ONE HUNDRED AND EIGHTH ANNUAL REPORT

OF THE

BUREAU OF WATER

FOR THE

YEAR ENDING DECEMBER 31, 1909

AND

ANNUAL REPORT

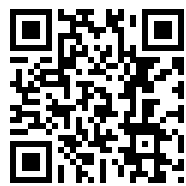
OF

GEORGE R. STEARNS

Director of the Department of Public Works

ISSUED BY THE CITY OF PHILADELPHIA, 1910

PHILADELPHIA
DUNLAP PRINTING CO., 1315-37 CHERRY STREET
1910



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1910

ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC WORKS

FOR THE

YEAR ENDING DECEMBER 31, 1909

OFFICERS

OF THE

DEPARTMENT OF PUBLIC WORKS

DECEMBER 31, 1909

Director
GEORGE R. STEARNS.

Assistant Director,
WILLIAM R. KNIGHT, JR.

Chief Clerk—Willis Sheble.
Clerk—Ernest T. Hanefeld.
Assistant Clerk—Andrew L. Teamer.
Stenographer and Clerk—Harry A. Stoy.
Stenographer and Typewriter—Joseph B. Smarr.
Special Inspector—Elvin S. Rodgers.
General Inspector—Robert C. Hicks.
Official Photographer—Lewis R. Snow.
Assistant Official Photographer—William Shane.
Chauffeur—Edward P. Van Deusen.
Chauffeur—Thomas McKeever.
Office Boy—Archibald Frederick.
Messenger—J. Jarriatte Johnston.

CHIEFS OF BUREAUS.

Gas—Dr. N. Wiley Thomas.
Highways—Street Cleaning—William R. Benson.
Lighting—John J. Kirk.
Surveys—George S. Webster.
Water—Filtration—Fred. C. Dunlap.

Summary of Appropriations, Expenditures, Receipts, etc., of the Department of Public Works During the year 1909, and Totals for the Years 1907 and 1908.

Bureaus.	Balance from previous years.	Annual appropriation for the year 1909.	Additional appropriations and transfers.	Transfers from	Net amount available 1909.	Number of warrants drawn.	Amount of Warrants Drawn.				Balance available for 1910.	Amount merging.	Receipts.	Number of employees Dec. 31, 1909.
							Salaries and wages.	Maintenance.	Improvements.	Total.				
Director's Office		$34,630 00	$3,215 00		$37,895 00	280	$31,295 00	$6,540 72		$37,835 72		$59 28		15
Gas		10,000 00			10,000 00	102	9,500 00	500 00		10,000 00			$46 00	6
Highways—Street Cleaning	$3,403,601 70	2,485,184 00	1,364,009 22	$1,009,958 76	6,242,836 16	4,873	264,850 48	2,920,242 98	$1,034,596 32	4,219,689 78	$1,999,765 45	23,380 93	63,750 84	217
Board of Highway Supervisors	*												8,350 25	12
Lighting		430,765 00	61,430 00		492,195 00	197	8,100 00	483,750 89		491,850 89		344 11		7
Surveys	4,853,273 82	302,820 00	2,467,365 12	11,410 02	7,612,048 92	3,889	290,274 41	38,593 98	2,359,397 36	2,688,265 75	4,916,912 52	6,870 65	44,137 42	348
District Surveyors	†												146,862 21	14
Water—Filtration	1,443,956 40	950,651 00	2,127,553 28	13,570 00	4,508,590 68	4,177	1,452,741 73	151,598 54	1,222,859 36	2,827,199 90	1,654,340 01	27,050 77	4,440,574 19	2,100
Total, 1909	$9,700,831 92	$4,214,100 00	$6,023,572 62	$1,034,938 78	$18,903,565 76	13,518	$2,056,761 62	$3,601,227 11	$4,616,853 31	$10,274,842 04	$8,571,017 98	$57,705 74	$4,703,720 91	2,719
Total, 1908	$7,734,517 64	$4,446,763 25	$10,617,553 16	$239,728 09	$22,559,105 96	14,213	$2,061,133 57	$3,242,924 82	$7,538,325 06	$12,842,383 45	$9,700,831 92	$15,890 59	$4,509,158 00	2,657
Total, 1907	$8,511,764 80	$3,710,608 30	$8,499,119 69	$3,266,889 94	$17,454,602 85	14,835	$1,999,567 00	$2,657,376 55	$5,156,149 94	$9,813,093 49	$7,552,017 64	$69,141 84	$4,403,929 86	2,754

* Included in the appropriation and in the expenditures of Bureau of Highways.

† Included in the appropriation and in the expenditures of Bureau of Surveys.

NOTE.—The above statement does not include expenditures made by Department of Supplies for material and supplies for Department of Public Works.

TWENTY-THIRD ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC WORKS

GEORGE R. STEARNS, Director

Philadelphia, January 3, 1910.

HON. JOHN E. REYBURN,
Mayor of Philadelphia.

DEAR SIR:—I have the honor to submit herewith the report of the operations of the Department of Public Works for the year ending December 31, 1909—the Twenty-third Annual Report.

The exhaustive reports of the Chiefs of the several Bureaus comprising this Department, which are attached hereto, will give you all the details of operations, etc.

Appropriations.

The net amount of money available during the year was $18,903,565.76, of which $11,303,202.29 was derived from loans and $7,600,363.47 from direct taxation.

Expenditures.

The expenditures during the year aggregated $10,274,842.04, of which $5,657,988.73 was for maintenance and current expenses and $4,616,853.31 for extensions and improvements.

Receipts.

The total receipts were $4,703,720.91, an increase over 1908 of $194,562.91, this increase being due to the efficient methods recently established in the Bureau of Water in the work of inspecting and collecting.

Bureau of Gas.

The report of the Chief Inspector of Meters shows the close supervision that is exercised over the inspection of meters and the tests of the quality of gas furnished to the citizens of this City.

Complaints. The complaints against the service rendered by The United Gas Improvement Company (lessees of the Philadelphia Gas Works) have been reduced to an infinitesimal number.

Photometrical Tests. Daily photometrical tests continue to be made of the gas furnished at the Gas Testing Stations, with the following results:

Month.	Candle Power.
January	22.53
February	22.51
March	22.57
April	22.60
May	22.71
June	22.59
July	22.57
August	22.58
September	22.59
October	22.61
November	22.61
December	22.78
Maximum monthly average	22.78
Minimum monthly average	22.51

Chemical Tests. The chemical tests for impurities resulted as follows:

Carbon dioxide	2.50%
Illuminants	10.20
Oxygen	.90
Carbon Monoxide	25.60
Methane	23.10
Hydrogen	34.90
Nitrogen	2.80
	100.00%

Bureau of Lighting.

