,616 90	2,790 63	53,263 65	2,646 91	4,088 71	2,318 64	83,725 44
July	9,384 25	1,403 94	13,552 60	2,031 74	3,430 49	3,576 37	33,379 39
August	5,388 80	808 38	15,747 25	2,362 45	3,692 75	3,564 11	31,563 74
September	1,764 29	263 89	24,496 60	3,672 91	4,416 40	3,101 67	37,715 76
October	1,770 25	264 89	21,767 00	3,263 07	4,249 99	4,244 82	35,560 02
November	2,359 50	353 97	7,803 75	1,170 69	4,671 40	4,608 08	20,967 39
December	2,120 00	276 01	7,536 25	1,071 71	2,975 14	2,614 56	16,593 67
Totals	$78,543 01	$11,479 18	$1,295,419 87	$18,016 23	$49,529 90	$34,979 52	$1,487,967 71

Amount of claims for water-pipe returned for lien in 1882..... $34,546 18

Amount of claims for water-pipe collected by City Solicitor in 1882,.. 21,421 05

Comparative statement of receipts for the years 1881 and 1882.

Year.	Delinquent rents.	Penalties.	Water rents	Penalties.	Fractional rents.	Water-pipe.	Totals.
1882	$78,543 01	$11,479 18	$1,295,419 87	$18,016 23	$49,529 90	$34,979 52	$1,487,967 71
1881	84,591 40	12,627 66	1,256,662 00	19,234 38	53,451 56	47,489 11	1,474,056 11
Increase			$38,757 87				$13,911 60
Decrease	$6,048 39	$1,148 48		$1,218 15	$3,921 66	$12,509 59	

Items of receipts under head of "Fractional Rents."

Year.	Rents.	Ferrules.	Repaving.	Repairs.	Totals.
1882	$35,321 65	$7,200 00	$4,858 00	$2,150 25	$49,529 90
1881	38,684 56	7,086 00	5,322 00	2,359 00	53,451 56
Increase		$114 00			
Decrease	$3,362 91		$464 00	$208 75	$3,921 66

Estimated receipts in statement to City Controller	$1,419,500 00
Actual receipts, as above	1,495,483 59
Increase over estimate	$75,983 59

List of Dwellings, Factories, Horse-power, etc., charged on Registers for 1882.

	WARDS.																													Totals.
	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	
Baths	3221	1149	955	601	692	385	2514	2431	1765	2159	402	887	1422	2053	4609	656	559	1350	4089	5863	650	2059	513	4393	1673	2749	2065	4389	6138	2507	2113	67,011
Bakeries	55	34	35	36	33	19	9	29	21	37	31	29	25	42	31	35	32	38	21	73	10	13	8	29	11	44	7	23	51	49	48	958
Banks	.....	.....	.....	1	5	15	.....	3	1	.....	1	1	2	1	.....	.....	1	1	1	1	.....	1	1	.....	.....	.....	2	.....	.....	.....	.....	38
Bars	171	165	189	202	391	238	79	141	354	162	187	130	128	144	241	148	142	160	287	205	89	55	62	128	173	153	75	120	165	116	177	5,177
Barber shops	33	32	17	18	35	40	21	25	38	16	19	12	26	30	39	24	22	24	41	40	17	9	4	28	16	11	12	20	25	23	23	740
Bidets	.....	.....	.....	.....	.....	2	3	94	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	12	.....	6	.....	4	.....	.....	2	.....	8	.....	.....	147
Billiard saloons	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	1	.....	.....	.....	.....	.....	3	.....	7
Blacksmith shops	4	1	14	13	3	5	.....	12	8	5	8	7	4	15	11	14	5	7	26	23	.....	.....	6	18	15	13	3	.....	.....	.....	17	257
Bleaching establ'ts	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3
Bottling "	2	4	.....	2	3	3	.....	.....	.....	2	2	2	.....	1	4	.....	3	5	13	3	3	.....	.....	1	2	.....	.....	4	4	1	1	65
Boarders	.....	.....	.....	.....	69	230	.....	425	600	333	100	103	32	.....	.....	.....	.....	.....	.....	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,937
Boilers	58	31	13	4	15	244	31	63	89	37	89	92	34	39	153	123	90	90	201	66	24	59	45	29	96	44	42	24	51	43	135	2,154
Breweries and dis's	.....	1	2	1	1	2	.....	.....	1	.....	6	5	3	1	3	.....	12	2	16	10	2	1	2	1	5	1	.....	7	17	.....	1	103
Brickyards	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	1	1	2	.....	.....	2	.....	2	.....	12	1	1	.....	29
Carriages	59	62	55	73	41	33	48	194	187	343	28	214	289	206	351	50	70	130	112	313	24	304	114	113	42	37	165	176	131	70	61	4,095
Carpenter shops	2	1	.....	.....	2	2	6	9	6	.....	3	4	10	22	11	13	6	.....	6	17	.....	.....	1	1	.....	3	8	.....	.....	5	2	140
Car shops	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	3	5
Cars	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	81	30	117	.....	.....	.....	66	.....	.....	.....	.....	191	.....	.....	32	.....	.....	55	111	700
Chemical works	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	7
Churches	12	9	7	8	7	10	9	10	8	7	3	2	9	16	16	5	3	8	14	17	10	11	10	27	12	9	16	7	19	14	17	342
Children's Homes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	1	2	1	.....	.....	3	.....	.....	.....	.....	9
Coal yards	4	22	2	3	.....	.....	.....	.....	.....	.....	.....	.....	7	4	8	.....	.....	2	10	11	5	.....	.....	1	3	.....	7	6	.....	5	.....	100
Cooper shops	3	.....	9	14	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
Coffee roasters	2	1	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	4	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	12
Depots	1	1	.....	.....	.....	.....	.....	.....	1	.....	4	.....	1	1	4	.....	.....	.....	4	.....	.....	.....	1	4	2	.....	3	2	.....	2	2	33
Drove yards	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	4
Drug stores	20	15	15	9	10	7	20	18	9	21	5	13	17	18	20	8	9	13	32	36	9	12	7	28	9	17	9	26	30	16	16	494
Dwell'gs & hydra'ts	7838	4347	2418	2309	2088	2824	2510	2968	2356	3549	1755	1971	2929	3514	7284	2401	2423	4139	7414	7700	2830	3176	2907	8162	5647	6627	2669	5794	8043	5247	6026	131,865
¾	133	64	28	34	14	18	27	44	61	27	16	27	14	46	137	90	120	686	202	72	20	.....	1	19	48	7	17	40	53	12	366	2,443
½	223	1162	1111	1108	548	294	775	422	77	816	781	709	485	478	698	1075	1193	683	177	395	15	14	49	42	203	43	43	31	28	251	113	14,042

Permits issued during the year 1882.

	WARDS.																													Totals.
	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	102	16	.....	1	7	6	4	6	7	3	2	1	3	15	105	10	10	57	306	91	242	116	106	264	337	235	57	239	320	15	59	2,742
" ½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	4
Baths	86	19	1	3	3	4	12	23	16	3	.....	4	5	21	76	1	6	64	266	110	68	57	38	199	224	165	56	189	288	15	47	2,069
Wash paves	11	3	1	1	1	4	3	7	4	1	.....	2	6	14	62	4	5	20	177	45	30	18	27	73	98	47	33	110	177	12	18	1,014
Water closets, urinals, and bidets	.....	4	1	.....	106	55	17	74	112	57	1	5	14	39	160	10	8	9	125	134	28	46	28	130	21	17	80	190	302	5	12	1,790
Basins, sinks, and wash tubs	5	5	.....	1	117	18	23	88	70	35	1	2	15	40	67	7	3	4	18	49	18	51	12	93	16	2	76	106	263	7	7	1,219
Bars	2	.....	.....	2	2	4	1	2	3	1	2	2	6	4	2	1	.....	2	15	7	7	.....	4	7	8	1	1	6	7	2	4	105
Watering horses	1	1	1	.....	.....	.....	1	.....	2	.....	.....	.....	1	.....	4	2	2	1	8	3	1	.....	2	3	9	.....	1	2	4	.....	3	52
" engines	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	2
Stables	2	1	1	.....	.....	.....	1	3	4	2	2	.....	.....	2	8	3	1	5	14	....	5	12	3	8	11	1	3	4	6	3	2	107
Slaughter houses	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	3	2	.....	.....	2	.....	.....	1	9
Factories	2	2	.....	.....	1	3	.....	.....	1	.....	1	2	.....	1	2	6	2	5	7	1	1	1	5	2	8	1	1	4	.....	2	1	62
Boilers and engines	4	4	.....	.....	10	32	.....	4	9	4	5	4	.....	2	7	10	9	8	16	5	3	5	10	7	13	1	1	6	4	3	7	193
Horse powers	168	140	.....	.....	148	694	.....	59½	158	64	98	45	.....	60	100	183	321	112½	186	29	4	112	361	64	280	12	15	70	132	49	96	3,761
Stores, shops, and offices	.....	2	.....	.....	1	.....	1	.....	2	3	1	.....	.....	.....	1	1	.....	2	4	.....	.....	.....	1	1	2	1	2	9	4	.....	2	38
Fountains	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	.....	1	1	.....	.....	.....	.....	9	.....	.....	17
Breweries and bottling establish'ts.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	3	.....	1	.....	1	1	1	.....	.....	.....	1	1	.....	11
Bakeries	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	5
Hot houses	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	.....	12	1	.....	7	.....	8	1	.....	.....	.....	32
Institn's & Chu'hes	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	2	.....	.....	.....	.....	2	.....	.....	.....	.....	7
Drug stores	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	1	2	.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	9
Dye houses	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	2	.....	.....	.....	.....	2	.....	2	.....	2	1	4	.....	2	.....	.....	1	1	.....	1	21
Photograph gall'es	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Barber shops	1	.....	.....	.....	.....	1	.....	.....	1	1	.....	1	.....	3	2	.....	.....	1	1	2	2	.....	1	1	1	.....	.....	1	.....	1	.....	21
Building purposes	6	2	.....	.....	.....	2	2	6	5	3	.....	.....	1	2	20	3	3	8	57	15	64	32	25	39	53	23	9	40	28	1	7	456
Water for ships	1	93	5	4	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	109
Sprinkling streets	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38
Hatters' planks	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	5
Washing machines	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	.....	1	.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	2	9
Cut offs	57	19	15	9	18	28	24	23	27	25	3	12	20	19	36	12	13	45	51	43	7	19	3	27	19	43	26	15	25	31	41	745
Total	449	311	25	21	414	852	90	295½	423	209	119	84	73	223	655	257	387	346½	1262	540	483	485	633	924	1115	549	371	997	1574	147	312	14,654

List of Dwellings, etc.—Continued.

	WARDS.																													Totals.
	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	
Dye houses	1	2	1	7	5	3	.....	3	.....	4	18	2	4	1	3	5	13	4	19	4	5	6	7	.....	17	.....	.....	4	1	3	15	157
Dye vats	.....	.....	.....	.....	52	.....	.....	.....	.....	.....	.....	.....	.....	2	27	14	17	10	.....	.....	7	32	.....	.....	.....	.....	.....	3	.....	.....	3	167
Eating saloons and restaurants	.....	.....	1	.....	7	43	5	13	26	16	22	1	2	.....	2	15	.....	.....	3	5	.....	.....	7	6	.....	8	6	.....	.....	4	4	196
Engines	62	29	21	3	57	202	19	12	32	19	8	5	41	43	97	42	39	51	135	48	17	56	27	19	50	38	35	30	26	44	87	1,394
Engine houses	1	.....	.....	.....	1	1	1	1	1	1	.....	1	.....	1	2	.....	.....	.....	1	1	.....	.....	1	1	.....	1	1	.....	.....	.....	.....	17
Factories	8	7	3	2	3	12	3	5	2	54	55	2	7	48	53	61	28	20	60	44	24	40	27	16	29	19	4	4	20	16	27	703
Feed stores	3	3	2	.....	.....	.....	.....	2	.....	1	1	1	.....	1	.....	.....	.....	4	13	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	6	5	54
Fire plugs	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fish stands	.....	1	1	2	2	1	1	5	3	4	4	.....	.....	.....	6	.....	.....	.....	2	5	3	.....	.....	4	.....	.....	2	.....	.....	.....	1	47
Firebrick works	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Foot baths	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	13
Foundries	5	1	.....	.....	7	3	.....	.....	.....	.....	.....	.....	.....	5	29	1	1	4	8	11	.....	1	2	.....	1	.....	1	.....	.....	2	2	84
Fountains	8	2	3	.....	.....	10	7	29	21	1	.....	7	2	17	19	3	.....	5	32	20	9	27	6	34	2	3	34	16	36	17	2	372
Forges	5	6	8	20	3	11	3	6	4	28	27	2	17	29	42	30	15	150	20	48	.....	.....	10	3	17	15	3	.....	.....	27	26	575
Furnaces	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Galvanizing works	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Gas works	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	2	.....	.....	.....	2	1	.....	.....	.....	.....	.....	8
Glass works	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	6
Green houses	16	.....	.....	.....	.....	.....	.....	12	4	.....	.....	.....	.....	2	7	.....	.....	7	7	8	16	73	19	24	55	16	86	81	15	12	1	461
Grind stones	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	10	30	.....	.....	17	.....	.....	.....	1	.....	.....	.....	2	.....	.....	.....	.....	65
Hatter's planks	.....	.....	.....	.....	12	18	.....	.....	2	.....	.....	2	.....	3	.....	21	.....	.....	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	77
Halls	3	.....	2	1	.....	2	1	4	2	.....	.....	.....	2	1	1	.....	.....	1	.....	4	.....	3	2	2	.....	.....	1	.....	.....	6	1	39
Hay markets	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	2
Horse troughs	36	12	14	8	15	6	6	5	10	13	10	13	5	6	32	6	20	36	59	34	16	13	14	59	43	16	16	33	18	10	34	618
Horse power boilers	962	1189	180	338	1546	3407	412	841	2253	1021	1024	345	604	998	2241	2329	2392	1822	4077	1156	377	1991	1051	366	1480	970	647	294	1087	790	2453	40,646
Hotels	.....	.....	.....	.....	.....	5	.....	7	4	2	2	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	3	.....	.....	.....	.....	31
Hospitals	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	2	.....	5	.....	.....	1	.....	3	1	.....	19
Ice cream saloons	3	7	9	2	1	6	22	15	14	10	10	.....	.....	5	11	4	.....	.....	.....	8	.....	.....	.....	10	.....	1	3	2	5	1	1	150

List of Dwellings, etc.—Continued.

	WARDS.																													Totals.
	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	
Kitchens										5	5		8																		18
Laboratories								1	8	1	1		1						1					1				8		1		23
Laundries		1			5	3	3	11	13	8			6	7	4					4		4		1			2	3	3	2	1	81
Lime vats												39				66	60		10												175
Lime yards		1												1			1			2				2						1	8
Lumber yards	2	1					1						1	1	2		1		3				1			1			2		16
Machine shops								2						1	5			4	3				6	1	2	5	1			4	3	37
Marble yards	2						4	2	5				2	7	1	2			6	4				5		6		5		6	8	65
Market houses			2	2	2	2			3		2	3	1	1	4				1	3	2		2	4		2	2	2	3	3	1	47
Market stalls			629	52	629	485			1263		220	602	19	146	495				39	288	50		326	310		301	12	60	885	350	50	7,211
Malt houses		1			1	1			3	1	2		1		1	1		1	4	3				4					3			28
Mills	2	2	1	1	1	3	1			2	2							2	1				9	24	1	2	6			1	1	62
Offices											15					5		5	10	28		6	7		8	5	21	22	16		4	152
Oyster houses	7	1		13	22	5						4	1	1				1	17		3				1		2		4			82
Paint shops									2																						2	4
Paper factories								1													1			1	1	2						6
Photo. galleries		1	1	2	5	4	5	8	15	5	6	3	4	1	2	3	1	2	3	4	4	2	1	1			1	6	1		2	93
Polishing wheels						3	1							2											1							7
Pools	2				1			1	1	3			2	1	6	1			2			1	1									22
Potteries	1																														1	2
Printing offices					1	2		2	9	2									1				1								2	20
Rectifying establishments							1		3																							4
Schools	8	5	2	1	4	3	8	12	9	7	3	6	4	9	8	4	4	8	9	9	7	9	6	8	8	10	9	8	11	2	5	209
Scholars	1720	1261	1301	1115	400	315	3350	1904	1581	3552	1431	2023	1154	2235	2400	2085	1620	4910	4530	3270	1662	2455	1975	2534	2377	3365	1534	2006	3746	1713	3900	69,424
Scouring establishments												1			2					3											4	10
Shower Baths								26					11	4	409						9		1	2			40	19	123	1		645
Shot towers		1																														1
Shoe factories							1			1																						2

List of Dwellings, etc.—Continued.

	WARDS.																													Totals.
	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	
Sinks	.....	1	.....	4	29	176	123	701	122	83	26	10	20	22	139	.....	.....	.....	4	79	9	160	.....	120	.....	36	304	.....	71	26	.....	2,265
Skin dressing establishments	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	6	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
Slaughter houses	45	1	.....	.....	.....	.....	1	.....	.....	1	.....	.....	4	14	13	8	56	18	72	15	.....	1	7	50	22	4	.....	73	17	2	45	469
Soap factories	2	.....	2	.....	1	1	.....	.....	.....	1	.....	.....	1	.....	2	.....	.....	.....	2	2	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	17
Stables	128	61	72	77	46	44	152	198	68	173	86	76	56	121	229	63	168	71	116	236	58	110	117	300	34	42	73	42	99	113	133	3,362
Stalls	1078	753	403	677	234	840	586	560	835	862	563	600	734	862	2047	693	698	1494	1323	1848	364	1103	571	2600	592	1103	1397	2050	1668	964	903	31,005
Steam heaters	.....	.....	.....	21	28	.....	.....	6	4	.....	.....	.....	5	4	7	.....	.....	.....	1	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	78
Steam saws	.....	.....	.....	.....	.....	2	.....	5	.....	2	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
Stills	.....	.....	.....	.....	.....	.....	.....	.....	1	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Stores and shops	25	26	3	15	6	38	.....	6	22	6	1	11	1	65	11	3	27	22	92	31	10	16	25	34	24	9	10	3	30	27	108	707
Storehouses	.....	.....	1	9	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23
Sugar houses	2	2	.....	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
Tanneries	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	4	5	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26
Theatres and opera houses	.....	.....	.....	.....	.....	2	.....	4	4	3	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	16
Turbine wheels for organs	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	4
Tubs, vats, & tanks	15	22	23	3	215	93	300	.....	192	153	82	121	237	8	37	127	180	10	77	319	.....	.....	3	401	46	41	.....	.....	.....	62	128	2,895
Type foundries	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Urinals	13	16	4	21	276	327	33	308	225	133	90	83	90	39	57	12	10	6	43	34	9	13	.....	49	.....	20	35	20	30	38	12	2,046
Vinegar factories	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	2	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	6
Warehouses	.....	.....	.....	1	.....	.....	1	.....	3	.....	9	.....	5	5	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	29
Wash paves	1177	586	512	77	553	425	1411	1204	1932	1525	325	606	1160	1441	3298	409	507	1050	2307	4207	443	1090	535	2462	668	1061	1517	3585	4770	1596	1221	43,760
Wash basins	95	62	95	74	1645	2769	1260	2863	2126	1573	299	519	885	816	3236	158	112	118	397	2133	232	900	130	1769	99	154	2139	2321	3948	186	133	33,246
Wash tubs	.....	.....	.....	.....	3	13	142	.....	198	190	12	83	177	87	584	.....	.....	.....	15	51	14	367	15	.....	.....	13	234	107	568	.....	.....	2,873
Water closets	92	111	138	90	1706	2539	1625	3594	2219	1589	181	590	1246	1072	2329	168	132	108	510	2424	246	1438	95	2547	107	215	2416	2768	3695	646	246	36,882
Wool washers	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3

OPERATIONS

—OF—

CHERRY STREET SHOP

—FOR—

1882.

STOCK ACCOUNT.

Statement of the operations of the Cherry street shop, from January 1, 1882, to December 30, 1882.

Dr.

To stock on hand January 1, 1882	$15,835	83
447,434 lbs. iron castings	12,080	70
10,635½ " brass "	1,972	51
2,181¼ " gun metal	475	94
2,195 " malleable castings	153	65
1,385 " steel (assorted)	293	79
26,171½ " wrought iron	1,046	92
157 tons coal	874	30
9,157 feet lumber	675	23
2 cords wood	16	00
1,232 stop boxes	3,697	00
50,023 lbs. lead	2,651	22
Bolts and nuts	983	00
Gum rings, valves (and assorted gum)	2,600	13
Wrought pipe and fittings	376	28
Hardware	971	87
Paints and oils	255	13
Water meters (assorted)	291	28
Railroad tickets	1,087	50
Machine work	1,269	17
Wages paid hands	30,698	73
Brooms and brushes	13	23
Leather belting	39	63
Gauges and repairs to same	2	00
Brass fittings	1,985	40
Galvanizing	132	84
Old metals	827	99
Incidentals	4	73
Rope and gasket	642	93
Miscellany	35	02
Building and grounds	240	78
Hauling	31	00
Ice	31	92
	$82,293	65
Balance	13,137	19
	$95,430	84

Cr.

By repairs and supplies, First District	$12,653 67		
" " " Second "	8,756 91		
" " " Third "	11,490 36		
" " " Fourth "	13,322 31		
" " " Germantown	3,801 68		
" " " Manayunk	2,125 97		
		$52,150	90

CHERRY STREET SHOP.

By new work, construction, building, and grounds	$1,517 25		
By new work, construction, machinery	1,240 16		
" " " patterns (mach'y)	235 23		
		3,022	64

FAIRMOUNT WORKS.

By repairs to machinery	$1,244 89		
" " boilers (at building, ground, and reservoir)	20 65		
By repairs to building and grounds	189 13		
		1,454	67

SCHUYLKILL WORKS.

By repairs to machinery	$3,990 46		
" " boilers	566 68		
" " building and grounds	556 24		
" new work, construction	83 19		
" pumping water	7 89		
		5,204	46

ROXBOROUGH WORKS.

By repairs to machinery	$2,064 62		
" " boilers	1,392 45		
" " buildings and grounds	74 42		
" new work construction (machinery)	348 74		
		3,880	23

BELMONT WORKS.

By repairs to machinery	$4,130 02		
" " boilers	682 98		
" " building and grounds	199 77		
" new work construction (machinery)	886 20		
		5,898	97

DELAWARE WORKS.

By repairs to machinery	$2,229 03	
" " boilers	160 91	
" new work construction (machinery)	9 90	
		$2,399 84

FRANKFORD WORKS.

By repairs to machinery	$1,450 95	
" " boilers	47 03	
" " building, grounds, and reserv's	78 00	
		1,575 98

CHESTNUT HILL WORKS.

By repairs to machinery	$169 73	
" " boilers (machinery)	18 42	
		188 15

MOUNT AIRY.

By new work, construction, machinery	$526 41	
		526 41

By water meters (construction for District)	$1,593 62	
" main office (B. G. and R., repairs)	55 01	
" empty oil barrels	3 65	
" old metals	1,859 26	
3506 ferrules, construction, for distribution (assorted)	1,753 00	
Stock on hand, as per inventory, January 1, 1883	13,864 05	
		19,128 59
Total amount		$95,430 84

Stock on hand as per inventory January 1, 1883	$13,864 05
Receipts during 1882, paid to main office and deposited with City Treasurer	1,862 91
	$15,726 96

Salaries paid for men detailed to Spring Garden Works from Item 18	$7 89	
		7 89
Repairs to buildings, grounds, and reservoirs at Fairmount	209 78	
Repairs to buildings, grounds, and reservoirs at Spring Garden	556 24	

Repairs to buildings, grounds, and reservoirs at Roxborough	$74 42	
Repairs to buildings, grounds, and reservoirs at Belmont	199 77	
Repairs to buildings, grounds, and reservoirs at Frankford	78 00	
Repairs to buildings, grounds, and reservoirs at Spring Garden Hall	55 01	
		$1,173 22
Repairs to machinery at Fairmount	$1,244 89	
" " " Spring Garden	4,557 14	
" " " Roxborough	3,457 07	
" " " Belmont	4,813 00	
" " " Delaware	2,389 94	
" " " Frankford	1,497 98	
" " " Chestnut Hill	188 15	
		18,148 17
Distribution		52,150 90

CONSTRUCTION—NEW WORK.

Buildings, grounds, and reservoirs, Shop 918 Cherry street	1,517 25	
Buildings, grounds, and reservoirs, Spring Garden Hall	83 19	
		1,600 44
Machinery, Shop 918 Cherry street	1,505 39	
" Roxborough Works	348 74	
" Belmont Works	886 20	
" Delaware Works	9 90	
" Mount Airy Works	526 41	
		3,276 64
Distribution, water meters	1,593 62	
" ferrules	1,753 00	
		3,346 62
		$95,430 84

INVENTORY OF STOCK ON HAND JANUARY 1, 1883.

17	4-inch square-top screws, at	$5.00	$85 00	
17	6 " " " "	5.00	85 00	
6	10 " " " "	8.00	48 00	
5	12 " " " "	10.00	50 00	
16	16 " " " "	12.00	192 00	
8	20 " " " "	14.00	112 00	
				$572 00

6	4-inch	square-top	screws,	N.	S.,	at	5.00	$30 00	
33	6	"	"	"	"	"	5.00	165 00	
3	8	"	"	"	"	"	7.00	21 00	
6	10	"	"	"	"	"	9.00	54 00	
3	20	"	"	"	"	"	16.00	48 00	
8	30	"	"	"	"	"	20.00	160 00	
3	36	"	"	"	"	"	25.00	75 00	
									$553 00
72	4-inch	socket-screws,	at				5.00	360 00	
4	6	"	"	"			5.00	20 00	
17	8	"	"	"			6.00	102 00	
24	10	"	"	"			6.50	156 00	
25	12	"	"	"			8.00	200 00	
									838 00
31	4-inch	spindles,	at				5.00	155 00	
39	6	"	"	"			5.00	195 00	
20	10	"	"	"			5.00	100 00	
10	8	"	"	"			5.00	50 00	
7	12	"	"	"			5.00	35 00	
									535 00
3	4-inch	stop-cocks,	at				22.00	66 00	
7	8	"	"	"			55.00	385 00	
1	10	"	"	"			67.00	67 00	
11	12	"	"	"			75.00	825 00	
2	16	"	"	"			100.45	200 90	
									1,543 90
17	pair	6-inch	bands,	at			5.00	85 00	
9	"	8	"	"	"		6.00	54 00	
7	"	10	"	"	"		7.25	50 75	
17	"	12	"	"	"		8.50	144 50	
15	"	16	"	"	"		9.50	142 50	
5	"	24	"	"	"		11.00	55 00	
7	"	20	"	"	"		10.50	73 50	
7	"	30	"	"	"		25.00	175 00	
3	"	36	"	"	"		26.00	78 00	
									858 25
4	stop-boxes,	at					3.00	12 00	
2	sets gearing	for derricks,	at				50.00	100 00	
19,640	lbs.	cast iron,	at				$2\frac{7}{10}$	530 28	
8,146	"	wrought iron,	at				$3\frac{1}{2}$	285 11	
706	"	steel (assorted),	at				12	84 72	
132	"	malleable castings					7	9 24	
1,990	"	forgings,	at				12	238 80	
5,529	"	unfinished brass,	at				$18\frac{1}{2}$	1,022 86	
2,578	"	finished brass,	at				38	979 64	

48 lbs. brass pipe, at	50	$24 00	
127 " rolled brass, at	80	101 60	
38 " brass wire, at	32	12 16	
			$3,400 41
2–15 " sledges, at	3.00	6 00	
4–26 " sledges, at	4.00	16 00	
55 caulking and gasket irons, at	75	41 25	
35 drills (assorted), at	1.00	35 00	
8 dozen chisels (assorted), at	8.40	67 20	
3 " " (with handles), at	12.00	36 00	
3 caulking hammers, at	1.00	3 00	
5,985 lbs. lead, at	$5\frac{30}{100}$	317 20	
			521 65
1 2-inch water meter, at	75.00	75 00	
1 3 " " "	140.00	140 00	
Finished stop-sides and valves		48 17	
16 reamers, at	2.80	44 80	
7 plug leases, at	7.50	52 50	
1,089 feet lumber (assorted)		67 53	
250 wood plugs, at	50	125 00	
			553 00
4 dozen hammer handles, at	33	1 32	
235 lbs. babbit metal, at	22	51 70	
2 car jacks, at	12.00	24 00	
2 bales gasket (174 lbs.), at	13	22 62	
5 6-inch globe-valves, at	75.00	375 00	
2 turn tables, at	92.77	185 54	
110 plug monkey screws, at	3.28	360 80	
			1,020 98
27 plug waste-valves complete, at	1.00	27 00	
270 " " rods, at	25	67 50	
12 stub end straps, at	11.50	138 00	
Hardware		276 57	
Bolts and nuts		431 19	
			940 26
Pipe and fittings		200 00	
22 cross-heads, with nuts, at	3.00	66 00	
Paints, oil, and tallow		42 25	
138 ferrules (assorted), at	50	69 00	
88 brass plugs (assorted), at	50	44 00	
90 brass pump-studs (assorted)		220 60	
881 gum plug-valves, at	2.00	1,762 00	
250 lbs. pure gum rings, at	49½	123 75	
			2,527 60
Total amount			$13,864 05

Stop-cocks, stop-cock boxes, frames and covers, fire plugs, cases, lead and gasket delivered from shop, No. 918 and 920 Cherry street, during 1882.