Appropriations.

The total appropriation to this Bureau during 1909 was $492,195.00, of which amount $491,850.89 was expended and the balance, $344.11, merged into the City Treasury.

Lamps Maintained

The following table shows the total number of lamps maintained and under supervision of the Bureau during 1909; also, statement of expenditures:

	1907.		1908.		1909.	
	Number of lamps.	Cost during the year.	Number of lamps.	Cost during the year.	Number of lamps.	Cost during the year.
Gas lamps maintained by the United Gas Improvement Company	22,313		22,913		22,940	
Gasoline lamps	11,432	$380,053 25	16,017	$120,806 81	16,017	$180,029 36
Gas lamps supplied by the Northern Liberties Gas Company	73	1,474 56	73	1,474 56	72	1,454 40
Gas lamps maintained by the Bureau of Correction	231		231		231	
Salaries and office expenses		10,267 38		10,399 04		10,367 13
Total	37,079	$391,795 19	39,234	$132,680 41	39,260	$191,850 89

	1907.	1908.	1909.
Of the gas lamps maintained by the United Gas Improvement Company there were not lighted, because of their proximity to electric lights	121	121	121
Of the gas lamps maintained by the Department of Charities and Correction there were not lighted, because of their proximity to electric lights	108	108	108
	229	229	229

Insufficient Gas Lamps.

As noted in previous reports, it is a matter of embarrassment to the Department to provide an equitable distribution of the 300 gas lamps which the United Gas Improvement Company is required to erect annually. The allotment of 300 lamps is ridiculously small in comparison with the demands made upon the Department, as a large number of improved streets in various sections of the City have been totally without light along the lines of gas mains. This matter becomes more serious each year and Councils should provide some means of relief.

Gasoline Lamps

On November 19, 1909, bids were opened for furnishing and lighting naphtha lamps of 60 candle power for the year 1910, and the contract has again been awarded to the Welsbach Street Lighting Company of America at $29 per lamp per year (the same price as paid during 1909); for posts the price this year will be $7.50, a reduction of $2.00 per post.

Bureau of Surveys.

Expenditures.

The expenditures during the year of this Bureau were $2,688,265.75, of which $328,868.39 was for current expenses and $2,359,397.36 for extensions and improvements.

Receipts.

The total receipts were $190,999.63, an increase over 1908 of $3,623.71.

Main Sewers.

The net amount available for the construction of main sewers was $627,500.00, which enabled the Department to proceed with a large amount of work planned for in previous years. In connection with this work, the Department is confronted with a serious problem, as the Act of Assembly requiring the City to purify its sewage before discharging into the waters of the State has placed upon the municipality the necessity for the construction of sewers in addition to those which are required to keep pace with the growth of the City. The construction of main sewers

for which there is immediate and pressing demand will cost over $8,000,000.00.

Branch Sewers and Inlets

There were constructed during the year, 24.628 miles of branch sewers at a cost of $581,548.81. This expenditure included the construction of inlets, curved curbing, laterals, manholes and reconstruction of inlets, etc.

Mileage of Sewers.

The total length of sewers constructed during 1909 was 38.049 miles, divided as follows:

Main sewers	5.024 miles
Branch sewers	24.628
Private sewers	7.424
Grade crossing sewers	.524
Boulevard sewers	.284
Levick street improvements	.165
	38.049 miles

The total length of all sewers built to December 31, 1909, is as follows:

Main sewers	182.643 miles
Branch sewers	854.610
Private sewers	129.435
Miscellaneous sewers	18.387
	1185.075 miles

Sewer Inspection.

The rigid system of previous years in the inspection of sewers has been adhered to and it is safe to say that the City receives value for every dollar expended for this class of work.

I can but repeat my recommendations of former years that the greatest liberality should be shown in making appropriations for this class of improvement. It is self-evident that the development of new territory is dependent upon proper drainage facilities, and it is incumbent upon the Department to assist operative builders in new operations, which ultimately return a handsome revenue to the City.

Drainage South Philadelphia.

The subject of drainage of South Philadelphia still continues to occupy the attention of the Department, and every effort is being made to bring about a more perfect system of sanitation in this important section of the City, so far as the appropriations will permit. As noted in the report for 1908, the essential link in connection with this work in the construction of the Shunk street sewer, and that portion of the sewer between Front and Fifth streets is now in progress.

Intercepting Sewer System.

While much work has been accomplished on the intercepting sewer systems, it is to be regretted that the appropriations made by Councils limit the work to such a restricted area, as with the great percentage of increase in population in urban centres during recent years, conditions have so changed as to make it necessary to conserve and protect the inter-city streams from pollution, two streams especially, Frankford creek and Cobb's creek, already being in such a state as to demand immediate attention.

Sewage Disposal.

Considerable progress has been made by the Bureau of Surveys in its study for a feasible plan to carry into effect the Act of Assembly which requires the City of Philadelphia to prepare and submit to the State Department of Health by January 1, 1912, a comprehensive method for the collection, purification and disposal of the sewage for the entire City.

It has been obligatory upon this City to take up the problem and formulate a plan not only because it is the first City of the Commonwealth, but because by the authority vested in the State Department of Health, a definite obligation so to do has been imposed upon the executives of the City.

Testing Station

In view of the importance of the above subject, the officials charged with the study and preparation of the plans deemed it advisable to continue the tests at the experi-

mental testing station, where the various methods of sewage treatment could be applied to local conditions and a plan adopted that would be most economical, efficient and satisfactory in meeting the requirements before the expenditure of any large sums on construction.

The work at this station has drawn the attention of many scientists from both at home and abroad, who are closely watching the results obtained with a view to applying the principles to other towns and cities.

Bridge Division.

The Bridge Division has given the same high grade of skill and attention to its work that has lately given beauty and character, as well as strength and stability, to the bridges that are being erected. Notable among those completed during the past year is the bridge on the line of the Northeast Boulevard over the Tacony creek, a structure of three arches, each of 80 feet span, executed in concrete, which demonstrates the possibilities of the execution of monumental structures of this kind, while keeping well within the lines of economy. The bridge at Forty-second street on the line of the Pennsylvania Railroad shows an unusual type of combined steel and concrete arch, which accomplishes the work of carrying the roadway in a clear span across the tracks of the railroad with a minimum of outlay and yet maintaining both strength and grace in the outline of the structure.

Bridges.

There was available during the year for the construction of bridges, $724,448.81. On January 1, 1909, there were twenty-one bridges under contract and during the year, fourteen bridges were completed. Three bridges, also, could not be thrown open to the public because of the unfinished character of the approaches, and one bridge, that at Forty-second street, over the Pennsylvania Railroad, has a small amount of work to be done, although travel is now passing over same. Work on the other three bridges is progressing satisfactorily. The report of the Chief En-

gineer gives interesting figures in connection with the construction of these bridges and their usefulness in aiding development of hitherto inaccessible sections of the City.

Passyunk Avenue Bridge.

Since my last report, contract has been let for the superstructure of the Passyunk avenue bridge over the Schuylkill river, which work will include the grading of the east approaches to the bridge on Passyunk avenue, from Schuylkill avenue, and on River road, both north and south on Passyunk avenue. It is expected that this work will be completed in July, 1910, but the grading of Passyunk avenue on the west side of the river, which is necessary for the public use of the bridge, has not yet been commenced, and as this work will take considerable time, Councils should make early provision for the same.

Parks.

The past year has witnessed continued activity in the extension of the general park system, 318.426 acres having been added during the year and 828.782 acres additional have been placed on the City plan for future taking.

Grade Crossings.

The Grade Crossing Division of the Bureau of Surveys, working in conjunction with the officials of the railroad companies, deserves special commendation for the vast amount of work which has been accomplished during the past year; and I would call your attention to the interesting report of the Chief Engineer of the Bureau, giving exhaustive details of the work performed.

Parkway.

The revised plan for the Parkway was confirmed by the Board of Surveyors on September 20, 1909, and provides for a central driveway of the uniform width of 80 feet from the City Hall Plaza to a plaza 400 feet by 600 feet at the foot of the old Fairmount Reservoir. The revised location is a return to the plan suggested by the Parkway Association in 1902, which contemplated a straight line and an unbroken vista from the City Hall to the Art Museum, which would seem necessary if the avenue is to possess the stateliness and dignity originally contemplated.

Future City Improvements

In compliance with recommendations of the present City administration, considerable progress has been made with preliminary studies for a comprehensive plan for future City improvements.

Testing Laboratory.

The high grade of materials entering into construction work under the supervision of this Department is a tribute to the efficiency of the methods in vogue in the testing laboratory of the Bureau of Surveys. The reliability and accuracy of the tests made in the laboratory have given it an enviable reputation in the engineering profession. The laboratory is conducted at a very low cost, less than one per cent. of the material used, which is about one third of the cost that would be incurred were the materials tested in commercial laboratories.

Widening Delaware Avenue.

Plans for continuation of the grading, paving and drainage, in connection with the widening of Delaware avenue, are under way and awaiting the agreement as to the final location of the steam railroad tracks in the bed of the avenue, and the construction of the new bulkhead.

Board of Surveyors.

Twenty-two stated meetings and six special meetings were held by the Board of Surveyors during the year, for the transaction of general business and for visiting sections where changes of City plans are contemplated.

The following is a summary of the receipts and expenditures of the District Surveyors during the year 1909:

Summary of Receipts and Expenses of District Surveyors for the Year 1909, and Totals for the Years 1907 and 1908.

Districts.	Surveyors.	Cash receipts.	Credit for work done for the City.	Total credit.	Expenses.				Balance profit to the City.	Profit to the City in 1908.	Increase.	Decrease.
					Salaries.	Pay of Assistants.	Miscellaneous.	Total.				
1	John M. Nobre	$9,195 08	$13,208 62	$22,403 70	$4,000 00	$8,634 54	$1,319 39	$13,953 93	$8,449 77	$5,701 14	$2,748 63	
2	R. A. McFadden	7,279 16	6,821 94	14,101 10	4,000 00	6,866 19	1,201 59	12,067 78	2,033 32	6,217 01		$4,183 69
3	W. C. Cranmer	11,248 51	19,024 19	30,272 70	4,000 00	9,756 13	1,192 37	14,948 50	15,324 20	5,642 86	9,681 34	
4	F. Bloch	4,891 64	8,599 98	13,491 62	4,000 00	6,373 87	1,146 17	11,520 04	1,971 58	3,894 10		1,922 52
5	Walter Brinton	21,466 38	12,349 00	33,815 38	4,000 00	11,800 00	1,819 82	17,619 82	16,195 56	11,848 69	4,346 87	
6	Joseph Mercer	10,788 01	10,969 57	21,757 58	4,000 00	11,563 55	1,843 71	17,407 26	4,350 32	21,361 70		17,011 38
7	W. K. Carlile	5,435 14	8,408 37	13,843 51	4,000 00	4,600 00	1,131 64	9,731 64	4,111 87	6,375 03		2,263 16
8	O. A. Sundstrom	3,433 51	15,294 97	18,728 48	4,000 00	12,300 00	1,847 23	18,147 23	581 25	1,935 65		1,354 40
9	Joseph C. Wagner	15,873 09	10,408 84	26,281 93	4,000 00	11,036 00	2,660 90	17,696 90	8,585 83	8,912 22		327 19
10	John H. Webster, Jr.	11,398 00	17,408 81	28,806 81	4,000 00	11,486 33	1,308 27	16,794 60	12,012 21	8,416 36	3,595 85	
11	Joseph Johnson	11,768 92	9,862 45	21,631 37	4,000 00	10,070 32	1,855 55	15,925 87	5,705 50	6,530 11		824 61
12	J. H. Gillingham	14,979 33	21,318 05	36,297 38	4,000 00	15,569 35	1,667 82	21,237 17	15,060 21	17,226 49		2,166 28
13	H. M. Fuller	17,182 90	14,890 74	32,073 64	4,000 00	10,579 02	1,889 35	16,468 37	15,605 27	10,332 98	5,272 29	
14	O. B. Webster	1,922 54	17,854 91	19,777 45	4,000 00	9,083 33	1,668 90	14,752 23	5,025 22	5,249 17		223 95
	Total, 1909	$146,862 21	$186,420 41	$333,282 65	$56,000 00	$139,718 63	$22,552 71	$218,271 34	$115,011 31	$119,643 51	$25,644 98	$30,277 18
	Total, 1908	$151,159 36	$181,938 71	$333,098 07	$56,000 00	$133,636 86	$23,817 70	$213,454 56	$119,643 51	$105,616 16	$21,683 91	$7,656 56
	Total, 1907	$129,570 08	$170,416 14	$299,986 22	$49,000 00	$123,539 90	$21,830 16	$194,370 06	$105,615 16	$98,397 37	$25,539 36	$18,320 57

Statement of Work upon Bridges.

	1907.	1908.	1909.
Finished	9	6	14
Begun	7	16	9
Authorized	5	1	8
Planned	10	15	11

Statement of Receipts.

Years.	Receipts of Bureau.	Receipts of District Surveyors.	Total.
1907	$38,839 99	$129,570 08	$168,410 07
1908	36,216 56	151,159 36	187,375 92
1909	44,137 42	146,862 21	190,999 63

Statement of Expenditures.