DISTRICTS.	3-inch stop-cocks.	4-inch stop.	6-inch stop.	8-inch stop.	10-inch stop.	12-inch stop.	16-inch stop.	20-inch stop.	23-inch stop.	30-inch stop.	36-inch stop.	Total.	Frames & covers.	Fire plugs.	Plug cases.	Stop boxes.	Lead, in pounds.	Gasket, Bales.
First District	.....	12	33	.....	.....	.....	.....	.....	.....	.....	.....	45	104	225	67	195	18,000	8
Second District	.....	16	32	.....	.....	1	.....	.....	.....	.....	.....	49	136	65	72	157	17,675	10
Third District	.....	18	79	.....	2	1	.....	.....	.....	.....	.....	100	117	94	97	490	9,950	8
Fourth District	.....	18	36	3	1	13	.....	8	.....	.....	.....	79	138	162	92	242	.....	17
Germantown	.....	11	27	.....	5	.....	.....	.....	.....	.....	.....	43	24	36	39	112	9,000	4
Manayunk	.....	2	10	.....	1	.....	.....	.....	.....	.....	.....	13	10	14	27	48	5,625	2
		77	217	3	9	15	.....	8	.....	.....	.....	329	529	596	394	1,244	60,250	49

Stop-cocks, fire plugs and casings, stop-boxes, frames, covers and ferrules, made and fitted up at Cherry street shop from January 1, 1882, to December 30, 1882.

1882.	3-inch stop cocks.	4-inch stop.	6-inch stop.	8-inch stop.	10-inch stop.	12-inch stop.	16-inch stop.	20-inch stop.	23-inch stop.	30-inch stop.	36-inch stop.	Total stop cocks.	New fire plugs.	Fire plug cases.	Stop-boxes.	Frames and covers.	½ inch ferrules.	⅝ inch ferrules.	¾ inch ferrules.	1-inch ferrules.	Total ferrules.
	.....	80	215	7	6	26	2	.....	.....	.....	.....	336	596	401	1,244	596	3,200	100	100	106	3,506

Inventory of Articles manufactured during the year 1882.

80	4-inch stops,	at	$22 00		$1,760 00
215	6 " "	at	25 00		5,375 00
7	8 " "	at	55 00		385 00
6	10 " "	at	67 00		402 00
26	12 " "	at	75 00		1,950 00
2	16 " "	at	100 45		200 90
596	fire-plugs	at	28 00		16,688 00
401	plug-cases	at	7 50		3,007 50
3,644	ferrules (assorted)	at		50	1,822 00
17	4-inch globe-valves	at	18 50		314 50
	Patterns				265 23
					$32,170 13

RECAPITULATION.

Estimated cost of materials for 1882	$35,759 09
Wages for finishing articles and setting the same	30,698 73
Actual cost	66,457 82
Stock on hand, January 1, 1882	15,835 83
Profits	13,137 19
	$95,430 84
Valuation of materials and finished articles used in 1882	$81,566 79
Stock on hand, January 1, 1883	13,864 05
	$95,430 84

	Wages,	Materials, and finished Articles.	Total.
New work, materials, and fittings to pipes	$12,733 50	$29,704 87	$42,438 37
New work, ferrules	634 95	1,118 05	1,753 00
New work, improvements at works	2,263 81	1,184 25	3,448 06
Repairs to pipes, plugs, etc	1,955 31	7,757 22	9 712 53
Repairs to machinery at works	11,659 58	6,509 24	18,168 82
Repairs to build'gs, grounds and reservoirs	1,443 69	2,731 52	4,175 21
	$30,690 84	$49,005 15	$79,695 99
Pumping water, wages of men detailed			$7 89
Cash returned to main office for old metals sold			1,862 91
			$81,566 79

OPERATIONS

—OF—

THE WORKS

—FOR—

1882.

Repairs—Construction—New Work.

Place.	Repairs.		Construction—New Work.					Total.
	Machin'y.	B., G. & R.	Machin'y.	B., G. & R.	Wages	Receipts.	Dist.	
Cherry street shop			$1,240 16	$1,517 25		$1,862 91		
" "			265 23					
			$1,505 39					$4,885 55
Fairmount Works		$20 65						
"	$1,244 89	189 13						
		$209 78						1,454 67
Schuylkill Works	$3,990 46	$556 24	$83 19		$7 89			
"	566 68							
	$4,557 14							5,204 46
Roxborough Works	$2,064 62	$74 42	$348 74					
"	1,392 45							
	$3,457 07							3,880 23
Belmont Works	$4,130 02	$199 77	$886 20					
"	682 98							
	$4,813 00							5,898 97

Repairs—Construction—New Work—Continued.

Place.	Repairs.		Construction—New Work.					Total.
	Machin'y.	B., G. & R.	Machin'y.	B., G. & R.	Wages	Receipts.	Dist.	
Delaware Works	$2,229 03							
"	160 91		$9 90					
	$2,389 94							$2,399 84
Frankford Works	$1,450 95	$78 00						
"	47 03							
	$1,497 98							1,575 98
Chestnut Hill Works	$169 73							
" "	18 42							
	$188 15							188 15
Mount Airy Works			$526 41					526 41
Water meters							$1,593 62	
Ferrules							1,753 00	3,346 62
Main office		$55 01						55 01
Totals	$18,148 17	$1,173 22	$3,359 83	$1,517 25	$7 89	$1,862 91	$3,346 62	$29,415 89

EXTENSIONS.

The unexpended balances of water loans were consolidated December 31, 1878.

January 10, 1879, in the annual appropriation to the Water Department, $100,000 in Item 17 was provided for the further extension of the Water Works, these were made subject, however, to future *specific* appropriation by these Councils.

Specific appropriation of the $155,250 was not made in 1879, and to prevent the merging of the $100,000 item, an ordinance was passed November 20, 1879. Specific appropriation of the $155,250 was not made until June 29, 1880.

The plans and specifications for the work, excepting the engine, were made in the department. Bids were advertised July 1, 1880, to be opened July 6th, the Water Committee, however, directed a postponement of the award and a readvertisement, extending the time to July 13th, when the contracts were awarded as follows:

Excavations and foundations for engine house and conduit at Spring Garden, also erection above foundations and alterations of old buildings, to Samuel H. Collum & Co. Ten million engine to H. R. Worthington. Boilers at Spring Garden and Belmont to John Zeh.

On July 20th, Mr. Zeh appeared before the Committee, and stated that he could not complete the contract in accordance with his bid without an increase of $10,000 to his contract price.

The Chief Engineer was instructed to readvertise again for these boilers, which was done, and the bids received August 10th, and awarded to Hilles & Jones.

THE SPRING GARDEN ENGINE HOUSE.

In response to an advertisement of July 1, 1880, bids were

to be opened July 6th, but was postponed until July 13th, when award was made to Collum & Co. They entered their securities July 21, 1880, but the contract and securities were not approved by Councils until September 20, 1880. The early winter forced a stoppage of the work. The advance in the price of labor and materials so crippled the contractors financially that they were unable to finish their contract. The work was readvertised June 14, 1881, bids opened June 21, 1881, and the new bid being in excess of the amount originally appropriated, $6,000 was, by ordinance December 5, 1881, transferred from the item for new engine, and the contract awarded to Thomas Gamon, January 17, 1882. The contract was not approved until April 1, 1882.

The new engine house for No. 8 Worthington is of Egyptian design, built on rock foundations, its inside dimensions are 69 feet long by 24 feet 9 inches wide, and 24 feet 6 inches high. The house is built of Port Deposit granite, the window trimmings and portals of New England granite, the cornice of galvanized iron, the roof of corrugated iron supported on I beams and covered with asphalt. The inside is lined with buff brick and terra-cotta, surrounded with a wainscot of heart pine, the doors and window frames are ash.

The old building adjacent was remodeled to correspond with the Egyptian stack and portals, and surmounted with two cast zinc sphinxes.

The new building was erected after engine No. 8 was put in service. It cost, including inlet and pump well, $18,836.15.

The new stand-pipe at Spring Garden Works was built under contract, awarded June 21, 1881, to W. Bugbee Smith, and approved by Councils September 15, 1881. The money was appropriated by ordinance December 31, 1878, January 13, 1879, November, 20, 1879, and June 30, 1880; the work was finished October 14, 1882.

The old West Philadelphia stand-pipe was taken down. The ornamental iron work, stairway, and masonry was utilized

in the completion of the new stand-pipe erected on the high ground adjacent to the Spring Garden Works, bounded by Thirty-third street on the east, and the Connecting and Philadelphia and Reading Railroads. The foundation is built of Conshohocken stone, is 24 feet diameter, and 28 feet deep. The top of foundation is 77 feet, City Datum.

The base casting is bolted to the foundations with four bolts, each $2\frac{1}{2}$ inches diameter, and 16 feet long. This casting is 5 feet 3 inches high, internal diameter 5 feet $\frac{3}{8}$ inch, with an opening for main connection of 36 inches, and a manhole 20 inches diameter.

The wrought iron pipe is 5 feet diameter and 153 feet high, built in three sections, the lowest 50 feet, and $\frac{3}{8}$ inch thick, the middle 50 feet, and $\frac{5}{16}$ inch thick, and the upper 53 feet, and $\frac{1}{4}$ inch thick, and is bolted to the base by a cast-iron collar.

The top of the stand-pipe is 235 feet City datum. A drain pipe 4 inches in diameter, a 36-inch stop, and 60 feet of pipe from the stand-pipe, has been laid. The plans for connection are in the department and the Y branches provided.

Cost of stand-pipe, including taking down old pipe, was $19,664.48, paid to W. Bugbee Smith.

By ordinance January 5, 1882, an appropriation of $25,000 was passed, to provide new boilers at the Roxborough Works, engines, boilers, and for remodelling the old schoolhouse, and to locate a new auxiliary works at the Mt. Airy reservoir.

The contracts were awarded February 7, 1882, as follows:

To James Moore, for three boilers at the Roxborough Works. Contract approved by Councils October 21, 1882.

The work was completed December 2, 1882. The contractor was to furnish and set three tubular boilers, each six feet diameter, fifteen feet long, having sixty-seven (67) four-inch lap welded tubes. Also, a twenty-inch steam drum, con-

necting the boilers, feed and blow pipes, valves, gauges, and water columns, the boilers to stand a hydrostatic test of 90 pounds and a working steam pressure of 60 pounds per square inch.

The shells are C. H. No. 1. Fire box $\frac{3}{8}$ inch thick. Heads C. H. No. 1. Flange $\frac{5}{8}$ inch thick. The contract price was $8,842.00 $329.35 was expended by the Department for pipe connections to pumping main and donkey pump.

MT. AIRY WORKS.

The contract for building stack, foundations of engines and boilers, remodelling old school-house into an engine and boiler house, grading and sodding grounds, masonry, etc., was awarded to Charles W. Rufe, February 28, 1882, approved by Councils March 18, 1882, and finished December 1, 1882.

The contract for boilers was awarded to Hilles & Jones, February 7, 1882, approved by Councils April 5, 1882, and finished August 25, 1882. The contractor was to furnish and set three tubular boilers, each four feet diameter, ten feet long, having forty-eight three-inch lap welded tubes, and an eight-inch steam pipe connecting boilers, feed and blow pipes, valves, gauges, water columns, and an automatic damper.

The boilers to be tested, and to stand a working steam pressure of ninety pounds per square inch. The shells are C. H., No. 1. Fire box $\frac{5}{16}$ inches thick. Heads, C. H., No. 1. Flange $\frac{1}{2}$ inch thick.

Contract price for these three boilers was.....	$4,296 08
Extra pipe.....	17 08
Total amount.....	$4,313 08

The contract for engines, for Mt. Airy, was awarded to W. E. Worthen, C. E., February 7, 1882, and approved by Councils March 22, 1882. The contractor was to furnish and

erect two direct acting, fly wheel, piston pumps, each capable of pumping a million gallons every twenty-four hours into the distributing mains, or a stand-pipe (the intent was to use the one in West Park), against a head of 125 feet, including gauges, pipes, and valves, in the engine room.

The steam cylinders are twenty inches, connected to an independent jet condenser and air pump. The water cylinders are ten inches, stroke twenty inches. The water valves are Worthen's patent, having a lift $\frac{3}{8}$ to $\frac{1}{2}$ inch. The valve seat openings are rectangular, one inch by fifteen, and 24 in number, twelve inlet and twelve outlet. The rods are two inches in diameter. At sixty revolutions each pump will average over a million gallons per day.

The water is delivered to the pumps from the Mt. Airy basin, under a head of fifteen feet. The inlet pipes are twelve inches, outlet pipes ten inches.

The cost under this contract was $6,800 00

CONNECTIONS, ETC.

The connections from the reservoir to the engine house, the delivery pipes to the distributing mains, the overflow pipes, stand-pipe in basin, pressure valve and wier, an old donkey pump, injector, hot well, pipe connections, clock, scale, gum hose, machinists' tools, oil tank, fire tools, and wheel-barrows were furnished by the Department.

An ordinance, dated June 7, 1882, transferred from Item 2, appropriation of June 29, 1880, $6,500, to an item for the purchase and erection of new boilers at Delaware Works. Bids were invited June 15, to be opened June 20, but the only bid being in excess of the appropriation, the work was re-advertised July 17, and bids opened July 20, and referred to a Committee, who reported August 3, when the work was awarded to Robert Wetherill & Co., of Chester, Pennsylvania, for the sum of $6,095, to furnish and set two

tubular boilers, each 15 feet long, 6 feet diameter, with 67 four-inch lap-welded tubes. The shells to be C. H., No. 1. Flange $\frac{3}{8}$ inch thick. Heads C. H., No. 1. Flange $\frac{5}{8}$ inch thick. Steam dome. C. H., No, 1. Flange $\frac{5}{16}$ inch thick. The boilers to be tested to sustain a working steam pressure of 60 pounds per square inch.

The contract and sureties were approved by Councils, November 21, 1882, and the work is being pushed to completion.

BUILDINGS, GROUNDS, AND RESERVOIRS.

FAIRMOUNT.

The sky-lights over Turbine No. 1, and over the water-closets were glazed and painted, the old stucco on inside was cut off and the walls replastered with cement mortar.

The mill-house, mansion house, benches, and reservoir fence were repaired and painted, and general repairs made to houses, walks, grounds, drains, and reservoir lining.

The flash-boards on the dam were renewed. The three slides in the reservoir slopes, made by the storm of September 21st, were repaired and sodded, and the grounds and reservoirs kept in order.

The flood-gates, fender-floats, and bulkhead at end of mound dam should be renewed, and the forebay cleaned.

Permission should be obtained from the Schuylkill Navigation Company to place a permanent timber on the dam to raise it to the height of the present flash-boards.

The swamps near the Zoological Gardens should be raised above high water to prevent the injurious effect of decaying vegetation.

SPRING GARDEN.

The river was dredged in front of forebay, the front screens repaired, new gates built and set, a screen provided and set in

main forebay for No. 8 inlet, also one in No. 8's well; a fender-float built, area back of boiler-houses repaved, new flues built, boiler-house doors hung, stop-houses covered, tin-roof over engines Nos. 4 and 7 renewed, tracks and scales repaired, and general repairs to buildings.

The stand-pipe at these works show signs of decay, the forebay should be cleaned, screens and gates to Nos. 4, 5, 6, and 7, and forebay fence should be renewed, the forebay walls should be raised, the roads graded and macadamized, the grounds graded and sodded, the coal-bins and wharf rebuilt, the tracks and sidings repaired and relaid.

SPRING GARDEN AND CORINTHIAN AVENUE BASINS, AND FOURTH DISTRICT YARD.

The brickwork was repaired at these basins, and some new paving done. The basins should be cleaned, the banks sodded, new fences provided, and the temporary stand-pipe at the Spring Garden taken down.

A fence was built around the new Fourth District Yard, also a shed. An office and additional sheds should be built.

BELMONT.

The river was dredged in front of inlet-pipe, the coal-bins were extended, the tracks and scales repaired, drains put in, pavements in boiler and engine-room laid, flues rebuilt, whitewashing and general repairs made to buildings and grounds.

The roadways and tracks should be repaired, fences erected, and the grounds put in order. The lining of the reservoir, and the fence around it were repaired, and the fence painted.

ROXBOROUGH.

General repairs were made to building, new doorway cut in boiler-room, arches built, sliding-doors furnished and hung, tracks, scales, and coal-bins repaired.

The river in front of these works should be dredged, the

inlet, conduit, gates, and screens renewed, the boiler-house should be paved, more tracks laid, and a new stack erected.

At the reservoir the stop-houses in the basin should be repaired and the woodwork painted. A new check-valve should be put in the main to Mount Airy, and the pressure valve-seat reset and jointed with lead.

DELAWARE WORKS.

The tracks and scales were repaired, the walls and ceiling of engine-room calcimined, the cellar and boiler-house whitewashed, the stack partially taken down and rebuilt, and general repairs made to roof, floors, benches, etc.

The wharf should be repaired, the hood renewed, the forebay dredged, and if this station is to be continued, new coal-bins should be provided.

DELAWARE BASIN.

The breaks in the banks made by the storm of September 21–23, were repaired. A slide on that repaired has occurred and the contractor will be required to repair it.

FRANKFORD WORKS.

Some repairs were made to coal-bins, the lower floor in engine-room relaid, and the scales and tracks repaired.

The wharf and coal-bins should be repaired, sheet piling and a bulkhead built to prevent further settlement, due to dredging into quick-sand.

The trestle carrying the 30-inch pumping main over the Little Tacony creek should be repaired. The breaks in the banks of the reservoir by the great storm of September 21–23, are still unrepaired, due to delay in obtaining money and authority to do the work; there is no item to pay for this. A small leak from the bottom shows, the one in the stop-house could be prevented by grouting, but it gives no trouble nor causes any alarm.

The ashes were removed daily from each of the works.

An itemized estimate of $30,000 was asked for special work; the appropriation made was $18,500, although the items necessary were retained and others added. Bids were asked for such work as could be done by contract, but the money at command of the Department was limited, and the following contracts could not be consummated, such as new flood-gates and fender-float at Fairmount, new fences at Corinthian and Spring Garden basins, cleaning Spring Garden basins; new coal-sheds and cleaning forebay at Delaware works, and repairs to wharves.

An appropriation of $5,000 by transfer from item 1, Gas Department, was made to repair the breaks in reservoirs by the storm of September 21–23. $2,884,50 was used to repair those at Fairmount and Delaware, the balance was provided to repair the Frankford basin and was considered sufficient, if the House of Correction labor could do the work, as had been claimed, but the inability to obtain carpenters from the House of Correction, and the late season deferred this work. No means are provided to do these repairs.

MACHINERY AT THE WORKS.

FAIRMOUNT.

The step of Turbine No. 3, and the valves and valve-seats of Turbine No. 5 were repaired, the latter faced.

The step of Turbine No. 7, and the valves and seats were faced and repaired. The metallic packing reset and the tail-gates repaired. A new crank-pin and brasses fitted.

The step of Turbine No. 8 was repaired.

SPRING GARDEN.

The piston-head of Engine No. 4, Overhead Cornish, was repaired, new bolts fitted, the guard plates in the air-pump refitted, the pump well cleaned, and the screen repaired.

The injection-pipes of Engine No. 5, Side Lever Cornish, were repaired, the piston in the air-pump refitted, the duplicate valves and valve-seats of the pump were put in August 19, 1882. The lower valve-seat was found broken October 27, 1882, which put the engine out of service until a new set of valves and seats could be furnished from Southwark Foundry, where the engine was constructed.

Simpson Engine No. 6, Compound. The inlet pump-valve box under the low pressure cylinder was secured with new bolts.

Cramp Engine No. 7. The connecting-rods were adjusted, liners put in the high pressure piston ring, and new screens placed in front of the inlet. No. 7's air-pump was connected by an 18-inch pipe with a 15-inch from No. 8's air-pump, and these with all the drips from Nos. 7 and 8 engines were drained into the main drain. The donkey pumps were connected with this overflow, and with the measuring tank. An eight-inch relief valve was placed between the mains of Nos. 7 and 8. The steam pipe covering in No. 8 engine room was repaired.

BELMONT.

Worthington Engine No, 1, received general repairs. Low pressure piston and followers were turned and faced, new rings and elliptic springs provided. The valve-seats were planed, valves faced, scraped, and air-pump connections rebuilt with barrel pistons.

Worthington Engine No. 2. The air-pump connections were rebuilt with barrel pistons, and new foot-valves placed on suction pipe. This engine should be thoroughly overhauled. The low pressure cylinder is cracked and leaks. It should be renewed, and the engine is now without steam in the jacket.

Worthington Engine No. 3. The low pressure piston rings, followers, springs, and bolts were renewed. The air-pump connections rebuilt with barrel pistons, and charging pipes connected between the main and pump chambers. The inlet valves should be renewed, new valves will be made and put in position as soon as possible. Both bell cranks were broken January 2, 1883, which put the engine out of service. The steam valves and seats should be faced. All these engines should be covered with lagging.

DELAWARE.

Engine No. 1, High Presure, and Engine No. 2, Low Pressure. These engines received general repairs. The pump barrel of No. 1 Engine was bored to 19 inches, and No. 2 to 20½ inches, and provided with new cast-iron pistons, the rods turned, stuffing-boxes and glands bushed with brass, guides planed, new brasses provided for crossheads and main rods. The pump-valves were planed, valve-seats faced with Babbett metal, and the valve-seats, gibs, and keys renewed. Steam chest joints of No. 2 were remade, with new bolts.

Worthington Engine No. 3, should be rebuilt. Temporary repairs were made. Low pressure cylinder patched, piston rings faced, the joints of the internal stuffing-boxes repaired. The channel plates of the air-pumps patched inside and out with riveted plates. The keyways in the crosshead were reslotted, and new keys put in. The air-pump links were provided with new brasses, and new bolts put in the guide braces. New keys fitted in high and low pressure piston, new stems for the pump valves and the suction chamber was provided with new valves. Patterns have been made for channel plates for the air-pumps of this engine.

ROXBOROUGH.

No. 1, Cornish, is in good repair.

No. 2, Worthington, needs general repairs, none have been

made for two years, except to the pump-valves and air-pumps, in order to keep up a supply. These repairs have been since January 1, 1883. A new engine is imperatively demanded at these works.

FRANKFORD.

Cramp Engine No. 1. New studs were fitted in the steam chest, the rockshaft renewed, and two valve-seats and stems were put in the pump. The eccentric and rods were lined. The steam and check valves ground, and the steam joints made.

CHESTNUT HILL.

The governor of the Geared Engine was repaired, valves and stops ground, refitted, and steam chest joints made.

Stops and valves of No. 2 Knowles, were repaired.

MOUNT AIRY.

An injector, donkey pump, and feed to boilers were put in. The heaters were connected, and a five-inch overflow from the hot well was laid.

BOILERS.

SPRING GARDEN.

The steam drum connection from No. 4 was repaired, safety valves, stops, and steam pipes riveted, and copper joints made. The blow-off valves of the ten new Tubulars were repaired, the steam joints renewed, valve and stem packed. The exposed surface of the upper boilers, dome, drums, and steampipes, were covered with felting. Ladders and galleries were put up and over the tops of these boilers, the safety-valves changed so as to be readily handled. The water columns taken off, the flanges riveted to the drum heads, and

cocks placed on the connecting pipes to facilitate repairs without blowing off.

No. 6 Boilers. The tubes were removed, the defective ones renewed, and the rest safe-ended and reinserted. The back sheets of these shells were renewed. Orders to repair two of these boilers have been given. Steam joints should be made and valve-stems repacked. The steam-valves at these works have been ground in, and eight steam-gauges provided. The furnaces were rebuilt, the boilers cleaned and scaled by the firemen.

The drips from the cylinders should be connected and carried overboard.

The flue from the cylinder boilers and the furnaces were rebuilt. New steam gauges and connections were placed on them.

The steam-drums were caulked, joints made, steam-pipes, stops, water columns, and valves refitted, and repaired. The blow-off valves on the tubulars were taken off and new ones substituted. The old ones were altered by the contractors to comply with the demands of the department. The water columns were taken off, the flanges riveted to the drum heads, and cocks placed on the connecting pipes to facilitate repairs without blowing off. Their exposed surfaces, domes, drums and steam pipes were covered with felting. Ladders and galleries were put to and over the top of these. The safety-valves were changed so as to be readily handled. The boilers were cleaned by the firemen at the works.

DELAWARE.

The tubulars were repaired and provided with new steam-gauges, connections, steam-joints, valves, and pipes. The water columns were repaired. An 8-inch wrought iron pipe and stops were erected and covered with felting, to carry

steam to the low pressure engine. The cylinder boilers condemned by the Boiler Inspector were sold by ordinance of Councils, and a contract with Robert Wetherill & Co., of Chester, Pa., was made to erect two tubulars on the site of those removed.

ROXBOROUGH BOILERS.

The mud drums of Nos. 1, 2, 3, and 4, were removed and the half-sheets replaced with new iron.

Boilers Nos. 5 and 6, were repaired. The tubes of the Luder boiler were taken out, examined, and fifty condemned. The good tubes and fifty new ones with connections were replaced. New blow-off valves and feed-pipes were connected with and to these boilers.

Three new tubulars under contract with Mr. James Moore were erected. New feed-pipe from donkey pump and main were put up by the department.

A 20-inch pressure valve was inserted in the pipe at the reservoir to force more water to Mount Airy.

FRANKFORD.

One of these boilers settled and was raised, and the foundation plate reset. The bridge walls were rebuilt, and the boilers were cleaned by the firemen.

PUMPAGE.

The total pumpage for 1882 was 24,691,440,430 United States gallons, a daily average of 67,647,782, an increase over 1881 of 1,970,423,592; or, .08$\frac{7}{10}$ per cent., a daily average increase of 5,398,427 gallons.

The greatest pumpage in one day (Sept. 9th), was 92 millions—27 at Fairmount, 33.3 at Spring Garden, 16.4 at Bel-

mont, 6.7 at Delaware, 4.7 at Roxborough, 3.6 at Frankford, and 0.3 at Chestnut Hill.

The greatest daily average for one week ending August 4th, was 82.15 millions—12.9 at Fairmount, 38.7 at Spring Garden, 16.1 at Belmont, 6.84 at Delaware, 4.9 at Roxborough, 2.4 at Frankford, and 0.31 at Chestnut Hill.

The total water-power pumpage at Fairmount was 9,377,468,535 gallons, a daily average of 25,691,694, an increase over 1881 of 1,802,141,846 gallons, or nearly 24 per cent.

A daily average increase of 4,937,375 gallons. This is the greatest quantity of water pumped at Fairmount, except in 1877, when the daily average was 26,015,985 gallons.

The following table compares the daily average pumpage and rainfall of 1882 with 1881, a minimum, and 1877 a maximum year.

The rainfall is the average, as reported at Philadelphia, Pottstown, Reading, and Lebanon.

	1882.		1877.		1881.	
	Mill. Galls.	Inches Rain.	Mill. Galls.	Inches Rain.	Mill. Galls.	Inches Rain.
January	33.2	4.73	25.1	2.2	24.4	3.9
February	31.8	4.25	26.0	2.1	23.3	4.4
March	33,7	3.54	26.4	5.0	29.3	5.5
April	34.7	2.21	28.5	3.2	31.5	0.9
May	35.0	6.79	25.9	1.3	29.1	3.4
June	33.8	2.89	28.0	6.1	32.9	6.6
July	23.7	2.61	23.3	5.7	19.1	1.5
August	13.6	4.25	19.9	3.0	9.4	1.5
September	19.4	7.60	20.7	3.6	5.2	1.2
October	16.0	1.93	28.3	7.0	6.0	3.0
November	14.4	0.97	30.0	5.6	12.6	2.7
December	19.4	1.70	29.9	1.2	26.2	4.7

The pumpage at the Spring Garden or Schuylkill Works was 6,993,626,480 gallons, a daily average of 19,160,620, an increase over 1881 of 91,281,720 gallons, or about $1\frac{1}{3}$ per cent., a daily average increase of 250,087 gallons.