	1907.	1908.	1909.
Current expenses	$280,926 62	$335,566 64	$328,868 39
For extensions	1,807,557 64	2,549,109 81	2,359,397 36
Total	$2,088,484 26	$2,884,676 45	$2,688,265 75

Registry Division.

	1907.	1908.	1909.
Number of certificates of registered owners issued	5,010	4,502	4,935
Number issued for use of Law Department	463	299	418
Receipts from certificates of registered owners	$1,251 25	$1,130 50	$1,231 75
Receipts from miscellaneous sources	$273 10	$252 50	$260 00
Number of original lots plotted	11,520	9,760	11,799
Number of transfers registered	47,559	37,911	39,709
Number of plans made for use of City Departments, Bureaus, etc	702	936	610
Number of examinations of registry plan books made by the public	71,056	72,426	72,692
Number of descriptions of property filed for registry	70,316	47,671	51,563
Number of titles perfected	2,715	2,196	2,210
Number of certificates of legal opening of streets issued to Bureaus, etc	2,778	2,655	2,474
Number of certificates of registered owners in municipal lien cases for Law Department	686	860	865
Number of certificates of registered owners in municipal lien cases for Receiver of Taxes	343	665	317

Statement of Main, Branch and Private Sewers Built during the years 1907, 1908 and 1909.

	1907.		1908.		1909.	
	No.	Linear feet.	No.	Linear feet.	No.	Linear feet.
Intercepting sewer extensions	5	3,460	11	7,981	12	14,105
Main sewers	19	11,119	25	21,714	15	12,423
Branch sewers	147	112,463	185	116,790	192	130,036
Private sewers	75	46,445	50	29,724	49	39,201
Boulevard sewers					1	1,501
Market street subway sewers	2	8,162	2	2,127		
Levick street improvement					1	871
Grade crossing sewers	7	1,578	7	8,744	3	2,765
Totals	255	*183,227	289	†187,080	273	‡200,902

* Equal to 34.701 miles. † Equal to 35.432 miles. ‡ Equal to 38.049 miles.

Bureau of Water.

Expenditures. There was expended by the Bureau of Water during 1909 the sum of $2,827,199.63, of which $1.604,340.27 was for current expenses and $1,222,859.36 for improvements and extensions.

Receipts. The receipts of the Bureau were $4,440,574.19, an increase over 1908 of $207,528.70. This gratifying increase is due almost entirely to the modern buisness methods adopted by the Bureau in its system of collecting water rents, etc. The receipts of the Bureau of Water equal 21.6 per cent. of the collections for City taxes and nearly 16 per cent. of the total revenue of the City.

Water Consumption. The consumption of water during 1909 was 111,696,176,909 gallons, a decrease as compared with 1908 of 6,171,922,931 gallons. The average daily consumption was 306,016,923 gallons, and a per capita consumption of 197.2 gallons per day, a decrease of 13.04 gallons per capita per diem.

Filtered Water Supply. On May 1, 1909, we were able, for the first time, to furnish all sections of the City with filtered water. As the weather grew warmer, with the increased demand for water, it was impossible to maintain sufficient pressure on the mains from Lardner's Point Station to supply the high levels of the Queen Lane District, and much though we regretted it, it became necessary on June 4, 1909, to supply these high levels with raw water by resuming operations at the Queen Lane Pumping Station.

Queen Lane Filters. In order to provide filtered water for the Queen Lane District above mentioned, the Department, on March 31, 1909, opened bids for a filter plant of a capacity of 70,000,000 gallons daily, located in the north section of the Queen Lane District. The contract was awarded to the Millard Construction Company, and up to December 31, 1909, there has been placed under contract for this

work $1,160,000.00. To complete this contract, it is estimated that it will require $740,000.00, of which amount there is now available $215,000.00. Councils have already been requested to provide funds to complete this great undertaking.

When these filters are placed in operation, we will be able to supply not only the high levels of the old Queen Lane District, but furnish a small surplus to meet emergency demands in other localities.

In connection with the above work, bids were opened by the Department on November 4, 1909, for the necessary machinery to operate the plant and contract awarded to M. L. Bayard & Company, for the sum of $82,000.00.

Typhoid Reduction.

One of the main factors that was considered at the time the filtration of the water supply for this City was agitated was the periodical outbreaks of virulent typhoid fever. In 1906 there were 9,725 cases of this dreaded disease recorded; in 1907 there were 6,712 cases; in 1908 there were 3,652 cases, and in 1909 but 2,406 cases were noted, a reduction of 1,246 and 4,306 cases from 1908 and 1907 respectively, the reduction being 35 per cent. and 64 per cent.

The deaths from this cause during 1906, 1907, 1908 and 1909 were respectively 1,060, 890, 533 and 333. These figures show conclusively the benefits derived from filtered water so far as typhoid fever alone is concerned.

Pre-Filters, Torresdale.

The completion of the preliminary filters at Torresdale, which were placed in service on January 21, has added much to the efficiency of the plant. These pre-filters normally filter 80,000,000 gallons per acre per day but have given satisfactory results from rates of 100,000,000 gallons per acre per day.

Future Extensions.

In studying the capacity of our filter plants, due consideration should be given to the fact that ten years have elapsed since the inception of the plans for filtering the

City's water supply, and as there was urgent demand throughout the community to place this system in operation at the earliest date possible, the plans were necessarily limited to our immediate requirements. It must also be bore in mind that during this time the population of the City has increased 300,000, a growth that is making it a serious task to maintain a proper supply for the entire City, and it is incumbent upon the authorities to either provide funds for the extension of our present system or adopt some method which will check the excessive waste of water.

Coal Consumption. Owing to the fact that the bituminous coal was purchased on a heat unit basis, it is a pleasure to note that the consumption of coal at the several stations only aggregated 214,956 tons during 1909 against 231,775 tons consumed during 1908, a decrease of 16,819 tons, or 7.25 per cent.

Pumping Machinery and Boilers. Under the intelligent direction of the Chief of the Bureau of Water and an experinced corps of assistants, the pumping machinery and boilers at the various stations have been brought to a decree of efficiency surpassing that of any previous administration.

Distribution. The total length of new pipe laid during the past year was 137,179 feet, equal to 25.34 miles, making the mileage now in use 1,612.15. Of the pipe laid during 1909, 14.43 miles were laid by private contract on account of the Bureau having no funds to purchase the pipe.

During the year 393 additional fire hydrants were put in service, making the total number now in use 15,561. There are 1,759 meters now in use, and the total number of dwellings furnished with water is 302,922, an increase over 1908 of 10,357.

General. Much valuable information can be obtained from a study of the report submitted by the Chief of the Bureau of Water, and to which I would call your especial attention.

Statement of Pumpage for the Years 1907, 1908 and 1909.

	1907. Gallons.	1908. Gallons.	1909. Gallons.
Pumped to reservoirs	116,882,212,622	160,264,695,178	194,503,704,802
Equal to gallons pumped 100 feet high	242,285,589,708	278,534,592,507	313,903,826,387

NOTE.—"The pumped to reservoirs" includes 83,373,937,290 gallons' repumpage to higher levels at Belmont, Roxborough, Mt. Airy and Frankford high service stations, and also the low service pumpage to filter beds at the Roxborough and Torresdale filter plants, which, deducted from the total pumped, gives a total pumped from rivers of 111,129,767,510 gallons.

The quantity stored in reservoirs on December 31, 1909, was 566,409,399 gallons less than that stored on December 31, 1908. This quantity added to the total pumpage from the rivers makes the total consumption for 1909, 111,696,176,909 gallons. The cost of pumpage is based on the total pumpage. The consumption per capita is computed from the average consumption during 1909 of 306,016,923 gallons per day.

	1907. Gallons.	1908. Gallons.	1909. Gallons.
Pumped by water power	8,133,114,825	5,369,821,111	1,018,742,639
Pumped by steam power	108,749,097,797	154,894,874,067	193,454,962,163
Largest quantity pumped in 24 hours	368,585,438	508,764,869	625,958,908
Smallest quantity pumped in 24 hours	199,486,931	329,016,621	287,203,110

Year.	Average daily consumption. Gallons.	Average consumption in gallons per capita per day.* Gallons.	Cost of one million gallons pumped 100 feet high.
1907	302,436,641	201.7	$5.68
1908	322,043,989	210.2	5.58
1909	306,016,923	197.2	4.43

*1907. Estimating the population at 1,499,747.
*1908. Estimating the population at 1,531,752.
*1909. Estimating the population at 1,552,000.

The decreased cost of pumpage per million gallons raised 100 feet high is $1.15 less than that of the preceding year.

Statement of Receipts and Expenditures for the years 1907, 1908 and 1909.

	Receipts 1907.	Receipts 1908.	Receipts 1909.
Receipts from water rents	$3,710,187 53	$3,873,179 02	$4,049,443 80
Receipts from fractional rent	92,619 45	95,556 28	161,933 09
Receipts from water pipes	107,071 85	127,955 41	104,046 54
Receipts from City Solicitor's office	39,176 74	37,848 32	34,865 02
Receipts from penalties	30,160 39	31,999 93	36,015 25
Receipts from delinquent rent	28,721 55	36,036 92	37,876 96
Receipts, miscellaneous	3,917 72	19,628 81	8,296 40
Receipts from searches	3,996 00	2,573 75	2,523 50
Receipts from delinquent penalties	4,938 13	5,267 05	5,573 63
Total	$4,020,819 36	$4,233,045 49	$4,440,574 19

	Expenditures 1907.	Expenditures 1908.	Expenditures 1909.
Current expenses	$1,358,934 15	$1,555,855 81	$1,604,340 27
For extensions	938,672 29	2,605,235 59	1,222,859 63
Total	$2,297,606 44	$4,161,091 40	$2,827,199 90

Statement of the Number and Type of Engines and Their Several Aggregate Capacities, at the Various Stations.

Pumping Stations.	Designated number of engine or turbine.	Type of Engine.	Designed capacity in million gallons per day.	Total.
*Spring Garden — Old Station	5	Compound Rotary	20,000,000	
Old Station	6	Simpson Compound Rotary	10,000,000	
Old Station	7	Marine Compound Rotary	20,000,000	
Old Station	8	Worthington Duplex	10,000,000	
New Station	9	Worthington Duplex	15,000,000	
New Station	10	Worthington Duplex	15,000,000	
New Station	2	Holly	30,000,000	
New Station	3	Holly	30,000,000	150,000,000
Queen Lane	1	Southwark	20,000,000	
Queen Lane	2	Southwark	20,000,000	
Queen Lane	3	Southwark	20,000,000	
Queen Lane	4	Southwark	20,000,000	80,000,000
Belmont	1	Bethlehem Cross Compound	10,000,000	
Belmont	2	Bethlehem Cross Compound	10,000,000	
Belmont	4	Worthington Duplex	17,000,000	
Belmont	5	Holly Horizontal Compound	10,000,000	
Belmont	6	Holly Horizontal Compound	10,000,000	
Belmont	7	Holly Horizontal Compound	10,000,000	67,000,000

*Shut down February 18, and supply obtained from Lardner's Point.

Statement of the Number and Type of Engines and their several Aggregate Capacities—Continued.

Pumping Stations.	Designated number of engine or turbine.	Type of Engine.	Designed capacity in million gallons per day.	Total.
Belmont High Service	1	Allis Chalmers Co	6,000,000	
Belmont High Service	1	Worthington	5,000,000	11,000,000
Roxborough, Old House	1	Gaskill	10,000,000	
Roxborough, Old House	2	Worthington Duplex	5,000,000	
Roxborough, Old House	3	Worthington Duplex	6,500,000	
Roxborough, New House	4	Worthington Horizontal Compound	5,000,000	
Roxborough, New House	5	Worthington Horizontal Compound	5,000,000	
Roxborough, New House	6	Worthington Horizontal Compound	5,000,000	
Roxborough, New House	7	Worthington Horizontal Compound	5,000,000	
Roxborough, New House	8	Worthington Horizontal Compound	5,000,000	
Roxborough, New House	9	Worthington Horizontal Compound	5,000,000	51,500,000
Roxborough High Service	1	Worthington	5,000,000	
Roxborough High Service	2	Worthington	5,000,000	
Roxborough Low Service	3	Worthington Centrifugal	10,000,000	
Roxborough Low Service	4	Worthington Centrifugal	10,000,000	
Roxborough Low Service	5	Worthington Centrifugal	10,000,000	40,000,000
Mt. Airy	1	Davidson	1,000,000	
Mt. Airy	2	Davidson	1,000,000	
Mt. Airy	3	Knowles	1,000,000	3,000,000

Statement of the Number and Type of Engines and their several Aggregate Capacities—Continued.