The pumpage for the first six months of the year was 1,547,302,820, a daily average of 8,548,634 gallons. For the month of August, it was 35,920,727 gallons, and for the last six months, 5,446,323,660, a daily average of 29,599,585 gallons, an increase of over 9 per cent., compared with the same period in 1881.

The pumpage at Belmont Works was 4,445,387,322, a daily average of 12,179,144, an increase over 1881 of 199,481,740 gallons, or $4\frac{6}{10}$ per cent., a daily average increase of 546,526 gallons. The pumpage for the first six months of the year was 2,337,013,333, a daily average of 11,648,475 gallons. The last six months there was a daily average of 12,701,159 gallons.

The pumpage at the Delaware Works was 1,549,240,460 gallons, a daily average of 4,244,494 gallons, a decrease compared with 1881 of 266,343,401 gallons, or less by 14 per cent., a daily average decrease of 729,708 gallons.

The pumpage at the Frankford Works was 933,747,002 gallons, a daily average of 2,558,211, an increase over 1881 of 53,663,780 gallons, or over 6 per cent., a daily average increase of 147,024 gallons.

The pumpage at the Roxborough Works was 1,301,128,786 gallons, a daily average of 3,564,736 gallons, an increase of 91,033,142 gallons, or over 7 per cent., a daily average increase of 249,406 gallons.

The pumpage of the Auxiliary Works to Manatawna was 3,511,845 gallons, a decrease of 322,035 gallons, or less by 8 per cent., a daily average pumpage of 9,621 gallons, a daily average decrease of 822 gallons.

The pumpage at the Chestnut Hill Works was 87,330,000, a decrease of 511,200 gallons, or nearly $\frac{6}{10}$ per cent., or a daily average pumpage of 239,260 gallons.

The total quantity of water pumped into the reservoirs and into the distribution in 1882 was 24,691,440,430 gallons to an average height of 153.4 feet. This equated into work done amounts to 37,873,302,258 gallons, pumped 100 feet high, an increase over 1881 of 3,634,774,147 gallons, or nearly $10\frac{5}{10}$ per cent.

The 15,313,971,895 gallons pumped by steam-power, was to an average height of 186 feet, and the work done was 28,495,833,723 gallons, when equated, or over 75 per cent. of all the work done, an increase over 1881 of 1,832,632,301 gallons pumped 100 feet high, or nearly 7 per cent.

The amount of work done by water-power was 25 per cent. of the total work done by steam and water-power, and 24 per cent. more than was done in 1881 by water-power.

EXPENSES OF PUMPAGE.

The work was accomplished at a total expense of $252,259.66, or $6.66 per million gallons, lifted 100 feet high, by both steam and water-power, divided and compared with 1881, as follows:

	1880.	1881.	1882.
Wages of engineers and fireman per million gallons 100 feet high	$1.79	$1.84	$1.60
Coal	2.46	3.60	3.29
Oil and gas for lubricating and lighting	0.22	0.22	0.26
Repairs and small stores	1.04	1.23	1.51
	$5.51	$6.88	$6.66

The increased cost to repair was required by the constant demand upon the steam pumping machinery, which is run to its utmost capacity.

The expense of work done by water-power was $1.75 per million gallons, lifted 100 feet high, against $2.21 in 1881, and $1.90 in 1880, due to the increased pumpage consequent upon the flow of the river.

The expense of work by steam power was $8.28 as against $8.20 in 1881, and $6.68 in 1880.

RUNNING EXPENSES OF ALL THE WORKS FOR THE YEAR 1882.

WORKS.	Salaries of engineers and firemen.	Coal. Tons.	Coal. Price per ton.	Coal. Amount.	Lubricating, Cylinder, and Castor Oil. Gallons.	Lubricating, Cylinder, and Castor Oil. Price per gallon.	Lubricating, Cylinder, and Castor Oil. Amount.	Tallow. Pounds.	Tallow. Price per pound.	Tallow. Amount.	Lighting Works. Gas.	Lighting Works. Oil.	All repairs to machinery and boilers.	Packing and small stores.	Total expenses.	Cost of raising one million gallons into reservoir.	Total gallons pumped.	Lift in feet, including friction.	Number of gallons pumped 100 feet high, friction included.	Cost of raising water 100 feet high, per million gallons, friction included.	Days run.	Per centage of work done at each pumping station.	REMARKS.
Schuylkill	$17,746 96	9,303·8	$4 48	$41,681 02	2,184	50⅞c.	$1,105 17	3,976	8¼c.	$327 98	$2,627 65	$74 90	$13,456 37 4,557 14	$1,211 83	$82,789 02	$11 83	6,993,626 480	120 202	10,323,923,308	$8 02	357	27 per cent.	
Delaware	9,212 34	2,448·62	4 37	10,700 47	475		240 00	196		16 14	1,110 96	4 74	4,145 82 2,389 94	279 67	28,100 08	18 13	1,549,240,460	133	2,060,489,811	13 64	339	5 "	
Belmont	15,219 23	9,473·25	4 23	40,071 83	1,984		1,004 00	1,077		88 93		228 54	8,049 76 4,813 00	759 03	70,234 34	15 80	4,445,387,322	216	9,602,036,615	7 31	364	25 "	
Roxborough	5,670 00	4,970·43	4 39	21,820 19	623		315 00	1,129		93 18		48 09	5,642 90 3,457 07	225 04	37,271 47	28 65	1,301,128,786	346	4,501,905,599	8 28	358	12⅔ "	
Roxborough Auxiliary	675 00	46·74	4 39	205 19	12		6 00	44		3 63					889 82	253 06	3,511,845	80	2,809,476	316 77	61	⅓ "	
Chestnut Hill	1,275 00	367·21	4 85	1,780 97	105		53 00	619		51 03		7 24	266 06 188 15	17 30	3,638 75	41 68	87,330,000	125	109,162,500	33 38	365		
Frankford	2,925 00	1,435	4 60	6,601 00	39		20 00	302		24 90		19 30	1,804 33 1,497 98	155 79	13,048 30	13 94	933,747,002	203	1,895,506,414	6 88	261	5 "	
Fairmount	7,849 12	170·44 180	4 75	809 60 855 00	515		261 00	18		1 53	2,245 36	5 01	1,489 06 1,244 89	1,627 31	16,387 88	1 75	9,377,468,535	100	9,377,468,535	1 75	363	25 "	
Totals	$60,572 65	28,395·49	$4 38	$124,525 29	3,937	50⅝c.	$3,004 17	7,361	8¼c.	$607 32	$5,983 97	$387 82	$53,002 47	$4,275 97	$252,359 66		24,691,440,439	153·4	37,873,302,258	$6 66		100 per cent.	

Repairs done at Cherry street shop	$18,148 17
Repairs to machinery from Item 13	34,854 30
	$53,002 47

ITEMS OF MAINTENANCE PER MILLION GALLONS 100 FEET HIGH.

POWER.	Engineering.	Registering.	Repairs to Pipes.	Repairs to B. G. & R.	Incidentals.	Deficiencies.	Expenses per million gallons 100 feet high, common to water and steam.	Pumping salaries.	Coal.	Lubricants, small stores, and gas.	Repairs to machinery.	Expense per million gallons pumped 100 feet high.	Coal deficiency.	Total.
Water power	48c.	71c.	86c.	$1 22	34c.		$3 61	84c.	18c.	44c.	29c.	$5 36		$5 36
Steam power	48c.	71c.	86c.	$1 22	34c.		$3 61	$1 86	$4 31	35c.	$1 76	$11 89	55c.	$12 44

$1 75		Total expense of pumping one million gallons 100 feet high by water power, without interest on plant.
8 28		Total expense of pumping one million gallons 100 feet high by *steam power*, without interest on plant.
6 66		Total expense of pumping one million gallons 100 feet high by both steam and water, without interest on plant.

Duty Table.

STEAM WORKS.	Lift in feet, including friction.	Coal.		Number of gallons pumped 100 feet high, friction included.	Coal per million gallons pumped 100 feet high	
		Amount. Tons. (2,240 lbs.)	Price.		Tons.	Cost.
Schuylkill	{120 / 202}	9,303.80	$4 48	10,323,923,308	0.90	$4 03
Delaware	133	2,448.62	4 37	2,060,489,811	1.19	5 20
Belmont	216	9,473.25	4 23	9,602,036,615	0.98	4 15
Roxborough	346	4,970.43	4 39	4,501,905,599	1.10	4 83
Roxborough Auxiliary	80	46.74	4 39	2,809,476	16.70	73 31
Chestnut Hill	125	367.21	4 85	109,162,500	3.37	16 34
Frankford	203	1,435.00	4 60	1,895,506,414	0.75	3 45
Total	186	28,045.05	$4 38	28,495,833,723	0.98	$4 29

Comparison of the running expenses of steam and water power.

	Water power.	Per cent.	Steam power.	Per cent.	Total water and steam power.	Per cent.
Salaries	$7,849 12	49	$52,723 53	23	$60,572 65	24
Coal	1,664 60	10	122,860 69	52	124,525 29	50
Lubricating oil, lights extra	4,140 21	25	10,119 04	4	14,259 25	5
All repairs	2,733 95	16	50,268 52	21	53,002 47	21
Total	$16,387 88	100	$235,971 78	100	$252,359 66	100
Gallons of water pumped into basin	9,377,468,535	38	15,313,971,895	62	24,691,440,430	100
Cost per million	$1 74	.....	$15 41			
Gallons of water pumped 100 feet high	9,377,468,535	25	28,495,833,723	75	37,873,302,258	100
Cost per million	$1 74	.....	$8 28			

Percentage of water pumped at each station in the years 1879, 1880, 1881, and 1882.

WORKS.	1879.		1880.		1881.		1882.	
	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.
Fairmount water power	7,278,357,488	36.58	7,887,897,254	37.35	7,575,326,689	33.34	9,377,468,535	37.97
Schuylkill steam power	4,468,480,020	22.46	5,483,661,280	25.96	6,902,344,760	30.37	6,993,626,480	28.33
Belmont steam power	3,954,962,917	19.88	3,543,457,439	16.78	4,245,905,582	18.68	4,445,387,322	18.01
Delaware steam power	2,194,470,977	11.03	1,995,974,076	9.45	1,815,583,861	8.00	1,549,240,460	6.27
Roxborough steam power	1,141,356,720	5.74	1,166,537,109	5.52	1,210,095,644	5.33	1,301,128,786	5.27
Roxborough Auxiliary	3,389,250	0.02	3,061,170	0.02	3,833,880	0.02	3,511,845	0.02
Chestnut Hill steam power	87,532,350	0.44	89,555,850	0.42	87,841,200	0.38	87,330,000	0.35
Frankford steam power	765,551,793	3.85	950,649,208	4.50	880,083,222	3.88	933,747,002	3.78
Total pumpage	19,894,101,515	100.00	21,120,792,386	100.00	22,721,014,838	100.00	24,691,440,430	100.00

Operations of the Schuylkill Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions during the mo.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating & cylinder oil
	Days.				Pounds.	Pounds.	Quarts.
January	31	365,261	206,226,160	6,652,457	1,000,109	.....	269
February	28	331,772	182,582,500	6,520,803	913,208	51	358
March	31	442,044	221,448,900	7,143,513	810,928	.....	279
April	27	358,255	210,623,290	7,020,776	935,504	.....	247
May	26	347,036	229,598,140	7,406,391	895,874	125	227
June	30	750,242	496,823,830	16,560,794	1,493,585	365	359
July	31	1,344,860	861,001,860	27,774,253	2,420,694	459	748
August	31	1,838,998	1,113,542,540	35,920,727	3,029,101	645	952
September	30	1,359,263	873,261,310	29,108,710	2,266,922	336	510
October	31	1,640,493	1,011,313,690	32,623,022	2,605,046	366	796
November	30	1,395,442	907,240,820	30,241,361	2,456,903	951	712
December	31	1,034,559	679,963,440	21,934,306	1,952,606	549	506
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	357	11,208,225	6,993,626,480	19,160,620	20,840,480	3,847	5,962

Operations of the Delaware Water Works for the year 1882.

MONTHS.	Running time Days.	Number of revolutions during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal. Pounds.	Tallow. Pounds.	Lubricating and cylinder oil. Quarts.
January	28	285,207	101,818,899	3,284,480	404,760	4	94
February	24	281,353	100,443,021	3,587,250	425,955	12	88
March	29	350,131	124,996,767	4,032,153	476,001	24	99
April	15	311,935	65,608,328	2,186,944	272,750	.....	73
May	30	543,275	91,354,130	2,946,907	399,701	.....	117
June	30	388,665	65,090,789	2,169,692	305,869	.....	88
July	31	637,456	129,737,448	4,185,079	449,501	.....	127
August	31	649,136	191,934,550	6,191,437	534,359	16	180
September	29	488,335	159,934,895	5,331,163	487,195	19	152
October	31	657,783	181,308,304	5,848,655	566,074	67	153
November	30	610,796	171,483,766	5,716,125	555,567	20	185
December	31	569,641	165,529,563	5,339,663	607,193	27	227
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	339	5,773,713	1,549,240,460	4,244,494	5,484,925	189	1,583

Operations of the Belmont Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions 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	923,836	283,747,632	9,153,149	1,554,719	412	278
February	28	881,015	269,620,416	9,629,300	1,408,674	430	274
March	30	794,829	271,073,347	8,744,301	1,347,026	167	278
April	30	805,821	319,285,181	10,642,839	1,499,488	.....	391
May	31	1,045,373	417,699,326	13,474,171	2,077,317	.....	450
June	30	1,169,957	446,948,087	14,898,269	2,021,162	.....	552
July	31	1,097,188	426,882,170	13,770,392	2,047,427	.....	513
August	31	1,203,148	453,885,900	14,641,480	2,049,900	.....	612
September	30	1,010,696	398,784,946	13,292,831	1,914,230	19	537
October	31	995,165	373,895,504	12,061,145	1,759,240	5	604
November	30	913,358	364,754,895	12,158,496	1,670,247	10	593
December	31	1,194,994	418,809,918	13,509,997	1,870,657	.....	201
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	364	14,935,380	4,445,387,322	12,179,144	21,220,087	1,043	5,298

Operations of the Roxborough Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions 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	358,274	98,575,446	3,179,853	883,510	106	102
February	27	288,902	85,226,090	3,043,788	716,996	56	80
March	31	329,638	97,243,210	3,136,878	850,273	92	92
April	28	319,532	94,264,940	3,142,064	785,554	21	112
May	31	336,999	99,414,705	3,206,926	865,497	78	81
June	29	393,180	115,988,100	3,866,270	1,029,338	85	55
July	31	451,101	133,074,795	4,292,735	1,059,463	98	72
August	31	473,640	139,723,800	4,507,219	1,163,362	124	92
September	30	419,766	123,830,970	4,127,699	1,124,879	117	86
October	29	375,936	110,901,120	3,577,455	927,429	105	78
November	30	344,080	101,503,600	3,383,453	856,605	106	77
December	31	343,678	101,385,010	3,270,484	870,859	105	78
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	358	4,434,726	1,301,128,786	3,564,736	11,133,765	1,093	1,005

Operations of the Roxborough Auxiliary Works for the year 1882.

MONTHS.	Running time. Days	Number of revolutions during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal. Pounds.	Tallow. Pounds.	Lubricating and cylinder oil. Quarts.
January	4	12,995	194,925	6,288	11,300	4	5
February	4	13,212	198,180	7,077	10,900	3	3
March	4	13,735	206,025	6,646	11,300	3	2½
April	4	14,740	221,100	7,370	8,300	2½	2
May	5	19,412	291,180	9,393	6,000	3½	3
June	5	19,470	292,050	9,735	6,300	3½	3½
July	7	31,351	470,280	15,170	10,100	5	4
August	7	32,885	493,275	15,912	10,600	4½	3½
September	6	25,345	380,175	12,672	7,400	4	3½
October	6	20,635	309,525	9,985	6,000	3½	3
November	5	16,615	249,225	8,307	6,200	2½	2½
December	4	13,727	205,905	6,642	10,300	3½	2½
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	61	234,123	3,511,845	9,621	104,700	42½	38

Practical operations of the Chestnut Hill Works for the year 1882.

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	386,400	6,858,600	221,245	68,025	54	7¾
February	28	328,800	5,836,200	208,436	56,840	49	7
March	31	341,400	6,059,850	195,479	62,000	54	7¾
April	30	289,800	5,143,950	171,465	60,000	52½	7½
May	31	331,800	5,889,450	189,982	62,000	54	7¾
June	30	386,400	6,858,600	228,620	69,120	52½	7½
July	31	508,200	9,020,550	290,985	80,000	54	7¾
August	31	570,000	10,117,500	326,371	90,025	.....	7¾
September	30	507,000	8,999,250	299,975	78,000	60	7½
October	31	472,800	8,392,200	270,716	72,280	62	7¾
November	30	406,200	7,210,050	240,335	62,280	52½	7½
December	31	391,200	6,943,800	223,994	62,000	54	7¾
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	365	4,920,000	87,330,000	239,260	822,570	598½	91¼

Operations of the Frankford Water Works for the Year 1882.

MONTH.	Running time.	Number of revolutions 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	25	238,375	77,945,628	2,514,472	288,338	25	12½
February	17	189,790	62,061,330	2,216,476	221,641	17	8½
March	21	209,329	68,450,583	2,208,083	253,410	21	10½
April	23	223,501	73,084,827	2,436,161	272,570	24	12
May	12	171,478	56,073,306	1,808,816	185,636	26	10½
June	26	265,853	86,933,931	2,897,794	292,594	26	13
July	27	269,781	88,218,387	2,845,754	309,985	28	14
August	26	277,843	90,854,661	2,930,796	299,157	27	12½
September	18	188,599	55,906,673	1,863,556	194,348	16	8
October	27	447,037	146,181,099	4,715,519	424,287	43	21½
November	20	202,620	66,256,740	2,208,558	235,007	20	10
December	19	188,920	61,776,840	1,992,801	237,405	19	9½
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	261	2,873,126	933,747,002	2,558,211	3,214,378	292	142½

CLUSIVE, IN U. S. GALLONS.

NUT HILL.	FRANKFORD.	TOTALS.

Total for all Works.	Percentage of Consumption.	Average per day.	Highest number of gallons in one day.	Lowest number of gallons in one day.
1,805,598,385	.86	58,245,109	66,194,130	42,957,580
1,597,241,332	.84	57,044,333	64,298,280	44,342,847
1,835,384,137	.88	59,205,939	69,868,165	45,330,183
1,809,472,770	.89	60,315,759	71,862,061	47,245,584
1,984,867,330	.95	64,027,978	80,818,275	50,360,967
2,233,972,035	1.10	74,465,734	86,041,812	61,074,338
2,384,045,678	1.14	76,904,699	90,752,671	59,343,433
2,422,795,505	1.16	78,154,694	85,056,917	72,917,446
2,203,357,264	1.09	73,445,242	92,162,413	44,104,658
2,328,569,737	1.11	75,115,152	83,626,669	63,317,244
2,049,544,271	1.01	68,318,142	74,175,219	52,455,227
2,036,591,986	.97	65,696,516	77,131,169	49,422,132
24,691,440,430	Average. 100	Average. 67,647,782	Average. 78,498,982	Average. 52,739,303
1,970,425,592		5,398,427	4,725,413	3,088,198

18[illegible]00	240,660	880,083,222	2,411,187	22,721,014,838	62,249,355
18[illegible]00	239,260	933,747,002	2,558,211	24,691,440,430	67,647,782

[illegible], 172,505,781 gallons.

[illegible]ning of the Frankford Works was commenced April, 1878.

Comparison of the running expenses of steam and water power.

	Water power.	Per cent.	Steam power.	Per cent.	Total water and steam power.	Per cent.
Salaries	$7,849 12	49	$52,723 53	23	$60,572 65	24
Coal	1,664 60	10	122,860 69	52	124,525 29	50
Lubricating oil, lights extra	4,140 21	25	10,119 04	4	14,259 25	5
All repairs	2,733 95	16	50,268 52	21	53,002 47	21
Total	$16,387 88	100	$235,971 78	100	$252,359 66	100
Gallons of water pumped into basin	9,377,468,535	38	15,313,971,895	62	24,691,440,430	100
Cost per million	$1 74	.....	$15 41			
Gallons of water pumped 100 feet high	9,377,468,535	25	28,495,833,723	75	37,873,302,258	100
Cost per million	$1 74	.....	$8 28			

Percentage of water pumped at each station in the years 1879, 1880, 1881, and 1882.

WORKS.	1879.		1880.		1881.		1882.	
	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.	U. S. Gallons.	Percentage.
Fairmount water power	7,278,357,488	36.58	7,887,897,254	37.35	7,575,326,689	33.34	9,377,468,535	37.97
Schuylkill steam power	4,468,480,020	22.46	5,483,661,280	25.96	6,902,344,760	30.37	6,993,626,480	28.33
Belmont steam power	3,954,962,917	19.88	3,543,457,439	16.78	4,245,905,582	18.68	4,445,387,322	18.01
Delaware steam power	2,194,470,977	11.03	1,995,974,076	9.45	1,815,583,861	8.00	1,549,240,460	6.27
Roxborough steam power	1,141,356,720	5.74	1,166,537,109	5.52	1,210,095,644	5.33	1,301,128,786	5.27
Roxborough Auxiliary	3,389,250	0.02	3,061,170	0.02	3,833,880	0.02	3,511,845	0.02
Chestnut Hill steam power	87,532,350	0.44	89,555,850	0.42	87,841,200	0.38	87,330,000	0.35
Frankford steam power	765,551,793	3.85	950,649,208	4.50	880,083,222	3.88	933,747,002	3.78
Total pumpage	19,894,101,515	100.00	21,120,792,386	100.00	22,721,014,838	100.00	24,691,440,430	100.00

Operations of the Schuylkill Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions during the mo.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating & cylinder oil
	Days.				Pounds.	Pounds.	Quarts.
January	31	365,261	206,226,160	6,652,457	1,000,109	.....	269
February	28	331,772	182,582,500	6,520,803	913,208	51	358
March	31	442,044	221,448,900	7,143,513	810,928	.....	279
April	27	358,255	210,623,290	7,020,776	935,504	.....	247
May	26	347,036	229,598,140	7,406,391	895,874	125	227
June	30	750,242	496,823,830	16,560,794	1,493,585	365	359
July	31	1,344,860	861,001,860	27,774,253	2,420,694	459	748
August	31	1,838,998	1,113,542,540	35,920,727	3,029,101	645	952
September	30	1,359,263	873,261,310	29,108,710	2,266,922	336	510
October	31	1,640,493	1,011,313,690	32,623,022	2,605,046	366	796
November	30	1,395,442	907,240,820	30,241,361	2,456,903	951	712
December	31	1,034,559	679,963,440	21,934,306	1,952,606	549	506
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	357	11,208,225	6,993,626,480	19,160,620	20,840,480	3,847	5,962

Operations of the Delaware Water Works for the year 1882.

MONTHS.	Running time	Number of revolutions 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	28	285,207	101,818,899	3,284,480	404,760	4	94
February	24	281,353	100,443,021	3,587,250	425,955	12	88
March	29	350,131	124,996,767	4,032,153	476,001	24	99
April	15	311,935	65,608,328	2,186,944	272,750	.....	73
May	30	543,275	91,354,130	2,946,907	399,701	.....	117
June	30	388,665	65,090,789	2,169,692	305,869	.....	88
July	31	637,456	129,737,448	4,185,079	449,501	.....	127
August	31	649,136	191,934,550	6,191,437	534,359	16	180
September	29	488,335	159,934,895	5,331,163	487,195	19	152
October	31	657,783	181,308,304	5,848,655	566,074	67	153
November	30	610,796	171,483,766	5,716,125	555,567	20	185
December	31	569,641	165,529,563	5,339,663	607,193	27	227
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	339	5,773,713	1,549,240,460	4,244,494	5,484,925	189	1,583

Operations of the Belmont Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions 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	923,836	283,747,632	9,153,149	1,554,719	412	278
February	28	881,015	269,620,416	9,629,300	1,408,674	430	274
March	30	794,829	271,073,347	8,744,301	1,347,026	167	278
April	30	805,821	319,285,181	10,642,839	1,499,488	.....	391
May	31	1,045,373	417,699,326	13,474,171	2,077,317	.....	450
June	30	1,169,957	446,948,087	14,898,269	2,021,162	.....	552
July	31	1,097,188	426,882,170	13,770,392	2,047,427	.....	513
August	31	1,203,148	453,885,900	14,641,480	2,049,900	.....	612
September	30	1,010,696	398,784,946	13,292,831	1,914,230	19	537
October	31	995,165	373,895,504	12,061,145	1,759,240	5	604
November	30	913,358	364,754,895	12,158,496	1,670,247	10	593
December	31	1,194,994	418,809,918	13,509,997	1,870,657	.....	201
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	364	14,935,380	4,445,387,322	12,179,144	21,220,087	1,043	5,298

Operations of the Roxborough Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions 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	358,274	98,575,446	3,179,853	883,510	106	102
February	27	288,902	85,226,090	3,043,788	716,996	56	80
March	31	329,638	97,243,210	3,136,878	850,273	92	92
April	28	319,532	94,264,940	3,142,064	785,554	21	112
May	31	336,999	99,414,705	3,206,926	865,497	78	81
June	29	393,180	115,988,100	3,866,270	1,029,338	85	55
July	31	451,101	133,074,795	4,292,735	1,059,463	98	72
August	31	473,640	139,723,800	4,507,219	1,163,362	124	92
September	30	419,766	123,830,970	4,127,699	1,124,879	117	86
October	29	375,936	110,901,120	3,577,455	927,429	105	78
November	30	344,080	101,503,600	3,383,453	856,605	106	77
December	31	343,678	101,385,010	3,270,484	870,859	105	78
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	358	4,434,726	1,301,128,786	3,564,736	11,133,765	1,093	1,005

Operations of the Roxborough Auxiliary Works for the year 1882.

MONTHS.	Running time. Days	Number of revolutions during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Coal. Pounds.	Tallow. Pounds.	Lubricating and cylinder oil. Quarts.
January	4	12,995	194,925	6,288	11,300	4	5
February	4	13,212	198,180	7,077	10,900	3	3
March	4	13,735	206,025	6,646	11,300	3	2½
April	4	14,740	221,100	7,370	8,300	2½	2
May	5	19,412	291,180	9,393	6,000	3½	3
June	5	19,470	292,050	9,735	6,300	3½	3½
July	7	31,351	470,280	15,170	10,100	5	4
August	7	32,885	493,275	15,912	10,600	4½	3½
September	6	25,345	380,175	12,672	7,400	4	3½
October	6	20,635	309,525	9,985	6,000	3½	3
November	5	16,615	249,225	8,307	6,200	2½	2½
December	4	13,727	205,905	6,642	10,300	3½	2½
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	61	234,123	3,511,845	9,621	104,700	42½	38

Practical operations of the Chestnut Hill Works for the year 1882.

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	386,400	6,858,600	221,245	68,025	54	7¾
February	28	328,800	5,836,200	208,436	56,840	49	7
March	31	341,400	6,059,850	195,479	62,000	54	7¾
April	30	289,800	5,143,950	171,465	60,000	52½	7½
May	31	331,800	5,889,450	189,982	62,000	54	7¾
June	30	386,400	6,858,600	228,620	69,120	52½	7½
July	31	508,200	9,020,550	290,985	80,000	54	7¾
August	31	570,000	10,117,500	326,371	90,025	.....	7¾
September	30	507,000	8,999,250	299,975	78,000	60	7½
October	31	472,800	8,392,200	270,716	72,280	62	7¾
November	30	406,200	7,210,050	240,335	62,280	52½	7½
December	31	391,200	6,943,800	223,994	62,000	54	7¾
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	365	4,920,000	87,330,000	239,260	822,570	598½	91¼

Operations of the Frankford Water Works for the Year 1882.

MONTH.	Running time.	Number of revolutions 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	25	238,375	77,945,628	2,514,472	288,338	25	12½
February	17	189,790	62,061,330	2,216,476	221,641	17	8½
March	21	209,329	68,450,583	2,208,083	253,410	21	10½
April	23	223,501	73,084,827	2,436,161	272,570	24	12
May	12	171,478	56,073,306	1,808,816	185,636	26	10½
June	26	265,853	86,933,931	2,897,794	292,594	26	13
July	27	269,781	88,218,387	2,845,754	309,985	28	14
August	26	277,843	90,854,661	2,930,796	299,157	27	12½
September	18	188,599	55,906,673	1,863,556	194,348	16	8
October	27	447,037	146,181,099	4,715,519	424,287	43	21½
November	20	202,620	66,256,740	2,208,558	235,007	20	10
December	19	188,920	61,776,840	1,992,801	237,405	19	9½
	Total.	Total.	Total.	Average.	Total.	Total.	Total.
	261	2,873,126	933,747,002	2,558,211	3,214,378	292	142½

TOTAL GALLONS OF WATER PUMPED DURING 1882.

MONTHS.	Fairmount Works.	Delaware Works	Schuylkill Works.	Belmont Works.	Frankford Works.	Roxborough Works.	Roxborough Auxiliary Works	Chestnut Hill Works.	Total for all Works.	Percentage of Consumption.	Average per day.	Highest number of gallons in one day.	Lowest number of gallons in one day.
January	1,030,228,098	101,818,899	206,226,160	283,747,632	77,948,625	98,575,446	194,925	6,858,600	1,805,598,385	.86	58,245,109	66,194,130	42,957,580
February	891,273,595	100,443,021	182,582,500	269,620,416	62,061,330	85,226,090	198,180	5,836,200	1,597,241,332	.84	57,044,333	64,298,280	44,342,847
March	1,045,905,455	124,996,767	221,448,900	271,073,347	68,450,583	97,243,210	206,025	6,029,850	1,835,384,137	.88	59,205,939	69,868,165	45,330,183
April	1,041,244,154	65,608,328	210,623,290	319,285,181	73,084,827	94,261,940	221,100	5,143,950	1,809,472,770	.89	60,315,759	71,862,061	47,245,584
May	1,084,547,093	91,354,130	229,598,140	417,699,326	56,073,306	99,414,705	291,180	5,889,450	1,984,867,330	.95	64,027,978	80,818,275	50,360,967
June	1,015,036,648	65,090,789	496,823,830	446,948,087	86,933,931	115,988,100	292,050	6,858,600	2,233,972,035	1.10	74,465,734	86,041,812	61,074,338
July	735,640,188	129,737,448	861,001,860	426,882,170	88,218,387	133,074,795	470,280	9,020,550	2,384,045,678	1.14	76,904,699	90,752,671	59,343,433
August	422,243,279	191,934,550	1,113,542,540	453,885,900	90,854,661	139,723,800	493,275	10,117,500	2,422,795,505	1.16	78,154,694	85,056,917	72,917,446
September	582,259,045	159,934,895	873,261,310	398,784,946	55,906,673	123,830,970	380,175	8,999,250	2,203,357,264	1.09	73,445,242	92,162,413	44,104,658
October	496,268,295	181,308,304	1,011,313,690	373,895,504	146,181,099	110,901,120	309,525	8,392,200	2,328,569,737	1.11	75,115,152	83,626,669	63,317,244
November	430,845,175	171,483,766	907,240,820	364,754,895	66,256,740	101,503,600	249,225	7,210,050	2,049,544,271	1.01	68,318,142	74,175,219	52,455,227
December	301,977,510	165,529,563	679,963,440	418,809,918	61,776,840	101,385,010	205,905	6,943,800	2,036,591,986	.97	65,696,516	77,131,169	49,422,132
Total	9,577,468,535	1,549,240,460	6,993,626,480	4,445,387,322	933,747,002	1,301,128,786	3,511,845	87,330,000	24,691,440,430	Average. 100	Average. 67,647,782	Average. 78,498,982	Average. 52,739,303
Increase over 1881	1,802,141,846		91,281,720	199,481,740	53,663,780	91,033,142			1,970,425,592		5,398,427	4,725,413	3,088,198
Decrease under 1881		266,343,401					322,035	511,200					

AMOUNT OF WATER PUMPED BY ALL THE WORKS FROM 1854--1882, INCLUSIVE, IN U. S. GALLONS.

YEAR.	FAIRMOUNT.		DELAWARE.		SCHUYLKILL.		TWENTY-FOURTH WARD AND BELMONT.		ROXBOROUGH AND GERMANTOWN.		CHESTNUT HILL.		FRANKFORD.		TOTALS.	
	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total for all the works.	Total daily average.
1854	2,286,402,222	6,264,116	618,173,121	1,693,625	1,366,011,559	3,742,497									4,279,586,902	11,700,238
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	7,853,850	769,566,040	2,102,639	1,980,637,500	5,411,578	52,577,642	143,655							5,669,970,147	15,491,722
1857	3,059,797,730	8,383,007	811,462,085	2,223,184	2,315,832,461	6,344,746	121,948,840	334,106							6,309,040,116	17,285,044
1858	3,058,418,667	8,379,229	757,187,690	2,074,487	2,819,641,992	7,725,047	204,177,624	559,391							6,839,425,973	18,738,153
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	3,612,989,017	9,871,555	872,144,980	2,382,910	2,696,960,210	7,368,744	283,646,070	774,989							7,465,740,277	20,398,197
1861	3,731,785,628	10,224,070	983,805,740	2,695,358	2,527,182,710	6,923,788	353,313,900	967,983							7,596,087,978	20,811,200
1862	3,564,724,753	9,766,369	909,126,440	2,490,757	3,038,527,420	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	2,203,769,280	6,037,724	525,754,090	1,440,422							9,498,775,141	26,024,041
1864	5,970,801,329	16,313,665	1,090,884,060	2,980,558	1,725,444,660	4,714,330	519,877,800	1,420,431							9,307,007,849	25,428,983
1865	7,082,015,640	19,402,783	1,429,591,700	3,916,690	2,005,038,484	5,493,256	535,923,360	1,468,283							11,052,569,184	30,281,011
1866	7,721,817,582	21,155,665	1,271,841,020	3,484,496	947,652,428	2,596,308	606,665,380	1,662,097	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	1,856,759	177,104,200	485,217					10,863,421,498	29,762,798
1868	8,024,530,911	21,924,948	705,442,350	1,927,438	2,337,365,642	6,386,245	727,824,780	1,988,592	190,015,200	519,167					11,985,178,883	32,746,390
1869	7,489,611,069	20,519,482	1,042,780,453	2,856,934	2,735,569,020	7,494,709	928,561,494	2,544,004	218,229,800	597,890					12,414,752,336	34,013,020
1870	8,134,985,170	22,287,631	1,186,131,144	3,249,674	3,003,737,166	8,229,417	*850,011,192	2,328,798	227,946,600	624,511					13,402,811,272	36,720,030
1871	8,821,728,593	24,169,065	1,007,378,521	2,759,941	2,201,294,172	6,030,943	1,054,210,990	2,888,249	‡413,787,205	1,133,664					13,498,399,481	36,981,916
1872	†7,366,632,573	20,127,411	1,474,531,040	4,028,773	2,223,287,070	6,074,555	1,456,756,728	3,980,210	§518,811,050	1,417,517					13,040,018,461	35,628,465
1873	†8,717,538,594	23,883,667	1,364,109,884	3,737,287	1,508,295,800	4,132,317	1,959,966,670	5,369,772	373,287,495	1,844,623					14,223,198,443	38,967,667
1874	†7,749,007,798	21,230,158	1,558,518,765	4,269,914	1,536,505,220	4,209,603	2,969,227,504	8,134,870	720,165,810	1,973,057					14,553,425,097	39,817,603
1875	†7,994,234,254	21,902,012	1,839,190,470	5,038,878	1,356,295,950	3,715,879	3,055,507,870	8,371,254	818,339,525	2,242,026	33,592,000	92,033			15,097,160,069	41,363,082
1876	†8,547,163,024	23,352,906	2,011,301,489	5,495,359	2,179,733,340	5,955,556	3,748,651,929	10,242,218	935,702,907	2,556,565	50,754,850	138,674			17,473,308,039	47,741,279
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			17,817,144,792	48,983,958
1878	8,322,288,784	22,800,791	2,133,094,379	5,844,000	2,902,600,680	7,955,070	4,076,537,188	11,170,000	1,056,085,543	2,893,386	78,267,900	214,433	‖532,789,858	2,090,000	19,101,664,332	52,333,326
1879	7,278,357,488	19,950,213	2,194,470,977	6,012,222	4,468,480,020	12,258,850	3,954,962,917	10,835,515	1,144,745,970	3,136,564	87,532,350	239,815	765,551,793	2,097,402	19,894,101,515	54,507,518
1880	7,887,896,254	21,551,630	1,995,974,076	5,453,481	5,483,661,280	14,982,681	3,543,457,439	9,681,577	1,169,598,279	3,195,624	89,555,850	244,688	950,649,208	2,597,402	21,120,792,386	57,707,082
1881	7,575,326,689	20,754,319	1,815,583,861	4,974,202	6,902,344,760	18,910,533	4,245,905,582	11,632,618	1,214,029,524	3,326,000	87,841,200	240,660	880,083,222	2,411,187	22,721,014,838	62,249,355
1882	9,377,468,535	25,691,694	1,549,240,460	4,244,494	6,993,626,480	19,160,620	4,445,387,322	12,179,144	1,304,640,631	3,574,369	87,330,000	239,260	933,747,002	2,558,211	24,691,440,430	67,647,782

* 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 146,540,883; 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. ‖ The record of pumping of the Frankford Works was commenced April, 1878.

Operations of the Fairmount Water Works for the year 1882.

MONTHS.	Running time.	Number of revolutions during the mo.	Total number of gallons pumped during the month.	Average gallons per day.	Coal.	Tallow.	Lubricating and cylinder oil.	From Pennsylvania Hospital Reports.	
								Rainfall during month.	Mean temperature.
	Days.				Pounds.	Pounds.	Quarts.	Inches.	Degrees.
January	31	2,661,850	1,030,228,098	33,233,164	Heating Mill House.	.....	120	5.602	31.62
February	28	3,319,935	891,273,595	31,831,199		.....	155	4.138	36.86
March	31	2,977,324	1,045,905,455	33,738,885		.....	116	3.380	42.23
April	30	3,004,125	1,041,244,154	34,708,138		.....	201	2.359	49.08
May	31	3,148,115	1,084,547,093	34,985,390		18	140	5.718	56.83
June	30	2,935,763	1,015,036,648	33,834,554		.....	156	2.143	72.82
July	31	1,961,086	735,640,188	23,730,328		.....	209	2.143	77.32
August	31	1,036,635	422,243,279	13,620,750		.....	109	6.605	73.20
September	20	1,531,066	582,259,045	19,408,634		.....	107	13.904	69.08
October	31	1,260,873	496,268,295	16,008,654		.....	96	1.287	59.75
November	30	1,005,387	430,845,175	14,361,506		.....	67	1.036	41.66
December	31	1,538,861	601,977,510	19,418,629		.....	106	2.000	33.14
	Total.	Total.	Total.	Average.	Total.	Total.	Total.	Total.	
	365	25,381,020	9,377,468,535	25,691,694	403,200	18	1,582	50.315	

Monthly rain-fall at Lebanon, Pennsylvania, observed by S. B. Lehman, from 1829 to 1882, inclusive. Elevation, 495 feet above tide-water.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1829	5·09	2·60	2·24	3·40	4·34	3·79	6·78	3·87	2·62	3·62	3·31	2·56	44·22
1830	2·80	·65	5·57	2·63	5·49	5·13	1·42	2·23	3·03	3·74	5·99	4·65	43·33
1831	1·64	2·75	2·07	3·60	1·17	4·86	6·26	3·40	5·84	3·38	2·18	1·32	41·47
1832	4·42	4·96	1·80	1·54	4·76	1·85	1·36	4·18	2·68	3·22	2·30	4·24	37·31
1833	2·74	·56	1·66	·57	4·58	9·00	5·97	1·07	4·14	6·97	2·34	5·18	44·78
1834	3·37	2·04	1·86	2·19	3·98	5·78	3·98	·98	2·39	2·89	2·18	2·85	34·49
1835	2·26	1·50	3·80	5·45	2·03	4·17	3·78	3·79	3·98	1·85	3·71	1·30	37·62
1836	4·40	3·05	1·45	2·80	3·32	6·32	2·00	3·47	1·18	4·10	3·37	4·36	39·82
1837	1·90	1·78	4·91	2·25	4·32	4·33	4·41	3·52	3·88	2·16	1·31	2·17	36·97
1838	3·89	1·41	3·18	2·38	5·64	3·89	·40	2·71	3·20	3·62	4·20	1·13	35·65
1839	4·22	2·70	·59	3·76	4·40	3·71	5·67	2·98	3·99	1·14	2·27	3·30	37·73
1840	1·59	2·39	2·68	4·12	2·77	2·58	1·89	1·54	1·40	3·75	2·87	3·28	30·86
1841	4·39	·90	3·87	4·62	4·90	3·64	2·45	2·07	2·97	1·47	2·94	4·65	38·87
1842	1·23	2·53	2·00	5·13	3·98	3·95	6·47	3·58	2·00	2·77	3·38	2·82	39·84
1843	3·04	2·61	6·18	2·15	2·68	2·02	2·76	4·39	7·30	4·55	3·60	2·84	44·12
1844	4·15	2·15	3·55	1·43	4·60	2·55	2·15	1·71	2·56	3·40	1·80	2·14	32·19
1845	2·27	2·16	2·57	·76	2·49	5·22	·83	2·38	2·11	7·27	3·07	2·15	33·28
1846	2·38	3·50	3·78	2·40	9·38	4·67	3·19	3·20	2·23	3·58	5·10	3·20	46·61
1847	3·70	3·35	3·43	1·00	3·36	3·86	6·04	2·04	7·46	4·46	5·22	6·68	50·60
1848	2·61	1·62	2·88	·69	2·26	2·81	6·00	2·17	1·76	1·69	3·83	5·10	33·42
1849	1·61	1·88	4·98	1·37	4·56	3·96	·39	1·51	·71	6·81	2·38	5·00	35·16
1850	5·61	4·70	3·97	2·09	5·92	6·45	10·14	5·46	8·75	4·61	1·98	4·49	64·17
1851	1·09	4·42	3·25	5·67	4·36	3·30	1·85	2·50	1·36	1·50	4·05	2·15	35·50
1852	2·45	2·45	4·45	4·79	2·61	3·75	3·21	5·47	1·47	1·55	6·65	5·05	43·90
1853	1·55	4·65	1·62	4·25	5·53	·49	5·91	7·82	4·28	3·70	1·79	1·52	43·11
1854	3·08	5·05	2·11	4·43	3·76	4·62	2·92	·80	·92	2·04	5·47	2·38	37·58
1855	3·82	3·45	2·03	2·18	2·98	8·50	10·29	3·17	5·34	5·49	·93	5·45	53·63
1856	2·53	1·30	1·32	4·30	2·93	4·85	2·16	4·46	1·97	1·46	2·56	3·71	32·55
1857	3·07	1·40	1·72	5·19	9·80	10·05	4·94	4·91	2·52	1·58	2·65	4·78	52·61
1858	2·23	1·00	1·09	3·48	9·35	4·52	1·81	4·78	2·00	3·12	4·73	5·17	43·28
1359	3·80	3·48	5·92	5·25	3·37	4·85	4·90	2·43	10·20	3·19	2·42	3·89	53·70
1860	3·06	3·55	1·33	4·45	10·65	5·18	·93	7·63	2·44	4·51	4·95	2·92	51·60
1861	3·57	1·97	2·86	4·09	4·18	1·60	6·28	5·49	4·23	5·47	4·03	1·25	45·02
1862	5·31	1·86	3·45	3·86	2·17	9·22	3·23	1·62	1·10	3·34	2·62	·86	38·64
1863	4·86	3·17	5·25	4·45	3·68	4·54	11·43	·89	4·93	4·33	3·79	5·42	56·74
1864	2·08	·61	3·46	4·06	5·75	2·43	1·87	3·27	6·05	1·77	3·24	3·84	38·43
1865	3·92	1·84	6·65	2·81	5·61	4·95	4·61	1·70	5·38	3·20	2·35	3·50	46·52
1866	1·74	4·39	1·21	2·37	2·98	4·87	3·74	4·28	5·51	2·83	3·34	2·20	39·46
1867	2·00	4·41	4·16	2·48	7·96	3·93	2·86	12·91	2·41	1·57	·70	3·08	48·47
1868	2·82	1·81	1·76	4·30	5·15	4·12	3·06	1·48	4·81	2·13	3·49	2·37	37·30
1869	3·17	2·80	3·62	2·83	3·70	4·55	3·92	1·46	2·57	7·39	2·26	5·13	43·40
1870	3·52	3·75	3·04	1·28	4·24	4·70	3·61	4·17	3·27	2·59	1·71	2·10	40·98
1871	2·43	2·68	5·50	2·54	2·93	4·18	7·03	5·48	2·27	2·02	3·10	1·33	41·49
1872	·99	1·11	1·79	2·52	2·79	3·12	3·09	8·63	3·86	3·79	2·54	2·77	37·00
1873	3·69	3·22	3·05	4·24	4·01	2·67	7·82	9·43	3·42	7·79	3·28	1·95	54·57
1874	2·85	2·86	2·20	5·94	2·79	1·21	6·25	3·28	2·32	·52	2·42	2·42	35·06
1875	2·79	2·79	4·68	2·97	1·86	3·93	2·96	8·24	2·41	3·39	3·49	2·64	42·15
1876	1·70	3·21	5·34	2·13	3·06	4·22	4·56	1·59	8·63	2·38	2·77	2·23	41·82
1877	2·78	2·09	4·33	3·69	1·54	5·73	4·43	1·92	3·27	6·64	5·53	1·30	43·25
1878	3·47	2·76	3·61	3·62	5·12	3·60	1·24	1·99	·91	3·33	2·89	3·92	36·46
1879	2·17	2·21	2·30	2·54	2·76	3·90	3·39	4·26	2·93	1·49	1·77	4·82	34·54
1880	3·59	3·61	3·34	3·74	1·37	4·43	3·28	2·80	3·69	2·08	2·98	2·33	37·24
1881	3·55	3·66	4·57	1·03	3·39	7·11	·53	·50	·77	3·67	2·37	4·93	36·08
1882	5·35	4·56	3·85	2·13	7·10	1·94	3·84	2·44	5·22	1·92	1·42	1·22	40·99

Monthly rainfall at Reading, Pennsylvania, observed by A. Harvey Tyson, City Engineer. Elevation, —— feet above tide-water.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1877	.....	.....	.....	.....	.....	.....	.....	2·15	4.34	7·16	5·77	1·46	.....
1878	5·01	2·43	3·44	2·75	3·48	2·73	1·63	1·84	3·18	3·74	2·63	4·37	37·23
1879	2·42	2·21	2·37	3·16	3·31	3·61	3·00	5·40	2·02	·67	1·57	2·48	32·12
1880	1·82	1·97	3·97	2·96	·66	2·58	4·71	2·52	2·36	1·88	2·78	3·25	31·46
1881	3·78	4·37	6·04	·99	3·69	7·08	1·36	1·02	1·66	2·40	2·56	5·34	40·29
1882	5·09	4·36	4·04	1·90	6·68	2·43	2·14	3·33	4·65	2·36	·95	1·96	39·89

Monthly rainfall at Pottstown, Pennsylvania, observed by Charles Moore, from 1872 to 1882, inclusive.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1872	3·00	2·00	2·00	3·00	2·50	4·00	4·50	9·00	4·50	3·00	5·00	4·00	46·50
1873	4·00	3·00	4·00	5·00	4·00	2·50	4·00	6·50	3·50	5·00	3·00	3·00	47·50
1874	5·00	3·00	3·00	6·00	4·00	3·50	6·00	3·00	5·00	3·00	3·00	2·50	47·00
1875	4·00	4·00	3·00	3·00	4·00	2·30	6·30	6·00	2·50	5·10	5·70	4·00	49·90
1876	1·80	3·60	7·70	3·20	3·20	2·80	7·10	2·00	9·00	2·00	4·50	·40	47·30
1877	1·10	1·80	5·60	3·00	1·26	7·00	6·75	3·09	3·67	7·60	4·94	1·20	47·01
1878	3·19	3·08	3·25	4·42	4·65	4·20	6·60	2·70	1·67	2·86	3·50	5·30	45·42
1879	1·60	1·05	2·38	4·00	2·55	6·40	4·67	8·32	1·50	·58	1·50	5·72	40·27
1880	2·43	1·55	4·45	2·83	·85	3·02	10·55	2·35	2·86	2·47	2·48	1·97	37·81
1881	3·73	4·05	5·73	·94	3·41	7.48	1·83	·83	1·10	2·33	2·80	5·13	39·36
1882	2·89	3·93	2·90	2·44	7·66	5·00	2·33	4·51	6·64	2·17	·46	1·61	42·54

RAIN FALL AT PHILADELPHIA, FROM PENNSYLVANIA HOSPITAL REPORTS.

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.	Reading, Pa.	Lebanon, Pa.	Pottstown, Pa.
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	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30·13	.....		
1819	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23·35	.....		
1820	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39·61	.....		
1821	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32·18	.....		
1822	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29·86	.....		
1823	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41·85	.....		
1824	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38·74	.....		
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	37·97	.....		
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	41·85	.....	44·22	
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	.....	43·33	
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	.....	41·47	
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	.....	37·31	
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	.....	44·78	
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	.....	34·49	
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	.....	37·62	
1836	7·62	2·99	1·75	3·47	2·28	7·31	2·91	1·97	1·82	3·59	3·34	3·61	42·66	.....	39·82	
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	.....	36·97	
1838	2·20	2·19	3·171	3·586	3·577	6·600	2·376	2·780	9·519	4·896	3·350	1·044	45·238	.....	35·65	
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	43·73	.....	37·73	
1840	1·481	3·009	2·626	6·827	2·688	5·948	4·538	5·554	2·502	5·734	2·486	3·647	47·400	.....	30·86	
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	.....	38·87	
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	.....	39·84	
1843	1·440	2·540	4·415	4·723	2·045	1·686	4·543	9·255	4·856	2·220	4·148	4·041	46·912	.....	44·12	
1844	4·052	1·449	4·430	1·354	3·091	3·351	5·284	2·399	4·034	5·025	2·951	2·753	40·173	.....	32·19	
1845	3·760	4·738	2·415	2·580	1·599	3·725	2·763	7·298	2·155	2·529	2·500	3·959	40·021	.....	33·28	
1846	4·680	3·330	4·598	2·112	3·444	3·300	4·604	4·272	·249	2·444	7·970	3·347	44·390	.....	46·61	
1847	4·730	4·569	4·700	·585	1·567	3·305	2·765	3·182	8·070	3·000	2·836	5·785	45.094	.....	50·60	
1848	2·030	1·443	2·756	1·541	4·902	4·433	3·281	1·714	1·805	3·747	2·343	5·007	35·102	.....	33·42	
1849	·730	2·610	5·470	1·752	3·995	2·195	2·933	6·975	1·404	5·595	2·600	5·836	42·095	.....	35·16	
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	.....	64·17	
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	.....	35·50	
1852	2·011	2·710	4·270	6·445	3·034	4·030	4·060	4·490	1·293	2·267	6·055	5·174	45·749	.....	43·90	
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	.....	43·11	
1854	2·331	4·203	1·615	7·750	6·935	2·390	3·024	1·842	3·798	1·545	2·834	2·910	40·180	.....	37·58	
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	.....	53·63	
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	.....	32·55	
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	.....	52·61	
1858	2·595	2·285	1·087	4·640	5·015	4·495	1·345	4·941	1·492	1·842	5·615	4·500	39·852	.....	43·28	
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	.....	53·70	
1860	3·225	2·755	1·415	3·800	3·817	2·885	·985	8·401	2·850	4·520	6·130	3·310	44·093	.....	51·60	
1861	5·245	2·065	3·925	3·705	6·640	3·880	2·560	3·137	4·402	3·797	4·875	2·092	46·440	.....	45·02	
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	.....	38·64	
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	.....	56·74	
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	.....	38·43	
1865	3·610	5·825	4·710	2·830	7·210	4·750	2·970	3·770	7·960	3·050	3·960	5·610	56·255	.....	46·52	
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	.....	39·46	
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	.....	48·47	
1868	3·620	2·520	3·360	5·44	7·005	4·370	3·514	2·056	8·908	1·737	5·280	3·595	51·405	.....	37·30	
1869	4·280	4·760	5·305	2·120	4·235	5·858	2·885	1·280	3·250	6·320	3·725	5·115	48·860	.....	43·40	
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	44·105	50·45	40·98	
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	46·27	41·49	
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	41·24	37·00	46·50
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	58·49	54·57	47·50
1874	4·218	2·823	1·595	7·509	2·697	2·664	2·759	6·531	3·987	1·650	2·229	2·249	40·911	36·71	35·06	47·00
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	.....	42·15	49·90
1876	2·023	3·680	5·605	1·999	5·189	2·209	6·223	1·215	7·776	1·210	9·025	3·169	49·323	.....	41·82	47·30
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	.....	43·25	47·01
1878	4·566	2·172	3·641	2·541	4·329	4·750	5·313	4·803	1·418	2·391	2·891	4·873	43·718	37·23	36·46	45·42
1879	2·814	1·750	2·505	5·687	1·315	7·858	4·575	8·435	1·297	·447	1·615	6·351	44·649	32·22	34·54	40·27
1880	2·171	2·875	4·799	2·935	0·578	1·991	9·461	5·494	1·683	1·242	1·957	4·492	39·678	31·46	37·24	37·81
1881	4·836	5·370	5·871	·715	3·283	5·066	1·139	2·176	1·241	3·720	3·143	3·722	40·282	40·29	36·08	39·36
1882	5·602	4·138	3·380	2·359	5·718	2·143	2·143	6·605	13 904	1·287	1·036	2·000	50·315	39·89	40·99	42·54

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, Pa.

DISTRIBUTION

—OF THE—

WATER DEPARTMENT

—FOR THE—

YEAR 1882.

PIPE LAID BY THE WATER DEPARTMENT IN FAIRMOUNT PARK AND ACCOUNTED FOR IN THE TABLE IN THE REPORT OF 1881.

Location.	PIPE HANDLED.										DEDUCTIONS.					
	Unknown.	1-inch.	2-inch.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	Total.	Relaid and Taken up.	Balance.	Taken up.	Total added.	Miles.	Feet.
East Park				650	6,298	3,089	740				10,777	126	10,651	63	10,588	2	28
West Park				136	448			1,076	14		1,674		1,674		1,674		1,674
Total feet				786	6,746	3,089	740	1,076	14		12,451	126	12,325	63	12,262	2	1,702
																TONS.	
East Park				9,750	119,662	95,759	31,080				256,251	2,394	253,857	1,197	253,660		126.33
West Park				2,040	8,512			59,180	1,008		70,740		70,740		70,740		35.37
Total pounds				11,790	128,174	95,759	31,080	59,180	1,008		326,991	2,394	324,597	1,197	323,400		161.70

PIPE LAID BY THE PARK COMMISSION, ZOOLOGICAL SOCIETY, AND CENTENNIAL EXHIBITION COMPANY IN FAIRMOUNT PARK NOT ACCOUNTED FOR IN THE TABLE IN THE REPORT FOR 1881.

	PIPE HANDLED.										DEDUCTIONS.					
	Unknown.	1-inch.	2-inch.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	Total.	Relaid and Taken up.	Balance.	Taken up.	Total added.	Miles.	Feet.
East Park	3,616										3,616		3,616		3,616		3,616
West Park	18,455	570	115	8,119	19,840	33,855	5,140	2,810	535	2,360	91,799	27,667	64,132	27,667	36,465	6	4,785
Total feet	22,071	570	115	8,119	19,840	33,855	5,140	2,810	535	2,360	95,415	27,667	67,748	27,667	40,081	7	3,121
																NET TONS.	
East Park	28,928							154,550			28,923		28,928		28,928		$14\frac{928}{2000}$
West Park	147,640	2,850	1,120	121,785	376,960	1,049,595	215,880		38,520	259,600	2,368,410	620,255	1,748,155	620,255	1,127,900		$563\frac{1800}{2000}$
Total pounds	176,568	2,850	1,120	121,785	376,960	1,049,595	215,880	154,550	38,520	259,600	2,397,338	620,255	1,777,083	620,255	1,156,828		$578\frac{828}{2000}$

RECAPITULATION OF THE FEET AND WEIGHT OF PIPE HANDLED AND IN THE GROUND.