Pumping Stations.	Designated number of engine or turbine.	Type of Engine.	Designed capacity in million gallons per day.	Total.
Chestnut Hill	1	Knowles	250,000	
Chestnut Hill	2	Worthington Duplex	500,000	750,000
Frankford	1	Marine Compound Rotary	10,000,000	
Frankford	2	Corliss Compound Rotary	10,000,000	
Frankford	3	Southwark Rotary	22,000,000	
Frankford	4	Southwark Foundry Quarter Crank Flywheel	15,000,000	
Frankford	5	Holly Vertical Triple Expansion	20,000,000	
Frankford	6	Holly Vertical Triple Expansion	20,000,000	
Frankford	7	Holly Vertical Triple Expansion	20,000,000	
Frankford	8	Holly Vertical Triple Expansion	20,000,000	
Frankford	9	Holly Vertical Triple Expansion	20,000,000	
Frankford	10	Holly Vertical Triple Expansion	20,000,000	
Frankford	11	Holly Vertical Triple Expansion	20,000,000	
Frankford	12	Holly Vertical Triple Expansion	20,000,000	
Frankford	13	Holly Vertical Triple Expansion	20,000,000	
Frankford	16	Holly Vertical Triple Expansion	20,000,000	257,000,000
Frankford High Service	1	Holly Horizontal Compound	3,000,000	
Frankford High Service	2	D'Auria Compound Duplex	4,000,000	7,000,000

Statement of the Number and Type of Engines and their several Aggregate Capacities—Continued.

Pumping Stations.	Designated number of engine or turbine.	Type of Engine.	Designed capacity in million gallons per day.	Total.
*Fairmount—New House	1	Turbine Wheels	2,000,000	
*Fairmount—New House	3	Turbine Wheels	5,330,000	
*Fairmount—New House	4	Turbine Wheels	5,330,000	
*Fairmount—New House	5	Turbine Wheels	5,330,000	
*Fairmount—Old House	7	Turbine Wheels	5,100,000	
*Fairmount—Old House	8	Turbine Wheels	5,100,000	
*Fairmount—Old House	9	Turbine Wheels	5,100,000	33,290,000
Torresdale	1	R. D. Wood Centrifugal	40,000,000	
Torresdale	2	R. D. Wood Centrifugal	40,000,000	
Torresdale	3	Allis Chalmers Co. Centrifugal	40,000,000	
Torresdale	4	R. D. Wood Centrifugal	40,000,000	
Torresdale	5	R. D. Wood Centrifugal	40,000,000	
Torresdale	6	R. D. Wood Centrifugal	40,000,000	
Torresdale	7	R. D. Wood Centrifugal	40,000,000	
Torresdale	8	Allis Chalmers Co. Centrifugal	40,000,000	320,000,000
Total				1,020,540,000

*Shut down February 18, and supply obtained from Lardner's Point.

Statement of the Location, Date of Completion, Elevation, and Capacity of the City's Reservoirs.

Name of Reservoir.	Location.	Date of completion.	Height above City datum.	Capacity in gallons.
Fairmount—Reservoir No. 1	East Fairmount Park	1815	91 feet	26,261,000
Fairmount—Reservoir No. 2		1821		
Fairmount—Reservoir No. 3		1827		
Fairmount—Reservoir No. 4, Section 1		1835		
Fairmount—Reservoir No. 4, Section 2		1836		
Fairmount—Reservoir No. 4, Section 3		1836		
Spring Garden	Twenty-sixth and Master streets	1844	120 "	12,970,000
Corinthian	Corinthian avenue and Poplar street	1852	120 "	37,311,000
East Park—Section 1	East Fairmount Park	1887	133 "	62,738,000
East Park—Section 2		1888		306,400,000
East Park—Section 3		1889		319,180,000
Queen Lane—South Basin	Thirty-third street and Queen Lane	1894	238 "	177,480,000
Frankford	Oxford turnpike and Comly street	1877	167 "	36,946,000
Belmont	West Fairmount Park	1870	212 "	40,000,000
Belmont	Belmont and City avenues	1903	279 "	72,000,000
Belmont Clear Water Basin	Monument avenue and Ford road	1903	239 "	16,500,000
Mount Airy	Allen's lane and Mower street, Germantown	1851	363 "	4,546,000
Roxborough	Ridge and Shawmont avenues	1866	366 "	12,838,000
Roxborough Clear Water Basin	Dearnley and Fowler streets	1903	325.75"	3,000,000
New Roxborough—North Basin	Port Royal avenue and Ann street	1893	411 "	71,591,000
New Roxborough—South Basin				75,438,000
New Roxborough Clear Water	Port Royal avenue and Hagy street	1903	410 "	8,000,000
Belmont Stand Pipe	West Fairmount Park	1895	364 "	106,000
Roxborough Stand Pipe	Port Royal avenue and Ann street	1895	491 "	106,000
Frankford Stand Pipe	Oxford turnpike and Comly street	1900	300 "	106,000
Oak Lane	Fifth and Medary avenue	1904	210 "	70,000,000
Torresdale Clear Water Basin	State road and Pennypack street	1905	7 "	50,000,000
Total				1,403,830,000

Statement Relating to Pipe Laying and Fire Hydrants Placed.

YEAR.	PIPE LAID.			*PIPE RELAID.	FIRE HYDRANTS PLACED IN POSITION.			SUBSTITUTED FOR DEFECTIVE HYDRANTS.			Fire Hydrants in Use.	New Water Attachments.
	Feet.	EQUAL TO—			New Style.	Old Style.	Total.	New Style.	Old Style.	Total.		
		Miles.	Feet.	Feet.								
1907	151,900	28	4,060	†5,910	308	.....	308	316	.....	316	14,852	9,167
1908	149,187	28	1,347	‡22,214	407	.....	407	493	.....	493	15,168	7,757
1909	135,392	25	3,392	‖11,170	448	.....	448	567	.....	567	15,561	8,139

Total pipe laid, 1,612.15 miles.

* Adds nothing to feet in ground.

† Pipe taken up exceeds quantity relaid 720 feet.

‡ Pipe taken up exceeds quantity relaid 1,648 feet.

‖ Pipe taken up exceeds quantity relaid 1,787 feet.

Bureau of Highways—Street Cleaning.

Expenditures and Receipts.

The expenditures of the Bureau of Highways during 1909 were $4,219,689.78, of which $3,185,093.46 were for current expenses and $1,034,596.32 for extensions and improvements. The receipts during the same period were $63,750.84.

Summary of Work Done.

Twenty-one miles of new streets were opened and graded to the established grade during the year, amounting to 539,343 cubic yards. Over 16 miles of new streets were paved with asphalt, vitrified fire clay or shale blocks and granite blocks upon a six-inch cement concrete foundation, amounting to 266,477 square yards. The cost of these new pavements was approximately $425,000, of which $89,690.90 was paid by the City for paving intersections and in front of unassessable property, the balance being assessed against the abutting properties.

Maintenance of Unpaved and Macadam Roads.

The maintenance of unpaved and macadamized public highways received the close supervision of the Bureau during the year, and the small number of complaints received testifies to the good character of the work performed.