		PIPE HANDLED.																				PIPE IN THE GROUND.				
		Unknown.	1-inch.	1½-inch.	2-inch.	2½-inch.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	18-inch.	20-inch.	22-inch.	23-inch.	24-inch.	30-inch.	36-inch.	48-inch.	Total handled.	Taken out.	Feet.	Miles.	Feet.	Pounds.	Net tons.
First Period. Pipe laid previous to Consolidation.	Total feet handled	2,285	175	2,698	1,364	280	180,201	203,978	588,772	24,381	151,976	38,771	35,703	14,625	43,765	2,661			23,195			1,314,230						
	Taken out																						6,302					
	Total feet added																							1,307,928	247	3,768		
	Estimated weight per foot	8	5	7	10	12	15	19	31	42	55	72	110	140	159	190	250	310	332	422	585							
	Total pounds handled	18,280	875	14,686	13,640	3,360	2,703,015	3,875,582	18,251,932	1,024,002	8,358,680	2,791,512	3,927,330	2,047,500	6,958,635	505,990			7,700,740			58,195,359						
	Total pounds taken out																						94,530					
	Total pounds added																										58,100,829	29,050,414⅓ 2000
Second Period. 1855—1872.	Total feet. 1855—1872						36,205	364,972	948,091	24,399	41,222	39,028	19,264	506	48,637		43	564	52,621	25,755	3,618	1,604,925						
	Total feet. Germantown			150	4,119		51,624	42,218	5,259	670	12,752											116,792						
	Total feet handled			150	4,119		87,829	407,190	953,350	25,069	53,974	39,028	19,264	506	48,637		43	564	52,621	25,755	3,618	1,721,717						
	Taken out																						94,416					
	Total feet added																							1,627,301	308	1,061		
	Total pounds. 1855—1872						543,075	6,934,468	29,390,821	1,024,758	2,267,210	2,810,016	2,119,040	70,840	7,733,283		10,750	174,840	17,470,172	10,868,610	2,116,530	83,534,413						
	Total pounds. Germantown			1,050	41,190		774,360	802,142	163,029	28,140	701,360											2,511,271						
	Total pounds handled			1,050	41,190		1,317,435	7,736,610	29,553,850	1,052,898	2,968,570	2,810,016	2,119,040	70,840	7,733,283		10,750	174,840	17,470,172	10,868,610	2,116,530	86,045,684						
	Taken out																						3,608,436					
	Total pounds added																										82,437,248	41,218,624 2000
Third Period. 1873—1882.	Total feet. 1872—1881			647	724		25,259	84,106	812,407	32,249	46,807	69,046	7,893	634	36,403				38,432	2,200	3,112	1,159,919						
	Total feet. Chestnut Hill			1,800			4,909	16,708	4,819	1,020	94											29,350						
	Total feet. 1882			41			358	2,744	37,751	1,019	3,294	2,156	1,148		10,941			1	2,155	362	2,630	64,600						
	Total feet. Fairmount Park	22,071	570		115		8,119	19,840	33,855	5,140	2,810	535	2,360									95,415						
	Total feet handled	22,071	570	2,488	839		38,645	123,398	888,832	39,428	53,005	71,737	11,401	634	47,344			1	40,587	2,562	5,742	1,349,284						
	Taken out																						203,333					
	Total feet added																							1,145,951	217	191		
	Total pounds. 1872—1881			8,129	7,240		378,881	1,598,014	25,184,617	1,354,458	2,574,385	4,971,312	868,230	88,760	5,788,077				12,759,424	928,400	1,820,520	58,330,447						
	Total pounds. Chestnut Hill			9,000			73,639	317,452	149,389	42,840	5,170											597,490						
	Total pounds. 1882			287			5,370	52,136	1,170,281	42,708	181,170	155,232	126,280		1,739,619			310	715,460	152,764	1,538,550	5,880,257						
	Total pounds. Fairmount Park	176,568	2,850		1,120		121,785	376,960	1,049,505	215,880	154,550	38,520	259,600									2,397,338						
	Total pounds handled	176,568	2,850	17,416	8,360		579,675	2,344,562	27,553,792	1,655,976	2,915,275	5,165,064	1,254,110	88,760	7,527,696			310	13,474,884	1,081,164	3,359,070	67,205,532						
	Taken out																						5,541,087					
	Total pounds added																										61,664,445	30,832,222 2000
																								4,081,180	772	5,020	202,202,522	101,101,261 2000

DISTRIBUTION.

During the year 1882, 2,630 feet of 48-inch pumping main was laid on Master and Twenty-eighth streets, and 4,408 feet of 20-inch supply main on Broad, from Girard avenue to Callowhill street.

There was laid 5,803 feet of 20-inch supply main on Market, from Juniper to Front; 2,137 feet of 30-inch on Twenty-second, from South street to Washington avenue; 515 feet of 20-inch on Sixteenth street, from Hamilton to Callowhill; 536 feet of 16-inch on Twentieth, from Girard avenue to below Poplar; and 35,593 feet of service pipe for which frontage is chargeable.

The balance, 12,978 feet, was for private connections, fire plugs, repairs, taken up, lowered, raised, etc., making a total of 64,600 feet or 12 miles 1,240 feet, and in weight 5,880,257 pounds handled, all of which is exhibited in detail in the following tables.

Ordinances for laying 34,841 feet of pipe were passed by Councils, which added to the balance of the previous years, made 217,227 feet, of which 35,593 feet have been laid, leaving still on our books 181,634 feet, or over 34 miles, to be laid.

The work of improving the quality of the water by connecting dead ends and intersections has been continued as far as the means provided would allow.

The large mains laid east of Broad and north of Callowhill streets, north and south from Market street, and east and west from Twenty-second, south of South street, have increased the demand for more water which must be promptly met.

The 20-inch main on Sixteenth street, from Hamilton to Callowhill, and the 16-inch on Twentieth street, from Girard avenue to below Poplar, have been laid, and connected with a view to redistricting the distribution of water from the various basins, throwing those of low elevation upon the low levels, and those of higher elevation upon the higher levels.

IRON SERVICE AND SUPPLY MAINS LAID IN 1882.

FIRST DISTRICT.

Comprising the First, Second, Third, Fourth, Twenty-sixth, and Thirtieth Wards.

Frontage chargeable after deducting the intersections.

Street. Location.	Size. Inches.	Distance. Feet.
Broad, from Tasker to Morris	6	475
Chadwick, from Tasker to Dickinson	6	432
Dean, from Pearce north	6	171
Eustis, from Fourth to Fifth	6	453
Juniatta, from Wilder to Rule	6	193
Juniper, from Tasker to Morris	6	466
Morris, from Otsego to Meadow	6	799
Rule, from D. E. 152 feet west of Fourth street to Juniatta	6	101
Tasker, from Eighteenth to Ward	6	161
Twentieth, from Wilder to Reed	6	305
Thurlow, from 202 feet west of Twelfth, west	6	48
Wilder, from Nineteenth to Twentieth	6	450
Total		4,054

Dead ends, etc., connected. No frontage chargeable.

Florida, with Catharine	4	9
Fifteenth, with Mifflin	6	4
Fifteenth, with Mifflin	8	34
Mifflin, with Broad	8	18
Mifflin, with Broad	6	30
Kater, with east side of Broad	4	24
Rose, with east side of Broad	4	24
Garrett, with Twentieth	6	16
Total		159

Fire purpose connections (private).

Swanson, north of Prime	4	48
Otsego, north of Morris, J. T. Bailey & Co	6	20
Total		68

	Size. Inches.	Distance. Feet.
Fire-plug connections	4	89
Fire-plug connections	6	89
Total		178
Repairs	20	3
Repairs	4	105
Repairs	6	149
Total		257

Repairs, intersections connected.

Fitzwater with Erie	6	7
Fitzwater with Erie	4	9
Fourth with Canal	6	7
Fourth with Canal	4	19
Twenty-second, 30-inch main with Carpenter	6	14
Twenty-second, 30-inch main with Montrose	6	11
Total		67

Repairs. New stops put in.

Street. Location.	Size. Inches.	Distance. Feet.
Montcalm, at S. H. L. of Fitzwater	4	4
Eighth, at N. H. L. of Snyder	6	4
Twelfth, at N. H. L. of Snyder	6	4
Thirteenth, at S. H. L. of Morris	6	4
Twentieth, at N. H. L. of Pemberton	6	3
Twenty-first and Carpenter, B. S	6	12
Total		31

Supply mains and connections.

Twenty-second street, from South street to Washington avenue	30	2,137
Connection with 20-inch main at Broad and Tasker streets	6	20
Connection, 30-inch main on Twenty-second street with Kater street	6	19
Connection, 30-inch main on Twenty-second street with Bainbridge	6	25
Connection, 20-inch main on Twenty-second street with Fitzwater	6	31

Street. Location.	Size. Inches.	Distance. Feet.
Connection, 20-inch main on Twenty-second street with Catharine	6	36
Connection, 30-inch main on Twenty-second street with Christian	6	25
Connection, 30-inch main on Twenty-second street with Washington avenue	6	18
Blow-off, Twenty-second street and Christian	6	8
Total		2,319

Recapitulation.

Purposes for which used.		Size. 4	6	8	20	30	Total.
New pipe or feet added.	Frontage chargeable	.....	4,054	.....	.....	.....	4,054
	Dead ends, etc., connected.	57	50	52	.....	.....	159
	Fire connections (private)	48	20	.....	.....	.....	68
	Plug connections	89	89	.....	.....	.....	178
	Supply main	.....	182	.....	.....	2,137	2,319
	Total — Feet	194	4,395	52	.....	2,137	6,778
	Total — Pounds	3,686	136,245	2,184	.....	709,484	851,599
Pipe used, but adding nothing to the total feet in the ground.	Repairs, general	105	149	.....	3	.....	257
	Repairs, intersections connected	28	39	.....	.....	.....	67
	Repairs, new stops put in.	4	27	.....	.....	.....	31
	Total — Feet	137	215	.....	3	.....	355
	Total — Pounds	2,603	6,665	.....	477	.....	9,745
	Total handled — Feet	331	4,610	52	3	2,137	7,133
	Total handled — Pounds	6,289	142,910	2,184	477	709,484	861,344

Second District.

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

Frontage chargeable after deducting the intersections.

Street. Location.	Size. Inches.	Distance. Feet.
Brooklyn, from Oregon to Myrtle	6	342
Chalfont, from Hamilton to Spring Garden	6	283
Chancellor, from Thirty-third east	6	287
Chant, from Tenth east	6	237
Hutton, from Fortieth east to Liberty	6	150
Locust, from Thirty-second to Thirty-third	6	666
Market, from W. H. L. of Allison to 308 feet west of Sixtieth street	10	2,947
Myrtle, from 270 feet west of Forty-second street to Lancaster avenue	6	220
Powelton avenue, from Thirty-second running east	6	36
Rockland, from Thirty-first to E. H. L. of Thirty-second street	6	273
Sixty-fifth, from Race to Vine	6	532
Seventy-first, from Woodland avenue southeast	6	232
Thirty-third, from Locust to Walnut street	6	425
Total		6,630

Dead ends, etc., connected. No frontage chargeable.

Sixtieth street, with north side of Market	8	4
Sansom west side, with Fortieth street	6	30
Total		78

Fire purpose connections (private).

Thirtieth, north of Market, P. R. R. grain depot	6	24
Delaware avenue, north of Dock street, P. R. R, depot	4	36
Water street, north of Walnut street, P. R. R depot	4	36
Water street, north of Dock street, P. R. R. depot	4	36
Broad street, south of Chestnut, Lafayette Hotel	4	2
Thirty-first, south of Chestnut, Wetherill Bros	4	164
Total		298

Connection for church organ motors.

Street.	Location.	Size. Inches.	Distance. Feet.
Twenty-second, north of Chestnut,	New Jerusalem	4	18

Supply connections (private).

Woodland avenue and Fifty-eighth street, Presbyterian Home	6	25
Woodland avenue and Fifty-eighth street, Presbyterian Home	4	5
Fifty-second, north of P. R. R., for P. R. R.	6	36
Park Fountain, Belmont and Fountain avenues	4	150
Park Fountain, Belmont and Fountain avenues	3	136
Total		352
Fire-plug connections	6	133
Fire-plug connections	4	328
Total		461
Repairs	4	40
Repairs	6	66
Repairs	10	3
Total		109

Repairs at intersections.

Arch and Thirty-third street, B. S.	6	3
Market with Second, N. S.	6	3
Market with Third, S. S.	6	5
Market street, 20-inch main, with Front street	8	3
Market street, 20-inch main, with Second	6	3
Market street, 20-inch main, with Third	6	3
Market street, 20-inch main, with Fourth	6	8
Market street, 20-inch main, with Fifth	10	3
Market street, 20-inch main, with Sixth	6	4
Market street, 20-inch main, with Seventh	6	6
Market street, 20-inch main, with Eighth	10	6
Market street, 20-inch main, with Ninth	6	2
Market street, 20-inch main, with Tenth	6	2

Street. Location.	Size. Inches.	Distance. Feet.
Market street, 20-inch main, with Eleventh	10	2
Market street, 20-inch main, with Twelfth	6	3
Market street, 20-inch main, with Thirteenth	6	6
Market street, 20-inch main, with Juniper	10	3
Total		65
Repairs. New stops put in.		
Market street, west of Thirtieth	10	3
Market street, east of Thirtieth	4	4
Delaware avenue, east curb of Dock	4	3
Market street, east and west of centre at Third	6	8
Sansom street, west of Thirty-seventh	6	3
Total		21
Supply main.		
Market street, from Front to Juniper	20	5,803
Market street, at Fourth, from north to south side	6	52
Market street, at Sixth, from north to south side	6	52
Total		5,907
Relaid.		
Market street, from 82 feet west of Bridge to near Thirty-second	12	1,511
Market street, at Thirtieth	10	29
Market street, from Thirtieth east	4	24
Thirtieth street, from Market north	6	190
Total		1,754
Taken up.		
Pumping main to West Philadelphia stand pipe	16	208
Fire-plug connections on Market street	4	8
Fire-plug connections on Market street	3	54
Total		270

Recapitulation.

	Purposes for which used.	Sizes.								Total.
		3	4	6	8	10	12	16	20	
New feet of pipe added.	Frontage chargeable			3,683		2,947				6,630
	Dead ends, etc., connected			30	48					78
	Fire connection (private)		274	24						298
	Motor connection (private)		18							18
	Supply connections (private)	136	155	61						352
	Plug connections		133	328						461
	Supply mains			104					5,803	5,907
	Total — Feet	136	580	4,230	48	2,947			5,803	13,744
	Total — Pounds	2,040	11,020	131,130	2,016	162,085			922,677	1,230,968
Pipe used, but adding nothing to the feet in the ground.	Repairs, general		40	66		3				109
	Repairs, intersections connected			48	3	14				65
	Repairs, new stops put in		7	11		3				21
	Taken up	54	8					208		270
	Relaid		24	190		29	1,511			1,754
	Total — Feet	54	79	315	3	49	1,511	208		2,219
	Total — Pounds	810	1,501	9,765	126	2,695	108,792	22,880		146,569
	Total handled — Feet	190	659	4,545	51	2,996	1,511	208	5,803	15,963
	Total handled — Pounds	2,850	12,521	140,895	2,142	164,780	108,792	22,880	922,677	1,377,537

Third District.

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

Frontage chargeable after deducting the intersections.

Street. Location.	Size. Inches.	Distance. Feet.
Allegheny avenue, from north to south side at Trenton R. R	6	44
Berks, N. S., from Fourth to Germantown R. R	6	699
Berks, from Germantown avenue to Sixth	6	355
Berks, N. S., from Second to Philip	6	167
Berks, N. S., from Orrianna to Third	6	143
Bodine, from D. E. north of York to Cumberland	6	179
Bridge, from Washington to 67 feet northwest of H. L. of Young	6	262
Cambria, from Kensington avenue west to D. E	6	122
Clementine, from DE. west of Amber to Frankford avenue	6	114
Farson Place, from Innes north to D. E	6	375
Fourth, from Lehigh to Somerset	6	551
Fifth, from DE. south of Rising Sun lane to Luzerne	6	716
Innes, from Allen to Farson Place	6	104
Lehigh, N. S., from Richmond to Salmon	6	246
Lehigh, from north to south side east of Trenton R. R	6	6
Memphis, from Montgomery to Deal	6	242
Mercer, from Division to 94 feet south of Geisler	6	888
Potter, from 194 feet northeast of Leamy, N. E	6	60
Rawle, from Lawrence to McGrath	6	117
Tacony, from 30 feet north of H. L. of Bridge to north of Fraley	6	2,598
Venango, from west side of Third east	6	38
Willow, from New Market to Second	6	300
Willow, from Steam Mill Alley to St. John	6	90
Willow, from Belrose to Third	6	182
Total		8,658

Dead ends, etc., connected, no frontage chargeable.

Street. Location.	Size. Inches.	Distance. Feet.
Amber, with N. S. Lehigh avenue	6	9
Cedar, with S. S. Lehigh avenue	6	12
Orrianna, with N. S. Berks	6	19
Leithgow, with Berks	6	8
Lawrence, with Berks	4	3
Manor, with Berks	6	44
Philip, with Berks	6	14
Rainbow, with W. S. Trenton avenue	6	54
Steam Mill Alley, with Willow	4	12
Third, with N. S. Berks	6	21
Total		196

Fire purpose connections (private).

Hazzard, N. S., 50 feet east of Jasper, J. Kitchenman	4	15
Coral, W. S., 84 feet north of Adam, Wm. Beatty	4	18
Emerald, E. S., 75 feet south of Adam, Firth & Bro.	4	17
Tacony Road, at Fitler's Works	6	98
Fourth, W. S., 195 feet north of Lehigh, Horner Bros	4	21
Fifth, E. S., 103 feet north of Oxford, Hennings & Schaffer	4	16
No. 849 North Fourth street, Anton Stroebel	4	20
Total		205

Supply connections (private).

Third and Venango streets, P. R. R.	6	18
Third and Venango streets, Thos. Potter Sons & Co.		
Third, 230 feet north of Berks	4	16
Front, W. S., 140 feet south of Oxford, Thos. Dolan	4	8
Oxford, W. H. L. of Masher, Thos. Dolan	4	21
Willow, N. S., 35 feet west of Beach, P. & R. R. R. Co.	6	24
Noble, N. S., west of Front	6	20
Total		107

	Size. Inches.	Distance. Feet.
Fire-plug connection	4	231
Fire-plug connection	6	125
Total		356
Repairs	4	116
Repairs	6	126
Repairs	10	7
Repairs	12	15
Total		264

Repairs, intersections connected.

Street.	Location.	Size. Inches.	Distance. Feet.
Fifth street,	with 4-inch on S. S. Callowhill	6	9
Fifth street,	with 4-inch on S. S. Callowhill	4	3
Mascher,	with 10-inch pipe on S. S. Oxford	6	4
Hancock,	with 10-inch pipe on S. S. Oxford	6	4
Palethorpe,	with 10-inch pipe on S. S. Oxford	4	4
Otis,	with Richmond	6	29
Memphis,	with Huntingdon	6	11
Thompson,	with S. S. Allegheny	6	12
Thompson,	with N. S. Alllegheny	6	10
Total			86

Repairs. New stops put in.

Allen, E. H. L. of Penn	6	2
Almond, N. of Monmouth	6	3
Almond, N. of Sergeant	6	3
Callowhill, S. S. at Fourth	6	2
Callowhill, S. S. at Fifth	6	3
Clairborne, N. H. L. of Norris	4	3
Clearfield, W. H. L. of Gaul	6	3
Clearfield, W. H. L. of Thompson	6	3
Cumberland, E. H. L. of Edgemont	6	3
Church, W. H. L. of Tackawanna	6	3
Columbia, W. H. L. of Randolph	6	3
Dauphin, E. H. L. of Third	6	2
Delaware avenue, 206 feet S. of Poplar	6	48

Street. Location.	Size. Inches.	Distance. Feet.
Dauphin, W. H. L. Lawrence	6	3
Division, E. of Mercer	6	3
Edward, S. H. L. of Church	4	2
Frankford avenue and Allegheny, centre	10	4
Front, N. of York	6	3
Gaul, N. of Adam	6	3
Geisler, W. of Edgemont	4	3
Huntingdon, E. of Fourth	6	3
Jackson, E. of Sepviva	4	18
Lehigh, W. H. L. of Salmon	4	3
Lehigh, W. H. L. of Tulip	6	3
Lehigh, N. S. at W. H. L. of Thompson	4	2
Lehigh, N. S. at W. H. L. of Edgemout	6	2
Lehigh, S. S. W. of Belgrade	6	2
Lehigh, N. S. E. of Belgrade	6	2
Lehigh, S. S. E. of Almond	6	2
Memphis, N. H. L. of Vienna	6	3
Neff, E. H. L. of Edgemont	6	2
Norris, W. H. L. of Beach	6	3
Richmond, N. of Venango	6	3
Richmond and Lehigh, centre	6	7
Randolph, S. of Jefferson	6	3
Sixth, E. S. N. of Norris	4	3
Susquehanna, E. H. L. of Orkney	6	2
Thompson, S. S. Ann	6	3
Trenton avenue, W. S. and Dauphin	6	12
Tulip, S. H. L. of Norris	6	3
York, W. of Reese	6	2
Total		185

Relaid.

Huntingdon, between Memphis and Tulip	6	142

Recapitulation.

	Purposes for which used.	Sizes. 4	6	10	12	Total.
New pipe or feet handled.	Frontage chargeable	.....	8,658	.....	.....	8,658
	Dead ends, etc., connected	15	181	.....	.....	196
	Fire connections (private)	107	98	.....	.....	205
	Supply connections (private)	45	62	.....	.....	107
	Plug connections	231	125	.....	.....	356
	Total Feet	398	9,124	.....	.....	9,522
	Total Pounds	7,562	282,844	.....	.....	290,406
Pipe used, but adding nothing to the feet in the ground.	Repairs, general	116	126	7	15	264
	Repairs, intersections connected	7	79	.....	.....	86
	Repairs, new stops put in	34	147	4	.....	185
	Relaid	.....	142	.....	.....	152
	Total Feet	157	494	11	15	677
	Total Pounds	2,983	15,314	605	1,080	19,982
	Total handled Feet	555	9,618	11	15	10,199
	Total handled Pounds	10,545	298,158	605	1,080	310,388

Fourth District.

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

Frontage chargeable after deducting the intersections.

Street.	Location.	Size. Inches.	Distance. Feet.
Airdrie,	from Broad to Park avenue	6	311
Allegheny avenue, S. S.	from Seventeenth west	6	6
Berks,	from Sixth to Seventh	6	443
Cambridge,	from Carlisle to Fifteenth	6	246
Graham,	from Eighteenth to Nineteenth	6	444
Judson,	from Berks to Norris	6	550

Street. Location.	Size. Inches.	Distance. Feet.
Norwood, from Brown to Parrish	6	384
Parrish, from Corinthian to Twenty-second	8	792
Seventeenth, from Tioga to Venango	6	521
Scott, from Twenty-seventh west	6	220
Sharswood, from Twenty-fourth to Twenty-fifth	6	454
Twenty-first, from Brown to Parrish	6	381
Total		4,752
Dead ends connected, no frontage chargeable.		
Linden, with Green	6	4
Fire purpose connections (private).		
Thirty-second, E. S., 250 feet N. Thompson, C. Theiss	4	19
Twenty-first, from Spring Garden south, Wood & McGill	6	286
Wood, N. S., 96 feet E. of Twenty-fourth, Machine Tool Works	6	15
Judson, E. S., N. of Norris	6	179
Total		499
Supply connections (private).		
Thirty-second, E. S., 75 feet S. of Master, Bergner & Engel	4	23
Allegheny avenue, S. S. and W. S. of Seventeenth, Keystone Horse Shoe Co	4	12
Callowhill, W. S., 9 feet W. of Broad, P. & R. R. R. Co	6	31
Total		66
Fire-plug connections	4	36
Fire-plug connections	6	116
Total		152

Supply mains and connections.

Street. Location.	Size. Inches.	Distance. Feet.
Broad, Callowhill to Girard avenue	20	4,408
Broad, Callowhill to Girard avenue	30	6
Sixteenth, Hamilton to Callowhill	20	515
Twentieth, from S. of Poplar to Girard avenue	16	536
Blow-off, Sixth and Poplar	16	4
Blow-off, Sixth and Poplar	4	10
Blow-off, Broad and Poplar	10	10
Total		5,489

Pumping mains.

Master street, from Thirty-first east	48	2,214
Twenty-eight street, from Master south	48	416
Inlet, Spring Garden Works	36	158
Total		2,788

Drains at Works.

Spring Garden Works	4	380
Spring Garden Works	6	15
Belmont Works	4	10
Belmont Works	6	48
Belmont Works	8	96
Total		549
Repairs	4	73
Repairs	6	167
Repairs	8	28
Repairs	12	41
Repairs	20	12
Repairs	30	12
Repairs	36	4
Total		337

Repairs, intersections connected.

Street. Location.	Size. Inches.	Distance. Feet.
Parrish, with 20-inch main on Broad	6	10
Atmore, with 20-inch main on Broad	6	6
Brown, with 20-inch main on Broad	6	10
Olive, with 20-inch main on Broad	6	6
Fairmount avenue, with 20-inch main on Broad	10	28
Ridge, with 20-inch main on Broad	6	12
Wallace, with 20-inch main on Broad	6	12
Mt. Vernon, with 20-inch main on Broad	6	18
Green, with 20-inch main on Broad	6	5
Brandywine, with 20-inch main on Broad	6	5
Spring Garden, with 20-inch main on Broad	6	15
Spring Garden, with 20-inch main on Broad	10	5
Whitehall, with 20-inch main on Broad	6	15
Buttonwood, with 20-inch main on Broad	6	12
Hamilton, with 20-inch main on Broad	6	12
Pennsylvania avenue, with 20-inch main on Broad	6	10
Callowhill, with 20-inch main on Broad	10	5
Tenth street, with Susquehanna B. S	6	15
Total		201

Repairs, new stops put in.

Fairmount avenue, N. S. W. of Seventeenthe		
Fairmount avenue, S. S. W. of Nineteenth	4	3
Nineteenth, W. S. N. of Parrish	4	1
Callowhill, N. S. W. of Ninth		
Broad, W. S. S. of Mt. Vernon	6	3
Eighth, W. S. S. of Depot	4	2
Twentieth, E. S. S. of Fairmount	6	4
Callowhill, N. S. W. of Twelfth	4	6
Sixteenth, N. S. of Indiana	6	5
Eleventh, above Buttonwood	4	2
Total		26

Taken up.

Broad street, from Poplar to Girard	4	200
Broad, from Poplar to Girard	6	251
Fire connection, Twenty-second above Linn	4	26

Street.	Location.	Size. Inches.	Distance. Feet.
Master, from Thirty-first west		6	72
North College avenue, between Twenty-first and Twenty-second		16	200
Seventeenth, from Diamond north		6	480
Total			1,229
	Relaid.		
Master, from Thirty-first west		6	72
Broad, from S. of Poplar to Girard avenue		12	565
North College avenue, between Twenty-first and Twenty-second		16	200
Seventeenth, from Diamond north		6	480
Twenty-second, above Linn, fire connection, Am. L. I. Co		4	26
Total			1,343
	Lowered.		
At Belmont Works		6	212
Thompson, east of Twenty-eighth		36	200
Total			412
	Raised.		
Thompson, E. of Twenty-eighth		20	200

Recapitulation.

	Purposes for which used	Sizes. 4	6	8	10	12	16	20	30	36	48	Total.
New pipe or feet added.	Frontage chargeable	.....	3,960	792	.....	.....	.....	.....	.....	.....	.....	4,752
	Dead ends, etc., connected	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	4
	Fire connection (private)	19	480	.....	.....	.....	.....	.....	.....	.....	.....	499
	Supply connection (private)	35	31	.....	.....	.....	.....	.....	.....	.....	.....	66
	Plug connections	36	116	.....	.....	.....	.....	.....	.....	.....	.....	152
	Supply mains	10	.....	.....	10	.....	510	4,923	6	.....	.....	5,489
	Pumping mains	.....	.....	.....	.....	.....	.....	.....	.....	158	2,630	2,788
	Drains at works	390	63	96	.....	.....	.....	.....	.....	.....	.....	549
	Total — Feet	490	4,654	888	10	.....	510	4,923	6	158	2,630	14,299
	Total — Pounds	9,310	144,274	37,296	550	.....	59,400	782,757	1,992	66,676	1,538,550	2,640,805
Pipe used, but adding nothing to the feet in the ground.	Repairs, general	73	167	28	.....	941	.....	12	12	4	.....	337
	Repairs, intersections connec'd	.....	163	.....	38	.....	.....	.....	.....	.....	.....	201
	Repairs, new stops put in	14	12	.....	.....	.....	.....	.....	.....	.....	.....	26
	Taken up	226	803	.....	.....	.....	200	.....	.....	.....	.....	1,229
	Relaid	26	552	.....	.....	565	200	.....	.....	.....	.....	1,343
	Lowered	.....	212	.....	.....	.....	.....	.....	.....	200	.....	412
	Raised	.....	.....	.....	.....	.....	.....	200	.....	.....	.....	200
	Total — Feet	339	1,909	28	38	606	400	212	12	204	.....	3,748
	Total — Pounds	6,441	59,179	1,176	2,090	43,632	44,000	33,708	3,984	86,088	.....	280,298
	Total handled — Feet	829	6,563	916	48	606	940	5,135	18	362	2,630	18,047
	Total handled — Pounds	15,751	203,453	38,472	2,640	43,632	103,400	816,465	5,976	152,764	1,538,550	2,921,103

GERMANTOWN DISTRICT.

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

Frontage chargeable after deducting the intersections.