The resurfacing of macadamized roads was done under a separate contract at a fixed price per square yard. The total expenditure for the same amounted to $175,000, covering 251,997.88 square yards, equal to 23.86 miles.

In order to ascertain the best material to be used as a dust preventative, experiments were made with a number of preparations while work was in progress upon resurfacing nearly 190,000 square yards of roads, the preparations being incorporated with the stone. The subject of allaying the dust nuisance and maintaining suburban roads is now engrossing the attention of road builders throughout the world, and Philadelphia is now passing through an experimental era to determine what is the best character of material for this purpose. The preparations used

during 1909 have been fairly satisfactory, but before recommendations can be made, the roads so treated should have another season's wear.

Repairs to Paved Streets.

It is a regretable fact that the requests of the Department for appropriations for repairs to paved streets are not given more consideration at the time when much good work could be accomplished. The repairs during 1909 were made under annual contracts at a fixed price per square yard for the work done on each class of pavement, but unfortunately appropriations were made so late in the year that during the season when the most efficient work could have been performed we were only able to take care of dangerous places. I cannot refrain from again calling your attention to the fact that appropriations for this class of work should be made available not later than the advent of warm weather, at which time the most desirable results can be obtained.

Many of the vitrified brick and asphalt streets are in a most deplorable condition—in fact, some of them are worn down to the foundation—and it is needless to state that the longer the streets remain in a condition which are positively a menace to life and limb, the greater will be the cost of restoring them to a condition safe for public use.

Railroad Streets.

Repairs to passenger railway streets were made to the full extent of the appropriation for this purpose, and the work had the constant supervision of the Commissioner of Railway Repairs and his Inspectors.

Market Street Improvement.

A notable piece of work completed during the past year was the repaving of Market street, from Delaware avenue to Sixteenth street. Councils by ordinance approved July 15, 1909, authorized the repaving of the street from Delaware avenue to Second street with granite blocks and from Second street to the Schuylkill river with creosoted wood block upon a cement concrete foundation. This work was

completed west to Sixteenth street, with the exception of a small section at Delaware avenue.

This work was done at a cost to the City of $225,000, of which the Philadelphia Rapid Transit Company contributed the sum of $50,000 for repaving the street around City Hall, the said company having been responsible for the restoration of the street paving in this locality which had been disturbed during the construction of the Market Street Subway. While the Department did not recommend the repaving of the street with wooden blocks, the Market Street Business Men's Association were so insistent in the matter that it was considered expedient to accede to their wishes. Thus far the paving has met with universal commendation, as it presents a smooth, practically noiseless surface, which is easily cleaned.

It is to be hoped that Councils will, in the very near future, provide the necessary funds for the completion of this improvement to the bridge over the Schuylkill river.

Bridge and Sewer Repairs

Much good work was accomplished during the past year in repairing bridges and sewers. Many of the old dilapidated structures were thoroughly overhauled and repaired and placed in first class condition.

Hunting Park Avenue.

The work of widening and repaving Hunting Park avenue, from Blaine street to Germantown avenue, was completed during the year, and with the abolishment of the grade crossing between Blaine and Blabon streets will give us a splendid thoroughfare from York road to Wissahickon avenue. The work performed in connection with the widening of this street is a concrete example of the wisdom of the policy adopted by this administration in making efforts to connect park centres by means of broad thoroughfares, and as noted in my last annual report this would appear to be the opportune time to continue the improvement to the limits of Fairmount Park. This work can be performed now more economically than at any future

time, as property in this section is rapidly increasing in value, and the land damages will now be at a minimum.

Northeast Boulevard.

Improvement South Broad Street.

It is to be deplored that all work on the Northeast Boulevard, as well as the improvement of South Broad street, was stopped by injunction. It is problematical when operations will be resumed, and in the meantime sections of the City which should be showing a handsome increase in revenue return practically nothing.

Parkway.

During the past year, temporary improvements in the way of artistically designed pergolas and shelter houses were constructed along the line of the Parkway. These temporary improvements have added much to the appearance of this avenue.

Street Cleaning Division.

Work Performed.

More and better work was accomplished than ever before in the cleaning of streets, etc., during 1909, because of the provision in the specification requiring all streets to be cleaned six times each week.

Penalties.

Fines aggregating $4,045 were imposed upon the contractors for street cleaning and garbage for well founded complaints.

Collection, Waste Material.

A clause in the specifications for street cleaning, collection of ashes, etc., during 1910 provides that waste paper, etc., shall be taken from the premises of the householder, instead of being placed on the sidewalk as heretofore. To make this obligatory, an ordinance of Councils makes this a police regulation, whereby a violation of this ordinance makes the householder liable to a fine of $5.00. This ordinance, we anticipate, will be of great assistance to the Department in its endeavors to make the streets more sightly and prevent the blowing of waste paper over the thoroughfares after ash collections.

Street Cleaning Contract.

On November 22, 1909, the Department opened proposals for the cleaning of streets, removal of ashes, etc.,

during 1910, and the contract was awarded to Mr. Edwin H. Vare, the lowest bidder, for the sum of $1,299,000, an increase over 1909 of $100,000. This increase is due to a number of causes—the collection of waste as designated above, erection of new dwellings, increasel mileage of streets to be cleaned and the extension of the period for which the Philadelphia Rapid Transit Company will carry ashes, street dirt, etc., in one of the two districts where such arrangements are in force.

Garbage Contract.

On the date above mentioned proposals were also opened for the removal of garbage, etc., and the contract awarded to the Penn Reduction Company for $497,988, an increase over 1909 of $9,000. When it is taken into consideration that the daily removal of garbage this year from over 10,000 new buildings is added to the work performed during 1909, the increase is trivial.

Removal of Snow.

The problem of snow removal is a serious one, particulary when confronted with a storm of the magnitude of that which visited the entire country on December 25, 1909, when the fall in this City was recorded at 23 inches. So far there has been removed from the streets about 525,000 square yards of snow, covering about 22 miles of streets. This was disposed of by dumping into manholes and the rivers.

Street Sprinkling.

Because of the small appropriations, we were only able to sprinkle streets during the summer months in the territory between Twentieth street and the Delaware river, and Race and Walnut streets. I feel confident that the benefit derived by business communities in having the dust allayed more than compensates for the meagre sum which is at our command. I recommend that the territory wherein streets are sprinkled daily during the heated term be enlarged to take in those sections of the City where business interests are extensive, and for this purpose Councils should make ample provision.