Street.	Location.	Size. Inches.	Distance. Feet.
Baird, from Queen to Penn		6	384
Fifteenth, from Cayuga south		6	276
Gowen avenue, from Germantown avenue to Stenton avenue		6	3,668
Hancock, from Mill N. W		6	208
Miller, from Wister to Wisteria		6	836
Pulaski, from Apsley N. W. to con. D. E		6	680
Smedley, from Tioga to Venango		6	546
Wayne, from Apsley S. E		6	648
Total			7,246

Fire purpose connections (private).

Miller, S. W. S., S. E. of Wistar, J. & B. Allen		4	12
Wayne, N. E. side, S. E. of Apsley, McCallum, Crease & Sloan		4	36
Total			48
Fire-plug connections		4	85
Fire-plug connections		6	329
Total			414
Repairs		24	1

Repairs, new stops put in.

Allen's lane, S. W. of Germantown avenue		4	2
Waste cock, Broad below Fisher			
Waste cock, Seventeenth and Venango		1½	41

Pipes and Connections at Works.

	Size. Inches.	Distance. Feet.
Chestnut Hill engine house, exhaust	4	45
Mt. Airy engine house	10	27
Mt. Airy engine house	12	24
Mt. Airy engine house, blow-off	3	54
Mt. Airy engine house, waste	3	90
Mt. Airy engine house, waste	6	48
Total		288
Lowered.		
Allen's lane, from Mt. Airy Res. N. E	10	195

Recapitulation.

Purposes for which used.			Sizes. 1½	3	4	6	10	12	24	Total.
Pipe added to that already laid.	Frontage chargeable		.....	.....	.....	7,246	.....	.....	.....	7,246
	Fire connection (private)		.....	.....	48	.....	.....	.....	.....	48
	Plug connections		.....	.....	85	329	.....	.....	.....	414
	Pipes and connections at works		.....	144	45	48	27	24	.....	288
	Waste or service pipes		41	.....	.....	.....	.....	.....	.....	41
	Total	Feet	41	144	178	7,623	27	24	.....	8,037
		Pounds	287	2,160	3,382	236,313	1,485	1,728	.....	245,355
Pipes used for repairs, etc., which does not increase that already laid.	Repairs, general		.....	.....	.....	.....	.....	.....	1	1
	Repairs, new stops put in		.....	.....	2	.....	.....	.....	.....	2
	Lowered		.....	.....	.....	.....	195	.....	.....	195
	Total	Feet	.....	.....	2	.....	195	.....	1	198
		Pounds	.....	.....	38	.....	10,725	.....	310	11,073
	Total handled	Feet	41	144	180	7,623	222	24	1	8,235
		Pounds	287	2,160	3,420	236,313	12,210	1,728	310	256,428

MANAYUNK DISTRICT.

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

Frontage chargeable after deducting the intersections.

Street. Location.	Size. Inches.	Distance. Feet.
Adams, from Cresson to Sharp	6	198
Freeland, from Shur's lane N. W	6	380
Indian Queen lane, from 299 feet N. E. of Thirty-fifth N. E	6	98
Manayunk avenue, from Sumac to Rochelle or Jeannette	6	337
Martin, from Ridge avenue to S. W. of Pechin	6	1,599
Ridge avenue, from Roxborough avenue to N. H. L. Gerhard	6	354
Ripka, from Winchester to Mansion	6	146
Rochelle or Jeannette, from Manayunk avenue N. E	6	575
Sharp, from Adams to Hermit	6	350
Sumac, from Righter N. E.	6	121
Sunnyside, from 171 feet 9½ inches S. W. of Thirty-fifth S. W	6	83
Sunnyside, from 469 feet S. W. of Thirty-fifth S. W.	6	12
Total		4,253
Fire purpose connections (private.)		
Main, opposite Jackson, Patterson Mills	4	29
Shur's lane, S. W. of Freeland, J. Kenworthy	4	14
Pechin, N. W. of Shur's lane, T. Kenworthy	4	15
Total		58
Fire-plug connections	4	54
Fire-plug connections	6	40
Total		94
Repairs	4	44
Repairs	6	10
Total		54

RECAPITULATION.

WORK ON THE WATER PIPES, CLASSIFIED IN SIZES AND ARRANGED ACCORDING TO THE USE MADE OF THEM.

	Purposes for which used.	SIZE													Feet.
		1½	3	4	6	8	10	12	16	20	24	30	36	48	
New pipe or feet added.	Frontage chargeable, including intersections				31,854	792	2,947								35,593
	Dead ends, etc., connected			72	265	100									437
	Fire connections (private)			554	622										1,176
	Motor connections (private)			18											18
	Supply connections (private)		136	235	154										525
	Fire plug connections			628	1,027										1,655
	Supply mains			10	291		22		540	10,726		2,143			13,782
	Pumping mains												158	2,630	2,788
	Drains and connections at Works		168	469	111	96	27	24							895
	Waste on service pipes	41													41
	Total — Feet	41	304	1,986	34,324	988	2,996	24	540	10,726		2,143	158	2,630	56,860
	Total — Pounds	287	4,560	37,734	1,064,044	41,496	164,780	1,728	59,400	1,705,434		711,476	66,676	1,538,550	5,396,165
Pipe used, but adding nothing to the feet in the ground.	Repairs, general			378	518	28	10	56		15	1	12	4		1,022
	Repairs, intersections connected			35	329	3	52								419
	Repairs, new stops put in			61	197		12								270
	Taken up		54	234	803				408						1,499
	Relaid			50	884		29	2,076	200						3,239
	Lowered				696		195						200		1,091
	Raised									200					200
	Total — Feet		54	758	3,427	31	298	2,132	608	215	1	12	204		7,740
	Total — Pounds		810	14,402	106,237	1,302	16,390	153,504	66,880	34,185	310	3,984	86,088		484,092
	Total, handled — Feet	41	358	2,744	37,751	1,019	3,294	2,156	1,148	10,941	1	2,155	362	2,630	64,600
	Total, handled — Pounds	287	5,370	52,136	1,170,281	42,798	181,170	155,232	126,280	1,739,619	310	715,460	152,764	1,538,550	5,880,257

RECAPITULATION.

WORK ON THE WATER PIPES, CLASSIFIED IN SIZES AND BY DISTRICTS.

	DISTRICTS.	SIZES.													Total Feet.	Total Pounds.
		1½	3	4	6	8	10	12	16	20	24	30	36	48		
New pipe or feet added.	First			194	4,395	52						2,137			6,778	851,599
	Second		136	580	4,230	48	2,947			5,803					13,744	1,230,968
	Third			398	9,124										9,522	290,406
	Fourth			490	4,654	888	10		540	4,923		6	158	2,630	14,299	2,640,805
	Germantown	41	144	178	7,623		27	24							8,037	245,355
	Manayunk		24	146	4,298		12								4,480	137,032
	Total Feet	41	304	1,986	34,324	988	2,996	24	540	10,726		2,143	158	2,630	56,860	
	Total Pounds	287	4,560	37,734	1,064 044	41,496	164,780	1,728	59,400	1,705,434		711,476	66,676	1,538,550		5,396,165
Pipe used but adding nothing to the feet in the ground.	First			137	215					3					355	9,745
	Second		54	79	315	3	49	1,511	208						2,219	146,569
	Third			157	494		11	15							677	19,982
	Fourth			339	1,909	28	38	606	400	212		12	204		3,748	280,298
	Germantown			2			195				1				198	11,073
	Manayunk			44	494		5								543	16,425
	Total Feet		54	758	3,427	31	298	2,132	608	215	1	12	204		7,740	
	Total Pounds		810	14,402	106,237	1,302	16,390	153,504	66,880	34,185	310	3,984	86,088			484,092
	Total handled Feet	41	358	2,744	37,751	1,019	3,294	21,56	1,148	10,941	1	2,155	362	2,630	64,600	
	Total handled Pounds	287	5,370	52,136	1,170,281	42,798	181,170	155,232	126,280	1,739,619	310	715,460	152,764	1,538,550		5,880,257

64,600 feet = 12 miles — 1,240 feet:
Cost of Distribution, $199,753,51.

5,880,257 pounds = 2,940 net tons — 257 pounds.
Cost of Distribution per 100 pounds = $3.40.

Repairs. New stops put in.

Street. Location.	Size. Inches.	Distance. Feet.
Main centre of Washington avenue	10	5

Supply Main.

Ridge avenue and Hermit	10	12
Ridge avenue and Hermit	6	5
Total		17

Pipes and connections ot Works.

Roxborough Works, waste	4	34
Roxborough engine house, drain	3	24
Total		58

Lowered.

Sumac street	6	484

Recapitulation.

Purposes for which used.		Sizes. 3	4	6	10	Total.
New pipe or feet added.	Frontage chargeable	.....	.....	4,253	.....	4,253
	Fire connections (private)	.....	58	.....	.....	58
	Plug connections	.....	54	40	.....	94
	Supply main	.....	.....	5	12	17
	Pipes and connec'ns at works	24	34	.....	.....	58
	Total Feet	24	146	4,298	12	4,480
	Total Pounds	360	2,774	133,238	660	137,032
Pipe used, but adding nothing to the feet in the ground.	Repairs, general	.....	44	10	.....	54
	Repairs, new stops put in	.....	.....	.....	5	5
	Lowered	.....	.....	484	.....	484
	Total Feet	.....	44	494	5	543
	Total Pounds	.....	836	15,314	275	16,425
	Total handled Feet	24	190	4,792	17	5,023
	Total handled Pounds	360	3,610	148,552	935	153,457

Statement of the number of fire-plugs by Districts and Wards during 1882, and total previous thereto.

	First District.								Second District.								Third District.										Fourth District.								German-town.				Manayunk.				
	Wards.							Total	Wards.							Total	Wards.								Total		Wards.						Total		Wards			Total		Wards.			Total	Total
	1	2	3	4	26	30			5	8	9	10	24	27			12	18	19	20	23	25	31				14	15	20	28	29				22	25	28			21	28			
Prior to 1882.....	...	...	...	...	...	...	1046		...	...	...	...	...	...	1562		...	...	...	...	...	...	...	1691		...	...	...	...	...	1062		...	...	...	399		.....	.....	254		6,014
During 1882.....	8	1	1	1	6	1	18		1	1	1	1	9	11	24		1	2	5	1	7	12	1	29		3	2	1	3	3	12		23	1	2	26		10	1	11		120
Totals.....	...	...	...	...	...	...	1064		...	...	...	...	...	...	1586		...	...	...	...	...	...	...	1720		...	...	...	...	...	1074		...	...	...	425		.....	.....	265		6,134
Taken out 1882...	...	...	...	...	...	...	1		...	...	...	...	...	...	8		...	...	...	...	...	...	...	4		...	...	...	...	...	2		...	...	...	.....		.....	.....	.....		15
Totals in City...	...	...	...	...	...	...	1063		...	...	...	...	...	...	1578		...	...	...	...	...	...	...	1716		...	...	...	...	...	1072		...	...	...	425		.....	.....	265		6,119

Number of attachments for fire purposes previously reported..... 223
Made during 1882—First District..... 2
Made during 1882—Second District..... 6
Made during 1882—Third District..... 7
Made during 1882—Fourth District..... 4
Made during 1882—Manayunk District..... 3
Made during 1882—Germantown District..... 2
— 24

Total..... 247

Number of holes drilled for making new attachments to public mains during the year 1882.

MONTHS.	½-in. diameter.	⅝-in. diameter.	¾-in. diameter.	1-in. diameter.	Totals.	Shut-offs.
January	52	.....	1	5	58	39
February	35	.....	3	4	42	29
March	265	5	8	8	286	54
April	319	8	5	14	346	66
May	247	10	7	10	274	56
June	276	17	8	13	314	58
July	243	4	9	16	272	61
August	286	10	6	12	314	70
September	339	19	13	8	379	46
October	379	7	8	13	407	44
November	580	26	7	14	627	66
December	148	4	1	12	165	50
Totals	3,169	110	76	129	3,484	639

Table of attachments in Wards and Districts.

WARDS.	½-in. diameter.	⅝-in. diameter.	¾-in. diameter.	1 in. diameter.	Totals.	Shut-offs.
First District, 1, 2, 3, 4, 26, and 30	465	4	4	4	477	105
Second District, 5, 6, 7, 8, 9, 10, 21, and 27	461	41	35	47	584	141
Third District, 11, 12, 16, 17, 18, 19. 23, 31, and part of 25	1,042	8	7	51	1,108	179
Fourth District, 13, 14, 15, 20, 29, and part of 28	787	49	21	14	871	150
Germantown, 22, and part of 25 and 28	200	6	7	11	224	19
Manayunk, 21 and part of 28	214	2	2	2	220	45
Totals	3,169	110	76	129	3,484	639

Repairs to plugs, stops and mains, and plugs and stops taken out during 1882.

DISTRICTS.	Plugs.		Stops.		Repairs to mains.
	Repairs.	Taken out	Repairs.	Taken out	
First	926	1	385		77
Second	457	8	563	1	47
Third	548	4	736	2	88
Fourth	627	2	453		144
Germantown	516		683		21
Manayunk	225		157		43
Totals	3,299	15	2,977	3	420

Account of new stops and fire plugs for 1882.

DISTRICTS.	Stops.			Plugs.
	Two way.	Barton Four way.	Total.	
First	37	7	44	18
Second	55	3	58	24
Third	103	1	104	29
Fourth	60	4	64	12
Germantown	26		26	26
Manayunk	16		16	11
Totals	297	15	312	120

Number of valves raised in the different districts during the year 1882.

DISTRICTS.	8-inch Barton.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch	30-inch.	36-inch.	Total.
First	.....	.....	4	7	.....	2	.....	.....	.....	.....	.....	13
Second	.....	13	.....	3	1	.....	1	.....	.....	.....	.....	18
Third	.....	.....	11	20	.....	1	.....	.....	.....	.....	.....	32
Fourth	1	1	10	28	.....	2	.....	.....	.....	1	.....	43
Totals for 1882	1	14	25	58	1	5	1	.....	.....	1	.....	106
" 1881	.....	15	44	90	.....	5	7	.....	.....	.....	.....	161
" 1880	.....	7	23	47	.....	8	1	.....	.....	1	.....	87
" 1879	.....	9	16	60	1	3	2	.....	.....	1	1	93
" 1878	.....	27	22	100	.....	3	1	.....	1	1	.....	155
" 1877	.....	12	6	50	.....	1	.....	.....	1	.....	.....	70
" 1876	.....	3	17	49	.....	3	.....	.....	1	.....	.....	73
" 1875	.....	17	55	120	4	12	2	4	1	2	.....	217
" 1874	.....	13	32	111	6	6	3	3	.....	.....	.....	174
" 1873	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total for ten years	1	117	240	685	12	46	17	7	4	6	1	1,136

Account of Service Pipes laid during 1882, and the receipts therefor.

	Pipe laid in feet.	FRONTAGE. Feet.	FRONTAGE. Dollars.	Amount accounted for.	Collected by Registrar in 1882.
Balance due for frontage, December 31, 1881			$22,398 88		
Less overcharge in intersections corrected			1 63		
Balance			$22,397 25		
Amount received by Registrar in 1878, on deposit				$13 00	
Received by Registrar during 1882, for 1881				6,533 21	$6,533 21
Returned for lien				15,851 04	
				$22,397 25	
Total feet of frontage chargeable, including intersections	35,593				
Less intersections deducted	4,441·10				
Frontage chargeable, including corner allowances	31,151·02				
Single fronts, at $1 per foot		1,310·1½	$1,310 17		
Double fronts, at $2 per foot		29,851·0½	59,682 12		
Amount of frontage		31,151·2	$60,992 29		
Corner allowances deducted			3,487 68		
Net amount of frontage to be collected			$57,504 61		
Of this amount, received by deposit with Registrar during 1874				$201 00	
" " " " " 1875				18 00	
" " " " " 1876				18 00	
" " " " " 1878				220 97	
" " " " " 1879				141 83	
" " " " " 1880				361 62	
" " " " " 1881				212 00	
Amount received by Registrar during 1882				23,035 69	23,035 69
Amount returned for lien during 1882				18,737 14	
Balance due on books December 31, 1882				14,558 36	
				$57,504 61	
Amount received by Registrar on deposit (pipe not laid)					3,126 15
" " for expired claims for pipe laid					1,403 25
" " for pipe laid by Water Co., Germantown					881 22
Total received by Registrar during 1882					$34,979 52

Statement of the material on hand in the several Purveyors' Districts, January 1, 1883.

	DIAMETER IN INCHES.															Plugs.	
	3	4	6	8	10	12	16	18	20	24	25	26	30	36	48	Hills	
Bands	.....	1	15	6	4	18	4	1	11	9	.....	.....	4	9	60		Steam 35
Bevel hubs	.....	13	58	21	32	21											Hills 72
Bonnets	.....	21	.....	.....	.....	.....	2	.....	3	.....	.....	.....	5	.....	4		Three-way.. 8
Goosenecks	.....	40	24														Two-way.... 10
Pipes	83	26	93	533	141	120	48	2	118	3	.....	.....	80	80	96		
Pipes, curved	.....	15	2	.....	.....	6	10	.....	17	.....	.....	.....	19	2			
Pipes, flanged	.....	.....	.....	.....	.....	3	.....	.....	31	.....	.....	.....	.....	1			
Pipes, O. G	.....	8	83	36	21	31											Lead.
Quarter turns	.....	24	17	110	11	23	3	1	1								
Saddles	.....	29½	56	2½	4½	1											Pounds.
Sleeves, whole	14	96	130	161	64	83	19	16	5	.....	.....	1	16	6	2		37,316½
Sleeves, half	.....	.....	41	51	46	44½	2	.....	2	.....	.....	.....	.....	2	3		
Stops	4	8	10	2	2	6	10	.....	4	1	1	.....	4	7	.....		
Stops, Barton	.....	.....	24	1	.....	1											
Stops, flanged	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	2	

Statement of the material on hand in the several Purveyors' Districts, January 1, 1883.—Continued.

	3×3	4×3	4×4	6×3	6×4	6×6	8×4	8×6	8×8	10×4	10×6	10×8	10×10	12×4	12×6
Branches, single	2	.....	4	.....	29	50	62	14	24	15	28	10	21	95	29
Branches, double	.....	.....	24	.....	71	147	14	29	38	13	55	25	36	10	59
Reducers	.....	21	.....	5	29	.....	11	33	.....	7	37	45	.....	.....	5

	12×8	12×10	12×12	16×4	16×6	16×12	16×16	18×6	18×18	20×4	20×6	20×8	20×12
Branches, single	10	10	7	5	1	.....	2	.....	1	2	4		
Branches, double	22	19	69	.....	.....	1	1	2	.....	.....	8	1	3
Reducers	5	7	17	.....	.....	.....	2						

	20×16	20×18	20×20	30×6	30×12	30×20	30×30	36×30	36×36	48×30	48×36	48×48	30 inch, flanged
Branches, single	.....	.....	2	.....	.....	.....	1	.....	.....	.....	.....	1	2
Branches, double	.....	.....	1	4	3	1	3	.....	.....	.....	.....	1	
Breeches pipe	.....	.....	.....	.....	.....	.....	1	.....	3	2	1		
Reducers	1	1	.....	.....	.....	4	.....	1					

REPORT

OF THE

BOARD OF EXPERTS.

OCTOBER 14, 1882.

REPORT OF BOARD OF EXPERTS.

Philadelphia, October 14, 1882.

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

GENTLEMEN:—The undersigned, having been appointed by his Honor the Mayor, in conformity with the ordinance approved June 7, 1882, authorizing him to appoint a Board of Experts, to "report to Councils the methods pursued in the Water Department, together with their recommendations of what should be done for the present and future supply of the City, with such itemized estimates as will enable the cost to be determined," have the honor to state, that they met September 19th, and have been continuously engaged in examining and studying the subject; that the problem presented to them is of so large, complex, and important a character, that they are unable at this time to report upon the future supply; but that their examinations thus far have revealed a condition of affairs in regard to the present supply of water to the City which does not justify delay upon their part in presenting this partial report for the consideration of your honorable bodies.

They find that in supplying the lower levels of the City the existing machinery has been worked to its utmost capacity; that at the two largest steam works there is no spare machinery, and in two others the whole supply depends upon one engine in each. They also find that at the rate of annual increase in largest consumption of the past year (which is about eleven (11) million gallons daily) there will not be enough pumping power to sufficiently supply, during the driest seasons of next year, an area which contains two-thirds of the population, while in 1884 there will be a short supply throughout almost the whole City.

Nor can an abundant flow of water in the Schuylkill be relied on to avert this catastrophe next year; for not only is

such a flow, when it is most needed, unlikely, but the amount which could then be furnished by the Fairmount wheels is to the lower levels only, and would be entirely inadequate to supply the deficiency.

Indeed, the time has come, when it is necessary to face the fact that during periods of least flow of water, which are also those of greatest consumption, the water power at Fairmount is practically unavailable.

It is also to be noted that machinery is not always in good working order. Pumping engines and boilers must be stopped for repairs, and accidents occur to engines and pumps, and from breakage of mains. For these reasons it is customary in other cities, where there is abundant reservoir capacity, to add at least one-third to the pumping power which is ordinarily needed at periods of the greatest consumption.

Your Board regard the following named machinery and appliances as imperatively needed for the supply of water to the City in the summer of 1883. In their opinion, none of them can be dispensed with, except at the risk of serious results, in the localities supplied by the specified pumping stations.

I. For Schuylkill Works.

Two (2) fifteen million gallon engines to pump, one against 150 feet, one against a higher head	$96,000
Two (2) ranges of boilers and connections	60,000
Two (2) forcing mains	30,000
Completing 48-inch main partly laid	14,000
Boiler and engine house	40,000
Foundation for same	10,000
Total	$250,000

II. For Roxborough Works.

One (1) seven and a half million gallon engine, to pump against 360 feet head, with forcing main in house	$50,000
Removing old and substituting two boilers and connections	7,000
New inlet, screen, and dredging	3,000
Total	$60,000

Distributing main to supply Germantown, from Mt. Airy Reservoir to Manheim, on Green..... $70,000

III. For Frankford Works.

One (1) Ten million gallon engine and connections, to pump against 200 feet..... $45,000

As to the character of the machinery to be obtained the estimates given for the engines refer to the "Worthington Compound Duplex," which the Board consider to be reliable, comparatively free from liability to serious accident, not expensive in first cost and maintenance, and fairly economical in fuel. To supply an emergency like the present, where time for construction and erection is extremely short, they know of no other type which, on the whole, presents so many advantages.

In regard to boilers, they recommend and have estimated for the cylindrical tubular at Roxborough Works, like those just bought; and for Schuylkill Works marine tubular boilers, which although of greater first cost, present certain important advantages in preparing for an emergency, and are at least equal to the others in economy of fuel and repairs.

Your Board have reason to believe that if the above recommendations are adopted, and contracts for the machinery are entered into before December 1st next, that two of the engines can be used by June 1, 1883, and the other two by August 1st of the same year, although the time is short, both for consideration of the subject, and the execution of the work.

Your Board are satisfied of the great importance of an early completion of the East Park Reservoir, entire, with its connecting, forcing, and distributing mains; and of building a reservoir at Cambria and Thirtieth street; and of adding to that at Mount Airy. For both of the latter land should be acquired at once. All of them are needed now, and will ultimately form proper centres of distribution, whatever may be the permanent source of supply for the City.

The importance of reservoirs is due not only to the necessity for subsidence, but also to guard against the results of serious accidents, such as the experience of this and other cities shows are liable to occur.

The appropriations for these reservoirs are next in importance to those for the machinery, for which estimates have been given.

Expenditures under such appropriations would extend over a period of at least three years, 1883 to 1885. The following estimates of probable cost are believed to be sufficiently accurate to be a basis for appropriation.

I. East Park Reservoir and Connections.

Completing two basins	$400,000
Completing the third basin	300,000
Forcing mains	126,000
Distributing mains	371,200
Total	$1,197,200

II. Cambria Reservoir and Connections.

Land, say	$100,000
150,000,000 gallon reservoir	375,000
Forcing and connecting mains	240,000
Distributing main (one)	105,000
Total	$820,000

III. Mt. Airy Reservoir.

Land, say	$25,000
75,000,000 gallon reservoir	225,000
Total	$250,000

Of these amounts there should be expended:

In 1883, at East Park, finishing small basin and work on others	$372,500
Cambria, land and work	200,000
Mount Airy, land and work	75,000
Total, first year	$647,500

In 1884, at East Park, finishing second basin and work on other, and main	$340,000
Cambria, work on basin and main	325,000
Mount Airy, work on basin	100,000
Total, second year	$765,000
In 1885, at East Park, finishing basin and mains	$484,700
Cambria, finishing basin and mains	295,000
Mount Airy, finishing basin	75,000
Total, third year	$854,700

In considering the question of "present supply," it should be borne in mind that at least five years must elapse before a gravity system, such as contemplated by the Perkiomen or Delaware projects, could be accomplished. At least one year would be spent in making surveys, plans, and detailed specifications. Their discussion and adoption would consume another year, at least; and the construction of the works would take three or four years more, supposing that the funds for so large an undertaking could be provided in that time.

This is a sufficient reason for providing for an adequate water supply by steam pumping machinery and by storage in reservoirs, up to 1888. Long before that time, if the present rate of increase of demand prevails, the consumption of water will become so large as to demand a still further increase than has been recommended in this report, both in pumping power and in distributing facilities, which are now in many localities far below the demand. A consideration of these points may, however, be safely left for the final report of this Board.

Meanwhile your attention is respectfully called to the fact that complete surveys must be made, and reliable data obtained, of the localities from which and through which a pure water supply can be drawn, in order to form a correct judgment as to their availability. As it is essential that this information be obtained, an appropriation for such surveys of not less than fifteen thousand (15,000) dollars is suggested.

With regard to the management of the pumping stations, your Board would call attention to the system which is now, and has been since the earlier days of the Department, the prevailing one, as being radically wrong.

At each of these stations there are now two engineers of equal authority, who are on duty alternately during the day and the night. Thus there can be no definite responsibility or uniformity of management.

The Board recommend that this organization be so modified as to place one superior engineer in charge of each station. In the two larger stations—Schuylkill and Belmont—he should not be required to take a watch, but have two competent assistants. At the other works he might take a watch and have one assistant. He should in all cases be responsible only to the head of the Department, and should maintain discipline, receipt for supplies, provide spares, supervise repairs or any additional construction going on, and direct the proper use of the machinery. Such men should be paid good salaries, commensurate with their qualifications and the responsibility placed upon them.

The Board also consider that the salaries now paid to engineers, corresponding to those of the assistants under the proposed plan, being less than those of good mechanics, in proportion to the time they are on duty, and far below those paid in other cities for similar work, are insufficient to command and keep the best men. They believe that the saving in fuel alone which would result from these changes would more than pay the extra amount required for wages, and that greater security would be obtained.

They also suggest that the several pumping stations and reservoirs should be connected together and with the Purveyor's and central office by telephonic communication, the immense value of which at all times, and especially in case of accidents, is obvious.

The Board have been deeply impressed with the vital necessity of keeping out of the inlets to different pumping wells a large and constantly increasing amount of offensive sewage. They believe that this great evil, so far as it proceeds from the sewer that empties into the Schuylkill river at the east end of Girard avenue bridge, can be abated at an early day, and at a cost small in comparison with the importance of the object.

This, however, belongs to the Survey Department of the City, which has also under consideration methods for keeping the sewage of Manayunk and the points below it out of the river above Fairmount dam.

This is a necessity which cannot be too soon provided for, considering the importance of restoring the water supply to its original purity, and, at the same time, of protecting the great industries of that section.

Appended to this report, the Board submit a table showing the pumping capacity and consumption for a series of years; also a table showing the organization and wages paid in different cities.

Respectfully submitted.

E. S. CHESBROUGH,
J. VAUGHAN MERRICK,
FRED. GRAFF.

WM. H. McFADDEN, *Chief Eng. Water Dept.*

Table showing the available capacity of Works of Philadelphia Water Department, in millions of gallons per day, from 1872 to 1883, at time of maximum demand, the reserve engines at time of accident or break down of machinery, and the probable Deficit for 1883.

Year.	Steam power. M. g. p. d.	Water power. M. g. p. d.	Total. M. g. p. d.	Demand. M. g. p. d.	Reserve engines unavailable.*	Deficit, If no accident.	Deficit, If an accident to the largest engine
1872.....	41	15	56	45	10		
1873.....	43	15	58	49	10		
1874.....	43	15	58	50	10		
1875.....	43	15	58	52	10		
1876.....	47	15	62	62	10		
1877.....	47	22	69	57	25		
1878.....	60½	20	80½	64	14		
1879	59½	7½	67	65	14		6
1880.....	59½	7½	67	67	14		6
1881.....	74	5	79	75	9		11
1882.. ...	74	13½	87½	86	9		11
1883.....	74	5	79	100	9	21	32

NOTE.—If the large engine at Frankford breaks down, there will be a short supply at Frankford; and if the larger engine at Roxborough or its boilers break down, a failure at Germantown will be the result.

* Unavailable on account of want of boilers or pumping main.

Cities	St. Louis.		Brooklyn.	Cincinnati.	Philadelphia.
Pumping stations	.....	.....	Ridgewood.	Main Works.	Spring Garden.
Lift in feet	$\frac{230+40}{2}$	135	171	171	134
Max. mill's gall's into reservoir	35 + 2	70	37	37	45
Max. work mill's gall's 100 feet high	.....	94·50	63·27	63.27	60.30
Engineers in charge	No. 1	Pay per day. $6.95	No. 1 Pay per day. $6.85	No. 1 Pay per day. $5.00	No. 2 Pay per day. $2.46
Assistant engineers	9	4.50 3.33 4.16 3.17 3.80 3.00 3.50 2.80 2.60	8 3.61 to 3.68	5 3.50	..... None
Oilers	16	2.00	5 2.05	10 2.00	8 1.90
Firemen	24	2.00 1.83	16 1.97	13 2.00	10 1.90
Coal passers	20	1.66	6 1.81	9 2.00	4 1.90
Gaugemen	.....	None	..... None	..... None	2 1.90
Laborers	.....	Not specified	6 1.75	..... Not specified	1 1.75
Coal weighers	.....	.....	....	3 3.00 2.00	....
Clerks	.....	.....	....	1 3.00	1 1.90
Flue cleaners	.....	.....	....	1 1.75	....
Total wages per diem	60	$128.97	42 $97.44	40 $92.25	28 $54.17
Cost of labor per million gallons lifted 100 ft. high	.....	$1.36	..... $1.54	..... $1.45	..... 90c.

NOTE.—At St. Louis the water is first pumped from the Mississippi river, 40 feet, into settling basins; from thence into the distributing reservoir, 230 feet high; the average lift being 135 feet for double the consumption of 35,000,000 gallons, or 70,000,000 gallons 135 feet high = 94½ million gallons 100 feet high.

Cities	Louisville.		Chicago.		Philadelphia.	
Pumping stations	.....		West Side.		Belmont.	
Lift in feet	175 ft.		100 ft.		212 ft.	
Maximum millions gallons into reservoir	11 mill's		30 mill's		18 mill's	
Maximum work millions gallons 100 feet high	19·25		30·00		38·16	
	No.	Pay per day.	No.	Pay per day.	No.	Pay per day.
Engineers in charge	1	$5.00	1	$6.85	2	$2.46
Assistant engineers	3	{4.52, 4.31, 1.61}	3	4.39	.....	None
Oilers	2	2.18	4	2.13	4	1.90
Firemen	2	2.18	6	{2.23, 2.13}	10	1.90
Coal passers	2	2.18	3	1.97	4	1.90
Gaugemen	.....	.....	.....	.....	2	1.90
Laborers	.....	.....	.....	.....	1	1.75
Coal weighers	1	2.18	1	2.13	.....	None
Clerks	.....	.....	.....	.....	1	1.90
Flue cleaners	.....	.....	2	{2.13, 1.97}	.....	.....
Total wages per diem	11	$30.70	20	$53.76	24	$46.57
Cost of labor per million gallons lifted 100 feet high	.....	$1.59	.....	$1.79	.....	$1.22

Data of Water Service in Five Cities.

Compiled by J. J. R. Croes, C. E., of New York.

	New York.	Philadelphia.	Brooklyn.	Chicago.	Boston.	Boston.
Kind of supply	Gravity.	Steam and water power.	Steam power.	Steam power.	Gravity.	Steam power. Mystic.
Population in 1880	1,206,299	847,542	566,663	503,185		
Returns of 1881	1881.	1881.	1881.	1881.	1881.	
Expenses	$337,439 00	Maintenance, $326,465 68	$314,431 00	$384,304 00	$233,777 00	$78,824 00
Receipts	$1,633,501 00	Revenue, $1,509,541 34	$917,045 00	$1,026,533 00	$1,118,661 00	$254,359 00
Daily consumption (gallons)	95,000,000	Average, 62,249,355	32,731,499	63,922,700	31,020,000	7,194,700
High service (steam power)	11,605,630					
Miles of pipe	512	754—3,119 feet.	355	472.3	361.6	117.7
Number of taps (from mains)	90,000	133,314	61,440	73,627	53,655	16,700
High service (steam power)	8,607					
Daily consumption	1,055	Per tap, 467 gallons.	532	868	578	431
Per tap high service	1,348					
Meters	5,293	47	1,208	2,163	1,631	
Fire plugs	6,496	6,014	2,916	3,553	4,275	757

EXPENDITURES SINCE CONSOLIDATION--1855-1882.

Chief Engineer.	Years.	Total Maintenance.	Total Distribution.	Total Machinery.	Total Buildings, Grounds and Reservoirs.	Incidentals Loans, D. M. B. G. & R.	Total Expenditures.
Frederick Graff	1855	$116,911 98	$57,918 21	$73,395 90	.....	.....	$248,226 09
Samuel Ogden	1856	$89,430 78	$55,037 24	$16,000 00	.....	.....	$160,468 02
	1857	123,206 83	77 446 17	.....	.....	.....	200,653 00
	Total.....	$212,637 61	$132,483 41	$16,000 00	.....	.....	$361,121 02
H. P. M. Birkinbine	1858	$104,449 13	$83,528 96	.....	.....	.....	$187,978 09
	1859	97,717 07	248,813 60	$6,71 26	58,492 16	.....	411,737 09
	1860	90,559 02	107,810 76	448 66	53,714 10	.....	252,532 54
	1861	90,887 07	85,400 59	43,782 78	18,957 93	.....	239,028 37
	Total.....	$383,612 29	$525,553 91	$50,945 70	$131,164 19	.....	$1,091,276 09
Isaac S. Cassin	1862	$113,314 85	$72 082 79	$21,802 73	$10,765 81	.....	$217,966 18
	1863	131,176 16	79,584 76	.....	2,989 28	.....	213,750 20
	Total.....	$244,491 01	$151,667 55	$21,802 73	$13,755 09	.....	$431,716 38
H. P. M. Birkinbine	1864	$183,806 28	$79,728 83	.....	$15,393 72	$821 49	$279,750 32
	1865	190,595 80	173,339 40	$41 25	55,761 46	1,978 96	421,716 87
	1866	163,163 82	331,564 94	21,071 62	214,956 87	326 71	731,083 96
	Total.....	$537,565 90	$584,633 17	$21,112 87	$286,112 05	$3,127 16	$1,432,551 15
Frederick Graff	1867	$158,328 43	$243,694 34	$97,509 06	$75,895 30	$404 24	$575,831 37
	1868	173,143 26	361,363 22	141,976 74	124,019 61	1,964 63	802,467 46
	1869	249,758 61	302,495 71	219,603 80	136,768 66	1,138 33	909,765 11
	1870	231,945 12	586,274 88	192,421 06	129,379 71	4,034 73	1,144,055 50
	1871	215,314 36	543,853 20	223,680 94	85,862 72	482 18	1,069,193 40
	1872	206,909 51	312,315 96	97,537 06	442,985 78	3,827 97	1,063,576 28
	Total.....	$1,235,399 29	$2,349,997 31	$972,728 66	$994,911 78	$11,852 08	$5,564,889 12
William H. McFadden	1873	$213,978 44	$464,633 85	$47,664 68	$833,844 93	$4,208, 71	$1,564,330 61
	1874	321.269 72	413,364 54	20,164 90	465,131 64	5,171 28	1 225,102 08
	1875	400,021 50	507,626 75	7,341 43	20,243 67	3,103 39	938,336 74
	1876	394,534 64	464,807 97	93,140 23	146,811 51	1,789 52	1,101,083 87
	1877	293,351 32	275,397 91	44,980 96	56,636 04	483 65	670,849 88
	1878	288,884 53	166,256 46	10,065 67	14,306 25	3,159 58	482,672 49
	1879	277,144 34	166,549 34	.....	.....	.....	443,693 68
	1880	285,913 63	102,877 37	745 15	917 46	247 00	390,700 61
	1881	358,358 73	126,463 21	98,562 80	.....	3 00	583,387 74
	1882	385,694 19	212,635 35	41,663 47	20,965 44	.....	660,958 45
10 years	Total.....	$3,219,151 04	$2,900,612 75	$364 329 29	$1,558,856 94	$18,166 13	$8,061,116 15
18 years	Total.....	$2,730,618 08	$3,802,253 56	$1,155,985 86	$1,425,943 11	$14,979 24	$9,129,779 85
28 years	Total.....	$5,949,769 12	$6,702,866 31	$1,520,315 15	$2,984,800 05	$33,145 37	$17,190,896 00

ITEMS OF EXPENSE, EXCLUDING INTEREST ON PLANT, TO DISTRIBUTE A MILLION GALLONS PUMPED 100 FEET HIGH, BY WATER POWER, ON THE BASIS OF TOTAL MAINTENANCE.

Chief Engineer.	Year.	Work done by Water Pumpage. Gallons raised 100 feet high.	Expense of pumpage by water power.	Items of expense common to steam and water pumpage.							Items of expense where water pumpage differs from steam pumpage.						Expense per million, 100 feet high, by water power.	Average price of coal per 2,240 lbs.
				Engineering.	Registering.	Repairs to		Incidentals.	Deficiencies.	Expense per million, 100 ft. high, com'n to steam and water.	Pumpage salaries.	Coal.	Lubricants, small stores, and gas.	Repairs to machinery.	Navigation Company's charges.	Expense per million, 100 ft. high, common to water power only.		
						Pipes.	B., G. & R.											
Frederick Graff	1855	2,787,736,850	$33,874 20	$0 55	$1 60	$1 63	$2 61	$1 07	$2 22	$9 68	$0 86	$0 09	$0 43	$1 10		$2 48	$12 16	
Samuel Ogden	1856	2,867,188,965	$23,998 37															
	1857	3,059,797,730	46,080 55															$4 20
	Total	5,926,986,695	$70,078 92	$0 37	$1 23	$2 20	$1 79	$0 47	$0 68	$6 74	$0 86	$0 09	$0 43	$1 36	$2 36	$2 74	$11 84	
Henry P. M. Birkinbine	1858	3,058,418,667	$24,375 60															$4 10
	1859	3,390,271,757	24,104 83															No rec'd.
	1860	3,612,989,017	24,387 68															3 87
	1861	3,731,785,628	22,875 85															3 70
	Total	13,793,465,069	$95,743 96	$0 44	$1 56	$1 11	$1 16	$0 29	$0 58	$5 14	$0 64	$0 08	$0 27	$0 83		$1 82	$6 96	
Isaac S. Cassin	1862	3,564,724,753	$29,765 45															$5 91
	1863	5,586,712,091	38,380 71															5 73
	Total	9,151,436,844	$68,146 16	$0 40	$1 35	$0 85	$2 69	$0 28	$0 14	$5 71	$0 58	$0 09	$0 28	$0 87		$1 82	$7 53	
Henry P. M. Birkinbine	1864	5,970,801,329	$60,663 34															$10 08
	1865	7,082,015,640	61,188 61															10 05
	1866	7,721,817,582	61,465 67															6 90
	Total	20,774,634,551	$183,317 62	$0 44	$1 56	$1 47	$2 40	$0 37	$0 35	$6 59	$0 67	$0 09	$0 47	$1 03		$2 26	$8 85	
Frederick Graff	1864	7,990,416,594	$71,833 85															$5 94
	1868	8,024,530,911	68,689 98															6 50
	1869	7,489,611,069	105,244 96															7 43
	1870	8,134,985,170	73,048 32															7 00
	1871	8,821,728,593	70,252 77															6 96
	1872	7,220,091,685	57,087 60															6 75
	Total	47,681,364,022	$446,157 48	$0 44	$1 31	$1 72	$2 38	$0 37		$6 22	$0 63	$0 07	$0 32	$0 88	$1 17	$1 90	$9 29	
William H. McFadden	1873	8,717,538,594	$58,581 86															$6 75
	1874	7,582,023,422	*82,139 03															7 25
	1875	7,670,009,198	88,358 50															5 01
	1876	8,374,657,243	83,327 84															4 63
	1877	9,492,419,433	77,837 84															3 39
	1878	8,322,288,784	61,483 26															3 85
	1879	7,278,357,488	55,679 43															3 20
	1880	7,887,896,254	43,383 43															4 60
	1881	7,575,326,689	43,373 38															4 60
	1882	9,377,468,535	49,888 13															4 75
Ten years	Total	82,277,985,640	$644,052 70	*$0 65	$1 00	$1 21	*$1 84	*$0 44		$5 14	*$1 26	$0 11	$0 38	$0 88	$0 01	$2 63	$7 78	
Eighteen years	Total	100,115,624,031	$897,318 34	$0 43	$1 40	$1 51	$2 18	$0 38	$0 28	$6 18	$0 65	$0 08	$0 35	$0 94	$0 70	$2 72	$8 90	
Twenty-eight years	Total	182,393,609,671	$1,541,371 04	$0 56	$1 17	$1 34	$1 99	$0 41	$0 12	$5 59	$0 93	$0 09	$0 36	$0 80	$0 39	$2 57	$8 16	

* In years previous to 1874, engineering, buildings, grounds, reservoirs, and some pumpage salaries and other items of maintenance were paid from loans and other items. These drawn from loans and other items are not easily traceable to determine maintenance in these previous years.

* Note.—Previous to 1874, the officers of the Engineering Corps paid from salary roll cost $6,000—the Engineer and his clerk; while the rest were those paid on per diem roll from loans and other items—cost, $21,000. These added make $27,000, and shows that the Engineering Corps cost more previous to 1874 than since.

ITEMS OF EXPENSE EXCLUDING INTEREST ON PLANT, TO DISTRIBUTE A MILLION GALLONS PUMPED ONE HUNDRED FEET HIGH BY STEAM POWER, ON THE BASIS OF TOTAL MAINTENANCE.

Chief Engineer.	Year.	Work done by steam pumpage. Gallons raised 100 feet high.	Expense of pumping by steam power.	Items of expense common to steam and water pumpage.							Items of expense where steam pumpage differs from water pumpage.					Expense per million, 100 feet high, by steam power.	Average prices of coal per 2,240 pounds.	Percentage of tons, per million gallons, 100 feet high.	Cost per million 100 feet high, water and steam combined, on basis of total maintenance.	Cost per million 100 feet high, water and steam combined, on basis of total distribution.	Cost per million 100 feet high, water and steam combined, on basis of total construction.	On the basis of all expenditures.	Receipts per million, 100 feet high, on basis of water rents.	Receipts per million, 100 feet high, on basis of pipes.	Receipts per million, 100 feet high, on basis of receipts at Chief Engineer's office.	Receipts per million, 100 feet high, on basis of total receipts.
				Engineering.	Registering.	Repairs to Pipes.	Repairs to B. G. & R.	Incidentals.	Deficiencies.	Expense per million, 100 feet high, common to steam and water.	Pumpage salaries.	Coal.	Lubricants, small stores, and gas.	Repairs to machinery.	Expense per million, 100 feet high, common to steam power only.											
Frederick Graff	1855	2,606,108,681	$83,037 78	$0 55	$1 60	$1 63	$2 61	$1 07	$2 22	$9 68	$5 10	$12 96	$0 78	$3 31	$22 15	$31 83	$4 53	$2 86	$21 67	$10 74	$13 61	$46 02	$66 82	$3 89	$0 11	$70 82
Samuel Ogden	1856	3,509,123,551	$65,432 41																							
	1857	4,110,677,625	77,126 28																							
	Total	7,619,801,176	$142,558 69	$0 37	$1 23	$2 20	$1 79	$0 47	$0 68	$6 74	$2 96	$5 68	$1 17	$2 13	$11 94	$18 68	$4 12	$1 37	$15 69	$9 78	$1 18	$26 65	$57 41	$4 59	$0 09	$62 09
Henry P. M. Birkinbine	1858	4,813,277,699	$80,073 53																							
	1859	4,877,172,459	73,612 24																							
	1860	4,983,452,440	66,171 34																							
	1861	5,072,440,659	68,011 22																							
	Total	19,746,343,257	$287,868 33	$0 44	$1 56	$1 11	$1 10	$0 29	$0 58	$5 14	$2 92	$4 90	$0 50	$1 00	$9 41	$14 55	$3 69	$1 35	$11 43	$15 67	$5 42	$32 53	$56 46	$6 03	$0 16	$62 65
Isaac S. Cassin	1862	5,725,822,236	$83,549 40																							
	1863	5,305,611,876	92,795 45																							
	Total	11,031,434,112	$176,344 85	$0 40	$1 35	$0 85	$2 69	$0 28	$0 14	$5 71	$2 63	$5 64	$0 44	$1 48	$10 19	$15 90	$4 96	$1 14	$12 11	$7 51	$1 77	$21 39	$52 25	$3 73	$0 10	$56 08
Henry P. M. Birkinbine	1864	4,597,556,437	$123,142 94																							
	1865	5,416,764,497	129,407 19																							
	1866	4,339,814,549	101,698 15																							
	Total	14,354,135,483	$354,248 28	$0 44	$1 56	$1 47	$2 40	$0 37	$0 35	$6 59	$4 02	$10 54	$0 65	$2 83	$18 04	$24 63	$8 28	$1 27	$15 30	$16 64	$8 84	$40 78	$51 72	$3 46	$0 33	$55 51
Frederick Graff	1867	4,305,376,437	$86,494 58																							
	1868	5,705,710,869	104,453 28																							
	1869	7,115,454,638	144,513 65																							
	1870	7,488,634,027	158,896 80																							
	1871	7,554,381,177	145,061 59																							
	1872	9,654,631,368	149,821 91																							
	Total	41,824,188,516	$789,241 81	$0 44	$1 31	$1 72	$2 38	$0 37	.....	$6 22	$4 10	$6 42	$0 61	$1 63	$12 76	$18 98	$5 58	$1 15	$13 80	$26 25	$22 12	$62 17	$52 76	$7 13	$0 45	$60 34
William H. McFadden	1873	10,187,323,844	$155,396 58																							
	1874	12,988,925,707	*239,130 69																							
	1875	13,871,245,276	311,663 00																							
	1876	16,861,280,555	311,206 80																							
	1877	15,590,148,734	215,513 48																							
	1878	19,762,425,318	227,401 27																							
	1879	22,509,472,321	221,464 91																							
	1880	23,798,379,018	242,530 20																							
	1881	26,663,201,422	314,985 35																							
	1882	28,495,833,723	335,806 06																							
Ten years	Total	190,728,235,918	$2,575,098 34	*$0 65	$1 00	$1 21	*$1 84	*$0 44	.....	$5 14	$2 41	$4 09	$0 42	$1 46	$8 38	$13 52	$4 44	$0 92	$11 79	$10 62	$7 11	$29 52	$44 86	$4 51	$0 21	$49 58
Eighteen years	Total	97,182,011,225	$1,833,299 74	$0 43	$1 40	$1 51	$2 18	$0 38	$0 28	$6 18	$3 61	$6 76	$0 62	$1 75	$12 74	$18 92	$5 32	$1 27	$13 84	$19 27	$13 16	$46 27	$53 86	$5 68	$0 31	$59 85
Twenty-eight years	Total	287,910,247,143	$4,408,398 08	$0 56	$1 17	$1 34	$1 99	$0 41	$0 12	$5 59	$2 82	$5 00	$0 48	$1 63	$9 93	$15 52	$4 80	$1 04	$12 65	$14 25	$9 65	$36 55	$48 63	$5 00	$0 25	$53 88

* In years previous to 1874, engineering, buildings, grounds, reservoirs, and some pumpage salaries, and other items of maintenance, were paid from loans and other items. These drawn from loans and other items are not easily traceable to determine maintenance in these previous years.

*Note.—Previous to 1874, the officers of the engineering corps paid from salary roll cost $6,000, the engineer and his clerk, while the rest were those paid on per diem roll from loans and other items cost $21,000. These added, make $27,000, and shows that the engineering corps cost more previous to 1874 than since.

DISTRIBUTION, DRILLS, PIPES, SHOP FITTINGS, PIPE LAYING, WAGES AND SALARY ROLLS FROM TAXATION, AND ALSO MATERIAL AND LABOR FROM LOANS.

Chief Engineer.	Year.	Drills.	Pipes.	Pipe-laying.		Loans.		Total.	Estimated pounds of pipes and length of branches as pounds of pipes, and shop fittings and fitting up.	Feet of pipes and branches as fittings.	Miles.	Feet.	Cost per 100 pounds, handled and laid in the ground.
				Wages, per diem, Roll.	Salary Roll.	Material.	Labor.						
Previous to Consolidation	....	.....	.....	.....	.....	.....	.....	.....	58,195,359	1,314,230	248	4,790	
Frederick Graff	1855	.....	$40,324 78	$14,393 43	$3,200 00	.....	.....	$57,918 21	931,110	34,474	6	2,794	$6 22
Samuel Ogden	1856	.....	$35,323 03	$17,214 21	$2,600 00	.....	.....	$55,037 24	1,618,922	59,876	11	1,796	
	1857	.....	41,568 30	33,277 87	2,600 00	.....	.....	77,446 17	2,135,942	68,433	12	5,073	
	Total.....	.....	$76,891 33	$50,392 08	$5,200 00	.....	.....	$132,483 41	3,754,864	128,309	24	1,589	$3 53
Henry P. M. Birkinbine	1858	.....	$54,991 47	$25,937 49	$2,600 00	.....	.....	$83,528 96	2,153,356	74,561	14	641	
	1859	$4,409 03	89,215 99	26,489 82	2,600 00	$100,795 89	$25,302 87	248,813 60	8,576,455	120,279	22	4,119	
	1860	5,771 90	69,367 08	29,998 44	2,600 00	72 72	62	107,810 76	3,113,466	105,012	19	4,692	
	1861	4,220 13	43,761 37	21,225 36	2,592 23	10,067 80	3,533 60	85,400 59	2,086,257	61,422	11	3,342	
	Total.....	$14,401 06	$255,335 91	$103,651 11	$10,392 33	$110,936 41	$28,837 09	$525,553 91	15,929,534	361,274	68	2,234	$3 30
Isaac S. Cassin	1862	$4,999 67	$33,366 06	$22,991 11	$2,600 00	$7,524 35	$601 60	$72,082 79	1,515,078	48,853	9	1,333	
	1863	4,995 17	39,991 23	31,998 36	2,600 00	.....	.....	79,584 76	1,707,276	60,482	11	2,402	
	Total	$9,994 84	$73,357 29	$54,989 47	$5,200 00	$7,524 35	$601 60	$151,667 55	3,222,354	109,335	20	3,735	$4 71
Henry P. M. Birkinbine	1864	$5,583 25	$48,394 11	$22,375 87	$3,375 60	.....	.....	$79,728 83	1,318,366	45,076	8	2,836	
	1865	5,512 50	66,404 27	20,756 82	3,400 00	$64,790 65	$12,475 16	173,339 40	2,782,306	49,129	9	1,609	
	1866	5,544 75	72,553 38	34,424 54	3,368 01	182,189 13	33,485 13	331,564 94	8,496,325	73,482	13	4,842	
	Total.....	$16,640 50	$187,351 76	$77,557 23	$10,143 61	$246,979 78	$45,960 29	$584,633 17	12,596,997	167,687	31	4,007	$4 64
Frederick Graff	1867	$6,723 00	$121,897 33	$33,932 57	$3,400 00	$65,647 05	$12,094 39	$243,694 34	4,438,472	93,011	17	3,251	
	1868	6,488 12	85,959 78	33,197 06	3,400 00	215,272 34	17,045 92	361,363 22	4,754,349	96,888	18	1,848	
	1869	7,500 00	124,791 77	49,970 49	3,391 11	84,809 85	32,032 49	302,495 71	8,586,761	131,034	24	4,314	
	1870	7,385 00	149,651 72	57,067 61	3,400 00	325,315 55	43,455 00	586,274 88	10,331,569	147,467	27	4,907	
	1871	8,496 36	155,590 57	69,240 73	3,400 00	233,591 11	73,534 43	543,853 20	12,144,276	176,559	33	2,319	
	1872	8,489 74	179,997 55	82,238 30	3,400 00	13,247 17	24,943 20	312,315 96	6,844,127	158,887	30	487	
	Total.....	$45,082 22	$817,888 72	$325,646 76	$20,391 11	$937,883 07	$203,105 43	$2,349,997 31	47,099,554	803,846	152	1,286	$4 99
William H. McFadden	1873	$9,996 79	$215,992 44	$90,658 96	$3,400 00	$106,492 71	$38,092 95	$464,633 85	8,812,973	224,811	42	3,051	
	1874	12,999 45	228,125 00	120,852 78	8,800 00	20,551 10	22,036 21	413,364 54	8,462,453	236,167	44	3,847	
	1875	12,982 66	175,864 44	112,164 47	8,800 00	195,392 11	2,423 07	507,626 75	7,071,798	204,258	38	3,618	
	1876	14,994 11	176,184 67	130,194 49	8,800 00	110,349 73	24,284 97	464,807 97	13,513,404	166,904	31	3,224	
	1877	11,998 81	99,992 88	73,529 04	8,800 00	45,545 78	35,531 40	275,397 91	6,895,972	111,444	21	564	
	1878	9,998 50	68,869 98	43,544 02	7,920 00	20,248 84	15,675 12	166,747 38	4,522,440	71,912	13	3,272	
	1879	9,999 62	67,433 25	81,196 47	7,920 00	.....	.....	166,549 34	4,911,968	51,616	9	4,096	
	1880	9,380 00	47,999 50	38,657 87	6,840 00	.....	.....	102,877 37	1,103,571	32,359	6	679	
	1881	9,449 50	73,091 60	22,585 74	16,120 00	.....	5,216 37	130,128 30	3,032,272	60,448	11	2,368	
	1882	9,476 37	118,871 34	44,727 67	27,025 30	4,678 23	7,856 44	212,635 35	5,880,257	64,600	12	1,240	
Ten years, 1873–1882.....	Total.....	$111,275 81	$1,272,425 10	$758,111 51	$104,425 30	$503,258 50	$151,116 53	$2,900,612 75	64,207,108	1,224,519	231	4,839	$4 52
Eighteen years, 1855–1872.....	Total.....	$86,118 62	$1,453,149 79	$626,630 08	$54,527 05	$1,303,323 61	$278,504 41	$3,802,253 56	83,534,413	1,604,925	303	5,085	$4 55
Twenty-eight years, 1855–1882..	Total.....	$197,394 43	$2,725,574 89	$1,384,741 59	$158,952 35	$1,806,582 11	$429,620 94	$6,702,866 31	147,741,521	2,829,444	535	4,644	$4 54

AMOUNT EXPENDED FROM LOANS AND TAXATION FOR DISTRIBUTION, PHILADELPHIA WATER WORKS, 1855 TO 1882

Drills, Pipes, Pipe-laying, Wages, Salaries, etc.

		LOANS.													TAXATION.					
Chief Engineer.	Year.	Fairmount. 30-inch pumping mains and 48-inch pumping main. Loans 1 and 2.	Spring Garden. Pumping mains, 36-inch. Loans 3 and 4, and con. bal.	Roxborough and Frankford. Loans 2 and 6.	Pumping main to storage and 30-in. supply mains. Loans 1, 2, and 5.	20-inch main on Washington avenue, west of Broad, etc. Loan 2.	20-inch, 16-inch, and 12-inch supply mains, Roxborough, and 12-inch and 10-inch supply mains. Loans 2 and 6	30-inch main from Corinthian avenue to Delaware reservoir. 20-inch on Twenty-second street. 12-inch on Ridge. Loan 2.	16-inch, 12-inch, and 10-inch, Manayunk. Loan 3.	16-inch on Washington and Moyamensing avenues. Loans 6, 2, etc.	30-inch pumping and 20-inch supply mains, Belmont. Loan 3.	36-inch pumping main, Belmont. Loan 4.	20-inch main from Roxborough to Mt. Airy reservoir. Loan 3.	Total from loans.	Drills.	Pipes.	Pipe laying. Wages (per diem) roll.	Pipe laying. Salary roll.	Total from taxation.	Total from loans and taxation.
Frederick Graff	1855															$40,324 78	$14,393 43	$3,200 00	$57,918 21	$57,918 21
Samuel Ogden	1856															$35,323 03	$17 114 21	$2,600 00	$55,037 24	$55,037 24
	1857															41,568 30	33,277 87	2,600 00	77,446 17	77,446 17
	Total															$76,891 33	$50,392 08	$5,200 00	$132,483 41	$132,483 41
Henry P. M. Birkinbine	1858				30-inch Corinthian reservoir to First District.											$54,991 47	$25,937 49	$2,600 00	$83,528 96	$83,528 96
	1859				$126,098 76									$126,098 76	$4,409 03	89,215 99	26,489 82	2,600 00	122,714 84	248,813 60
	1860				73 34									73 34	5,771 90	69,367 08	29,998 44	2,600 00	107,737 42	107,810 76
	1861	$13,598 40			3 00									13,601 40	4,220 13	43,761 37	21 225 36	2,592 33	71,799 19	85,400 59
	Total	$13,598 40			$126,175 10									$139,773 50	$14,401 06	$257,335 91	$103 651 11	$10,392 33	$385,780 41	$525,553 91
Isaac S. Cassin	1862	$8,125 95												$8,125 95	$4,999 67	$33,366 06	$22,991 11	$2,600 00	$63,956 84	$72,082 79
	1863														4,995 17	39,591 23	31,998 36	2,600 00	79,584 76	79,584 76
	Total	$8,125 95												$8,125 95	$9,994 84	$73,357 29	$54 989 47	$5,200 00	$143,541 60	$151,667 55
Henry P. M. Birkinbine	1864			20-inch pumping main, Roxborough.	30-inch on Poplar, Corinthian ave. to Eighteenth st										$5,583 25	$48,394 11	$22,375 87	$3,375 60	$79.728 83	$79,728 83
	1865	$41,949 28			$12,108 25	$20,108 05		$3,100 23						$77,265 81	5,512 50	66,404 27	20,756 82	3,400 00	96,073 59	173,339 40
	1866	27,359 59		$413 21			$30,720 10	157,181 36						215,674 26	5,544 75	72.553 38	34,424 54	3,368 01	115,890 68	331,564 94
	Total	$69,308 87		$413 21	$12,108 25	$20,108 05	$30,720 10	$160,281 59						$292,940 07	$16,640 50	$187,351 76	$77,557 23	$10,143 61	$291,693 10	$584,633 17
Frederick Graff	1867			$21,733 31		20 inch main, Lancaster av.	$45,616 98	$10,391 15		16-inch and 12-inch supply mains, Germantown				$77,741 44	$6,723 00	$121,897 33	$33,932 57	$3,400 00	$165,952 90	$243,694 34
	1868	36-inch pumping main.	$38,199 91	24 80			69 00	1,093 39	$22,034 97		$79,618 25		$91,277 94	232,318 26	6,488 12	85,959 78	33,197 06	3,400 00	129,044 96	361,363 22
	1869	Delaware.	21,022 68			$20,468 92	30-inch descend'g main, Belmont.		1,387 90		46,946 02		27,016 82	116,842 34	7,500 00	124,791 77	49,970 49	3,391 11	185,653 37	302,495 71
	1870	Loans 4 and 5.	20,590 46			2,387 50	$93,907 69		119 37		18,027 18	$48,158 42	54,671 08	237,861 70	7,385 00	149,651 72	57,067 61	3,400 00	217,504 33	455,366 03
	1870	$123,242 92	7,665 93											130,908 85						130,908 85
	1871	73,693 22	56,441 75				102,726 62		73 00	$53,143 97	41 65	19,784 15	1,221 18	307,125 54	8,496 36	155,590 57	69,240 73	3,400 00	236,727 66	543,853 20
	1872	9,052 39	74 31		Pumping main to storage.					6,257 75				15,384 45	8,489 74	179.997 55	82,238 30	3,400 00	274,125 59	289,510 04
	1872		10,083 25				6,960 01					5,399 52	363 14	22,805 92						22,805 92
	Total	$205,988 53	$154,078 29	$21,758 11		$22,856 42	$249,280 30	$11,484 54	$23,615 24	$59,401 72	$144,633 10	$73,342 09	$174,550 16	$1,140,988 50	$45,082 22	$817,888 72	$325 646 76	$20,391 11	$1,209 008 81	$2,349,997 31
Wm. H. McFadden	1873	$1 92	12-inch and 10-inch supply mains, Manayunk.	20-inch and 30-inch mains Frankford.				12-inch on Ridge, 20-inch on Twenty-second street.	20-inch on Broad, Washington to Snyder avenue.					$1 92						$1 92
	1873		$14,553 95	$3,342 00		$17,642 40	$2,433 72	$30,932 58	$28,248 66	$29,739 32		$17,410 98	$280 13	144,583 74	$9,996 79	$215 992 44	$90,658 96	$3,400 00	$320,048 19	464,631 93
	1874	3 25	3,493 61		$1,238 56	8,103 65	2,809 65	8,067 43	3,364 94	14,328 89	$31 50	974 87	170 97	42,587 31	12,999 45	228 125 00	120,852 78	8,800 00	370,777 23	413,364 54
	1875		3,522 44	161,318 87	22,410 17	2,783 95			2,658 40	5,121 35				197,815 18	12,982 66	175,864 44	112,164 47	8,800 00	309,811 57	507,626 75
	1876			109,304 94	25,329 76									134,634 70	14,994 11	176,184 67	130,194 49	8,800 00	330,173 27	464,807 97
	1877			80,924 68	152 50									81,077 18	11,998 81	99,992 88	73,529 04	8,800 00	194,320 73	275,397 91
	1878			30,736 09	5,187 87									35,923 96	9,998 50	68,869 98	43,544 02	7,920 00	130,332 50	166,256 46
	1879														9,999 62	67,433 25	81,196 47	7,920 00	166,549 34	166,549 34
	1880									Pipes and specials.					9,380 00	47,999 50	38,657 87	6,840 00	102,877 37	102,877 37
	1881		2,713 87							2,502 50			Broad st. main.	5,216 37	9,449 50	73,091 60	22,585 74	16,120 00	121,246 84	126,463 21
	1882												$12,534 67	12,534 67	9,476 37	118,871 34	44,727 67	27,025 30	200.100 68	212,635 35
Total for ten years		$5 17	$24,283 87	$385,626 58	$54,318 86	$28,530 00	$5,243 37	$39,000 00	$34,272 00	$51,692 06	$31 50	$18,385 85	$12,985 77	$654,375 03	$111,275 81	$1,272,425 10	$758,111 51	$104,425 30	$2,246,237 72	$2,900,612 75
Total for eighteen years		$297,021 75	$154,078 29	$22,171 32	$138,283 35	$42,964 47	$280,000 40	$171,766 13	$23,615 24	$59,401 72	$144,633 10	$73,342 09	$174,550 16	$1,581,828 02	$86,118 62	$1 453 149 79	$626,630 08	$54,527 05	$2,220,425 54	$3,802,253 56
Total for twenty-eight years		$297,026 92	$178,362 16	$407,797 90	$192,602 21	$71.494 47	$285,243 77	$210,766 13	$57,887 24	$111,093 78	$144,664 60	$91,727 94	$187,535 93	$2,236,203 05	$197,394 43	$2,725 574 89	$1,384,741 59	$158,952 35	$4,466,663 26	$6,702,866 31

AMOUNT EXPENDED FROM LOANS AND TAXATION FOR MACHINERY PHILADELPHIA WATER WORKS--1855-1882.

		LOANS.													TAXATION.						INCIDENTALS.			
		Fairmount.		Delaware.	Spring Garden.			Roxborough.		Belmont.		Germantown.	Frankford.		Fairmount.	Spring Garden.		Belmont.						
Chief Engineer.	Year.	Turbines 7, 8 and 9. Loan. 1.	Turbine No. 5. Loan 4.	Worthington Engine. Loan 4.	No. 5 Cornish Engine, Boiler and Connections. Loans 2 and 3.	No. 6 Simpson Engine. Loan 4.	No. 7, or Cramp Engine. Loan 5.	Cornish Engine, Boilers and Connections. Loan 2.	Worthington Engine. Foundations and Inlet. Loan 5.	Worthington Engines No. 1, 2 and 3, and Small Engine. Loans 3 and 5.	Boilers and Connections. Loan 3.	Engine and Stand Pipe. Rox. Res. Loan 5.	New Engines Boilers and Setting and Testing. Loan 6.	Total Loans.	Turbine No. 3, and Testing Turbines.	New Boilers. Spring Garden.	New Engines and Stand Pipe.	Contract for Twenty-fourth Ward Works, etc.	Total Taxation.	Total Taxation and Loans.	Incidentals from all the Loans.	Surveys beyond City for Supply.	Surveys for Frankford Supply.	Total Incidentals.
Frederick Graff	1855																$31,308 64	$42,087 26	$73,395 90	$73,395 90				
Samuel Ogden	1856																	$16,000 00	$16,000 00	$16,000 00				
	1857																							
	1858														Testing.									
Henry P. M. Birkinbine	1859	$2,059 14												$2,059 14	$473 08	$4,182 04			$4,655 12	$6,714 26				
	1860	422 41												422 41	26 25				26 25	488 66				
	1861	43,782 78												43,782 78						43,782 78				
	Total	$46,264 33												$46,264 33	$499 33	$4,182 04			$4,681 37	$50,945 70				
Isaac S. Cassin	1862	$21,802 73												$21,802 73						$21,802 73				
	1863																							
	Total	$21,802 73												$21,802 73						$21,802 73				
	1864																					$821 49		$821 49
Henry P. M. Birkinbine	1865	Turbine No. 4.			$41 25									$41 25						$41 25	$25 35	1,953 61		1,978 96
	1866	Loan 3.			793 75			$20,227 87						21,071 62						21,071 62	183 43	143 28		326 71
	Total				$835 00			$20,227 87						$21,112 87						$21,112 87	$208 78	$2,918 38		$3,127 16
	1867				$7,517 00			$58,732 12						$66,249 12	$31,259 94				$31,259 94	$97,509 06	223 71	$180 53		$404 24
	1868				41,269 96			5,612 48		$8,659 81				55,542 25	86 434 49				86,434 49	141,976 74	1,964 63			1,964 63
	1869				5,375 72		Loan 3.	338 85		325 94				6,040 51	7,229 11				7,229 11	13,269 62	1,099 83			1,138 33
Frederick Graff	1869	$125,873 08		Loan 3.	45,181 60			$22,996 90			$12,282 60			206,334 18						206,334 18		38 50		
	1870	13,931 58	$59,921 35	$7,200 00	6,433 38	$9,614 12			$1,159 03		2,500 00			100,759 46						107,759 46	4,034 73			4,034 73
	1870			Loan 3.	4,818 05					$57,700 00		$4,186 20		66,704 25		$24,957 35			24,957 35	91,661 60				
	1871	189 00	56,387 33	$52,357 85		52,881 49			18,826 04	37,300 00		5,692 60		223,644 31	36 63			Testing Worthington.	36 63	223,680 94	447 43		$34 75	482 18
	1872	6 27	28,733 99	5,281 25	137 01	11 358 99		3 07	48,770 85		131 55	115 99		94,538 97	35 50			$2,962 59	2,998 09	97,537 06	3,620 62		207 35	3,827 97
	Total	$139,999 93	$145,042 67	$64,849 10	$110,732 72	$73,854 60		$87,683 42	$68,755 92	$103,985 75	$14,914 15	$9,994 79		$819,813 05	$124,995 67	$24,957 35		$2,962 59	$152,915 61	$972,728 66	$11,390 95	$219 03	$242 10	$11,852 08
	1873					$2,783 59			$904 00	$43,971 87	$5 22			$47,664 68						$47,664 68	$3,972 76		$235 95	$4,208 71
	1874					13,603 53	$117 00		427 49	5,977 65	39 23			20,164 90						20,164 90	5,097 66		73 62	5,171 28
	1875						5,716 12	$1,313 66					$311 65	7,341 43						7,341 43	3,103 39			3,103 39
	1876						53,210 32	3 10					39,926 81	93,140 23						93,140 23	1,789 52			1,789 52
	1877						14,685 87						30,295 09	44,980 96						44,980 96	483 65			483 65
William H. McFadden	1878						957 00						9,108 67	10,065 67						10,065 67	3,159 58			3,159 58
	1879				Stand Pipe.	Boilers.	No. 8 W. E.					Chestnut Hill.	Testing.											
	1880				Con. Bal.	Con. Bal.	Con. Bal.				Con. Bal.	New Boilers.	$745 15	745 15				New Boilers.		745 15	247 00			247 00
	1881				$6,378 96	$1,123 00	$2,000 00				$992 05	$2,184 24		12,678 25	Fittings done at Cherry steeet shop for works.	$33,876 61	$28,000 00	$24,007 94	$85,884 55	98,562 80	3 00			3 00
	1882				11,238 59		7,500 00							18,738 59		New Boilers. Roxborough.	Stand Pipe.	Engine and Boilers. Mt. Airy.		18,738 59				
	1882														$2,263 81	$9,224 35	$2,075 87	9,360 85	29,924 88	22,924 88				
Total during 10 years					$17,617 55	$17,510 12	$84,186 31	$1,316 76	$1,331 49	$49,949 52	$1,036 50	$2,184 24	$80,387 37	$255,519 86	$2,263 81	$43,100 96	$30,075 87	$33,368 79	$108,809 43	$364,329 29	$17,856 56		$309 57	$18,166 13
Total during 18 years		$208,066 99	$145,042 67	$64,849 10	$111,567 72	$73,854 60		$107,961 29	$68,755 92	$103,985 75	$14,914 15	$9,994 79		$908,992 98	$125,495 00	$29,139 39	$31,308 64	$61,049 85	$246,992 88	$1,155,985 86	$11,599 73	$3,137 41	$242 10	$14,979 24
Total during 28 years		$208,066 99	$145,042 67	$64,849 10	$129,185 27	$91,364 72	$84,186 31	$109,278 05	$70,087 41	$153,935 27	$15,950 65	$12,179 03	$80,387 37	$1,164,512 84	$127,758 81	$72,240 35	$61,384 51	$94,418 64	$355,802 31	$1,520,315 15	$29,456 29	$3,137 41	$551 67	$33,145 37

AMOUNT EXPENDED FROM LOANS AND TAXATION FOR BUILDINGS, GROUNDS, AND RESERVOIRS, PHILADELPHIA WATER WORKS, 1855 TO 1882.

Chief Engineer.	Year.	LOANS.																	TAXATION.			
		Fairmount.		Delaware.	Roxborough.				Belmont.				Purchase of works.	Frankford.				Storage reservoir.	Total from loans.	Engine and boiler house, Roxborough and Spring Garden.	Remodeling Mt Airy school house, etc.	Total from taxation.	Total from taxation and loans.
		New mill house. Sinking crib and rebuilding dam. Loans1, 2, and 5.	Raising Cor. ave. res. Loan 1.	Wharf, suction, and standpipe. Reservoir. Loans 2, 4, and 5.	Real estate. Loan 2.	Engine house Foundation and stack, and completing the same. Loans 2 and 3.	Engine and boiler house for Worthington. Loan 5.	Reservoir. Loan 2.	Real estate. Loan 2.	Engine and boiler house. Foundation and stack. Loan 2.	Foundation stack, wharf, coal sheds, etc. Loan 3.	Reservoir. Loans 2, 3, 4, and 5.	Loans 2, 3, and 6.	Engine house and stack. Loan 6.	Land damages. Loan 6.	Reservoir. Loan 6.	Subm'rg'd main and inlet. Loan 6.	Loan 5.				
F. Graff	1855																					
S. Ogden	1856																					
	1857																					
	1858																					
	1859	$20,992 17	$37,499 99															$58,492 16				$58,492 16
	1860	34,991 98	18,722 12															53,714 10				53,714 10
H. P. M. Birkinbine	1861	13,542 81	5,415 12															18,957 93				18,957 93
	Total	$69,526 96	$61,637 23															$131,164 19				$131,164 19
	1862	$8,312 97	$2,452 84															$10,765 81				$10,765 81
I. Cassin	1863		2,989 28															2,989 28				2,989 28
	Total	$8,312 97	$5,442 12															$13,755 09				$13,755 09
	1864			$15,393 72														$15,393 72				$15,393 72
	1865	$24,912 32		14,497 97				$15,569 41		$781 76			Germanto'n					55,761 46				55,761 46
H. P. M. Birkinbine	1866	13,329 32		102 02	$14,935 75	$11,641 49		35,499 17	$13,903 68	4,319 34		$7,773 55	$113,452 55					214,956 87	Roxboro'gh.			214,956 87
	Total	$38,241 64		$29,993 71	$14,935 75	$11,641 49		$51,068 58	$13,903 68	$5,101 10		$7,773 55	$113,452 55					$286,112 05				$286,112 05
	1867	$3,245 82				$10,356 77		$19,645 21	$192 50			$37,670 38	Reservoir, Mt. Airy.					$71,110 68	$4,784 62		$4,784 62	$75,895 30
	1868	1,624 11			$34 50			6,454 60	4,942 00	$20,988 07		73,891 00	$16,085 33					124,019 61				124,019 61
	1869	509 83				2,872 75		5,719 59		6,892 92	$38,147 44	82,626 13						136,768 66				136,768 66
	1870	103 07		$56,917 72		133 96	$4,834 50	75 30		1,122 85	4,849 57	61,342 74						129,379 71				129,379 71
F. Graff	1871			42,093 24		52 00	11,838 54				41 40	1,476 13						55,501 31				55,501 31
	1871			15,987 87								6,238 50					$8,135 04	30,361 41				30,361 41
	1872	631 55		961 13								46 30						1,638 98				1,638 98
	1872	$108,375 24		14,780 34		4,941 29	3,326 77				2 67	68,803 40					241,117 09	441,346 80				441,346 80
	Total	$114,489 62		$130,740 30	$34 50	$18,356 77	$19,999 81	$31,894 70	$5,134 50	$29,003 84	$43,041 08	$332,094 58	$16,085 33				$249,252 13	$990,127 16	$4,784 62		$4,784 62	$994,911 78
	1873			$24 99			$19,421 90					$18 00	Chestnut Hill.			$964 57		$641,926 64	$662,356 10				$662,356 10
	1873	$86,633 12		4,167 27								15,688 44	$65,000 00						171,488 83				171,488 83
	1874	13,213 20		10 50			10,479 77					4,320 29		$71 50		1,834 55		435,201 83	465,131 64				465,131 64
	1875	11,907 96		26 58												8,123 89		185 24	20,243 67				20,243 67
	1876													46,369 16	$19,152 00	75,473 20	$5,817 15		146,811 51				146,811 51
	1877													18,233 16		35,422 52	2,980 36		56,636 04				56,636 04
Wm. H. McFadden	1878			Addition to engine house, Spring Garden.										706 27		13,599 98			14,306 25	Spring Garden.			14,306 25
	1879																					
	1880			$178 20															178 20	$739 26		$739 26	917 46
	1881																					
	1882			11,806 83															11,806 83	4,467 00	$3,592 56	8,059 56	19,866 39
	1882																			4th District fence.	973 96	973 96	973 96
	1882																			Ch'tn't Hill Spring.	125 09	125 09	125 09
Total for 10 years		$111,754 28		$16,214 37			$29,901 67					$20,026 73	$65,000 00	$65,380 09	$19,152 00	$135,418 71	$8,797 51	$1,077,313 71	$1,548,959 07	$5,206 26	$4,691 61	$9,897 87	$1,558,856 94
Total for 18 years		$230,571 19	$67,079 35	$160,734 01	$14,970 25	$29,998 26	$19,999 81	$82,963 28	$19,038 18	$34,104 94	$43,041 08	$339,868 13	$129,537 88					$249 252 13	$1,421,158 49	$4,784 62		$4,784 62	$1,425,943 11
Total for 28 years		$342,325 47	$67,079 35	$176,948 38	$14,970 25	$29,998 26	$49,901 48	$82,963 28	$19,038 18	$34,104 94	$43,041 08	$359,894 86	$194,537 88	$65,380 09	$19,152 00	$135,418 71	$8,797 51	$1,326,565 84	$2,970,117 56	$9,990 88	$4,691 61	$14,682 49	$2,984,800 05

CONSTRUCTION—NEW WORK—PAID FROM TAXATION.

		Machinery.						Buildings, Grounds and Reservoirs.								
				Boilers.												
Chief Engineers.	Year.	Twenty-fourth Ward Works.	New engines, Sp'g Garden.	Sp'g Garden.	Belmont.	Turbines.	Testing Machinery.	Alterations to wheel-house, Fairmount.	New engine and boiler-houses, Sp'g Garden and Roxborough.	Surveys for water-supply from beyond the City and for Frankford.	Total paid from taxation for extension.	Machinery.	Buildings, grounds, and reservoirs.	Purchase of works and Mt. Airy reservoir.	Incidentals.	Total construction paid from loans for extensions.	Total construction paid from taxation and loans for extensions.
Frederick Graff	1855	$42,087 26	$31,308 64								$73,395 90						$73,395 90
Samuel Ogden	1856	$16,000 00									$16,000 00						$16,000 00
	1857																
	Total...	$16,000 00									$16,000 00						$16,000 00
Henry P. M. Birkinbine	1858			$4,182 04			$473 08				$4,655 12	$2,059 14	$58,492 16			$60,551 30	$65,206 42
	1859						26 25				26 25	422 41	53,714 10			54,136 51	54,162 76
	1860											43,782 78	18,957 93			62,740 71	62,740 71
	1861																
	Total...			$4,182 04			$499 33				$4,681 37	$46,264 33	$131,164 19			$177,428 52	$182,109 89
Isaac S. Cassin	1862											$21,802 73	$10,765 81			$32,568 54	$32,568 54
	1863												2,989 28			2,989 28	2,989 28
	Total...											$21,802 73	$13,755 09			$35,557 82	$35,557 82
Henry P. M. Birkinbine	1864									$821 49	$821 49		$15,393 72			$15,393 72	$16,215 21
	1865									1,953 61	1,953 61	$41 25	55,761 46		$25 35	55,828 06	57,781 67
	1866									143 28	143 28	21,071 62	101,504 32	$113,452 55	1,383 43	237,411 92	237,555 20
	Total...									$2,918 38	$2,918 38	$21,112 87	$172,659 50	$113,452 55	$1,408 78	$308,633 70	$311,552 08
Frederick Graff	1867					$13,091 02		$18,168 92	$4,784 62	$180 53	$36,225 09	$66,249 12	$71,110 68		$223 71	$137,583 51	$173,808 60
	1868					32,702 87		53,731 62			86,434 49	55,542 25	107,934 28	$16,085 33	1,964 63	181,526 49	267,960 98
	1869					7,206 11		23 00		38 50	7,267 61	212,374 69	138,204 49		1,099 83	351,679 01	358,946 62
	1870			$24,957 35							24,957 35	167,463 71	155,179 68		4,034 73	326,678 12	351,635 47
	1871							36 63		34 75	71 38	223,644 31	92,711 92		474 43	316,803 66	316,875 04
	1872						$2,962 59	35 50		207 35	3,205 44	94,538 97	445,788 17		3,620,62	543,947 76	547,153 20
	Total...			$24,957 35		$53,000 00	$2,962 59	$71,995 67	$4,784 62	$461 13	$158,161 36	$819,813 05	$1,010,929 22	$16,085 33	$11,390 95	$1,858,218 55	$2,016,379 91
Wm. H. McFadden	1873							County Line Spring, Chest. Hill, $125 09		$235 95	$235 95	$47,664 68	$768,844 93	$65,000 00	$3,972 76	$885,482 37	$885,718 32
	1874							New engine-house, Sp'g Garden. $4,467 00		73 62	73 62	20,164 90	466,726 40		5,097 66	491,988 96	492,062 58
	1875											7,341 43	20,243 67		3,103 39	30,688 49	30,688 49
	1876						Roxborough, $9,224 35	Remodeling school-house, Mt. Airy, $3,592 56				98,957 38	140,994 36		1,789 52	241,741 26	241,741 26
	1877											47,961 32	53,655 68		483 65	102,100 65	102,100 65
	1878						Mt. Airy, $9,360 85					10,065 67	14,306 25		3,159 58	27,531 50	27,531 50
	1879							Fourth District fence, $739 26	$739 26		739 26	745 15	178 20		247 00	1,170 35	1,909 61
	1880						Sp'g Garden, $2,075 87	$973 96			85,884 55	9,154 37			3 00	9,157 37	95,041 92
	1881		$28,000 00	$33,876 61	$24,007 94		$20,061 07	9,158 61			29,819 68	18,738 59	11,806 83			30,545 42	60,365 10
	1882																
	Total...		$28,000 00	$33,876 61	$24,007 94		$20,661 07	$9,158 61	$739 26	$309 57	$116,753 06	$260,793 49	$1,476,756 32	$65,000 00	$17,856 56	$1,820,406 37	$1,937,159 43

NEW WORK--CONSTRUCTING EXTENSIONS--PAID FROM TAXATION AND LOANS.

Chief Engineer	Year.	FROM TAXATION. Kind of extensions and where made.	FROM TAXATION. Total from taxation.	FROM LOANS. Machinery.	FROM LOANS. Buildings, grounds, and reservoirs.	FROM LOANS. Purchase of works.	FROM LOANS. Incidentals.	FROM LOANS. Total from loans.	Total from loans and taxation.
Frederick Graff	1855	Twenty-fourth Ward Works and new engine at Spring Garden	$73,395 90						$73,395 90
Samuel Ogden	1856	Twenty-fourth Ward Works	$16,000 00						$16,000 00
	1857								
	Total		$16,000 00						$16,000 00
Henry P. M. Birkinbine	1858								
	1859	Spring Garden boilers and testing machinery	$4,655 12	$2,059 14	$58,492 16			$60,551 30	$65,206 42
	1860	Testing machinery	26 25	422 41	53,714 10			54,136 51	54,162 76
	1861			43,782 78	18,957 93			62,740 71	62,740 71
	Total		$4,681 37	$46,264 32	$131,164 19			$177,428 52	$182,109 89
Isaac S. Cassin	1862			$21,802 73	$10,765 81			$32,568 54	$32,568 54
	1863				2,989 28			2,989 28	2,989 28
	Total			$21,802 73	$13,755 09			$35,557 82	$35,557 82
Henry P. M. Birkinbine	1864	Surveys for water supply beyond the City	$821 49		$15,393 72	Germantown.		$15,393 72	$16,215 21
	1865	Surveys for water supply beyond the City	1,953 61	$41 25	55,761 46		$25 35	55,828 06	57,781 67
	1866	Surveys for water supply beyond the City	143 28	21,041 62	101,504 32	$113,452 55	$1,383 43	236,211 92	236,355 20
	Total		$2,918 38	$21,112 87	$172,659 50	$113,452 55	$1,408 78	$307,433 70	$310,352 08
Frederick Graff						Mt. Airy basin.			
	1867	Turbines, alteration wheel-house, Fairmount; engine and boiler house, Spring Garden, and surveys	$36,225 09	$66,249 12	$71,110 68		$223 71	$137,583 51	$173,808 60
	1868		86,434 49	55,542 25	107,934 28	$16,085 33	1,964 63	181,526 49	267,960 98
	1869		7,267 61	212,374 69	138,204 49		1,099 83	351,679 01	358,946 62
	1870	Boilers, Spring Garden	24,957 35	167,463 71	155,179 68		4,034 73	326,678 12	351,635 47
	1871	Alterations wheel-house, Fairmount, etc	71 38	223,644 31	92,711 92		447 43	316,803 66	316,875 04
	1872	Alterations wheel-house, Fairmount, and testing machinery	3,205 44	94,538 97	445,788 17		3,620 62	543,947 76	547,153 20
	Total		$158,161 36	$819,813 05	$1,010,929 22	$16,085 33	$11,390 95	$1,858,218 55	$2,016,379 91
William H. McFadden						Chestnut Hill.			
	1873	Surveys for Frankford Works	$235 95	$47,664 68	$768,844 93	$65,000 00	$3,972 76	$885,482 37	$885,718 32
	1874	Surveys for Frankford Works	73 62	20,164 90	466,726 40		5,097 66	491,988 96	492,062 58
	1875			7,341 43	20,243 67		3,103 39	30,688 49	30,688 49
	1876			98,957 38	140,994 36		1,789 52	241,741 26	241,741 26
	1877			47,961 32	53,655 68		483 65	102,100 65	102,100 65
	1878			10,065 67	14,306 25		3,159 58	27,531 50	27,531 50
	1879								
	1880	Surveys for Frankford Works	739 26	745 15	178 20		247 00	1,170 35	1,909 61
	1881	Engines and boilers, Spring Garden and Belmont	85,884 55	9,154 37			3 00	9,157 37	95,041 92
	1882	County Line spring, engine house; engine and boilers, Mt. Airy; boilers, Roxborough; Spring Garden standpipe, and Fourth District yard	44.965 33	8,738 59	11,806 83			30,545 42	75,510 75
	Total	For ten years	$131,898 71	$260,793 49	$1,476,756 32	$65,000 00	$17,856 56	$1,820,406 37	$1,952,305 08
	Total	For eighteen years previous	$255,157 01	$908,992 98	$1,328,508 00	$129,537 88	$12,799 73	$2,378,638 59	$2,633,795 60
	Total	For twenty-eight years since Consolidation	$387,055 72	$1,169,786 47	$2,805,264 32	$194,537 88	$30,656 29	$4,199,044 96	$4,585,100 68