The following statement is a classification of the street pavements laid during the year, and their mileage; also, the total mileage of street pavements to December 31, 1909:

Kind of Pavements.	Laid during 1909.		Making Total in City, Dec. 31, 1909.	
	Sq. yards.	Miles.	Sq. yards.	Miles.
Sheet asphalt	235,347	17.81	7,031,225	448.86
Asphalt block			151,141	15.76
Granite block	38,770	1.98	6,474,322	392.72
Cobble or rubble			283,029	27.
Vitrified brick	87,502	6.47	2,588,459	165.91
Granolithic			72,726	12.77
Slag block			42,280	5.82
Macadam	76,512	5.64	3,147,414	295.03
Wood block	55,000	1.54	55,000	1.54
Total	493,161	33.44	19,845,596	1,365.41

Summary of Work Done in Improved Pavements—New Streets.

	1907.		1908.		1909.	
	Square yards.	Linear feet.	Square yards.	Linear feet.	Square yards.	Linear feet.
Granite blocks	12,760	4,300	30,025	7,990	25,841	7,592
Asphalt	335,531	98,456	325,120	87,691	172,637	55,990
Vitrified bricks	50,943	15,260	70,667	23,578	67,999	21,034
Macadam	118,221	40,268	93,093	30,173	76,542	29,793
Total	517,455	*158,284	518,905	†149,432	343,019	‡114,409

Replacing Cobble and Other Pavements With Improved Pavements—Old Streets.

	1907.		1908.		1909.	
	Square yards.	Linear feet.	Square yards.	Linear feet.	Square yards.	Linear feet.
Granite blocks	41,107	15,702	64,525	18,896	12,929	2,871
Asphalt	3,484	1,272	381,845	124,193	62,710	38,044
Vitrified bricks	450	300	52,857	21,515	19,503	13,126
Wood blocks					55,000	8,128
Total	45,041	*17,274	499,227	†164,604	150,142	‡62,169

*1907—Total amount of new pavements, 175,558 linear feet, equal to 33.25 miles.
†1908—Total amount of new pavements, 314,036 linear feet, equal to 59.47 miles.
‡1909—Total amount of new pavements, 176,578 linear feet, equal to 33.51 miles.

Statement of Work Done.

	1907.	1908.	1909.
New paving	118,016	119,259	84,616 linear feet
Repaving with improved pavement	17,274	164,604	62,169 linear feet
New macadamizing	40,268	80,173	29,793 linear feet
Grading	1,062,949	1,177,236	539,343 cubic yards
New footway paving	88,786	169,379	188,315 square yards
Repairs to paved streets	311,009	325,924	494,205 square yards
Footways repaved	22,636	49,627	34,101 square yards
Crossing stone laid	6,239	15,966	18,671 linear feet
Curbstone reset	79,863	210,165	86,747 linear feet
Wooden trunks	9,148	8,702	6,551 linear feet
Hand railings	4,958	9,638	4,339 linear feet
Curved curb corners	8,114	15,377	10,207 linear feet
New curbstone set	143,138	168,327	166,300 linear feet
Vitrified brick and stone gutters	53,720	42,764	22,262 linear feet
Resurfacing, sheet asphalt	56,599	13,581	38,845 square yards
Resurfacing, broken stone	61,949	117,189	282,732 square yards
Repairs to passenger railway streets	119,790	1,401,501	1,175,991 square yards
Footways, curb, railroad notices served	22,235	37,210	24,194

Total Amount of Work Done During the Years 1907, 1908 and 1909.

	CLEANED.						REMOVED.					Number of Complaints of all kinds.
								NUMBER OF LOADS.†				
	Squares.*	Alleys.	Inlets.	Cross-ings.	Market Houses.	Snow from Fire Plugs.	Number of Dead Animals.	Dirt.	Ashes.	Dry Waste	Gar-bage.	
Total, 1907.....	2,630,359	242,867	734,481	534,924	1,343	63,245	17,640	197,039	874,398	53,403	378,964	6,585
Total, 1908.....	3,736,255	310,692	854.518	324,258	1,153	59,705	12,027	248,167	797,226	67.991	363,716	5,093
Total, 1909	3,946,889	344,378	895,778	472,596	636	65,233	8,430	259,754	810,347	71,853	367.946	3,677

* A square covers about 500 feet in length with an average width of roadway of 26 feet.

† A cartload of ashes and of street dirt is equal to one cubic yard; a cartload of garbage is equal to one ton.

Board of Highway Supervisors.

Expenditures and Receipts

The expenses of the Board of Highway Supervisors during the year amounted to $11,496.75. There was received and deposited with the Receiver of Taxes for the same period the sum of $8,350.25.

Plans.

Fifty-seven plans were added to the records during the year, making 2,064 plans now on file, covering 434 miles of streets. The plans are examined daily and are of inestimable value to both the City and the various companies holding franchises for underground privileges.

The work performed by the Chief Draughtsman and his assistants has been most creditable, and this branch of the City's service becomes a more valuable adjunct each year.

Transactions of the Board of Highway Supervisors, 1907, 1908 and 1909.

	1907.	1908.	1909.
Pneumatic tubes	9	3	5
For vaults	10	3	3
For railroad tracks, curves and turnouts	41	29	38
For underground pipes	570	444	607
For electrical conduits	1,859	999	1,130
For drinking fountain	1	1	1
For bridges			2
For subway	15	8	1
For tunnels			1
STATEMENT OF WORK DONE.			
New street record plans prepared	17	207	57
Blue print plans placed on file	185	246	261
RECEIPTS AND EXPENDITURES.			
Receipts	$20,741 14	$8,736 87	$8,350 25
Expenditures	10,183 87	11,960 34	16,496 75
Deficit of receipts	*$10,557 27	$3,223 47	$3,146 50

*Excess of receipts.

Transactions of the Board of Highway Supervisors, 1907, 1908 and 1909—Continued.

	1907.	1908.	1909.
RECAPITULATION.			
Amount of earnings	$15,618 53	$8,570 50	$8,218 75
Amount outstanding from previous years	7,645 03	2,522 42	2,356 05
	$23,263 56	$11,092 92	$10,574 80
Amount received and deposited with Receiver of Taxes	20,741 14	8,736 87	8,350 25
Amount outstanding	$2,522 42	$2,356 05	$2,224 55

Director's Office.

As the work in the various Bureaus of the Department increases, the detail work of this office correspondingly grows, and only by close application is the time-honored regulation that each day's work must take care of itself successfully carried out.

Official Photographer.

The work of the Official Photographer, who is connected with this office, continues unabated and deserves commendation. The work performed last year, had it been done by commercial photographers would have cost $11,037.75 whereas the total cost to the City was only $6,841.38, showing a saving of $4,196.37.

The following is a summary of the expenditures of the Director's Office for the years 1907, 1908 and 1909:

Item.		1907.	1908.	1909.
1	Salaries	$25,369 96	$29,280 00	$31,295 00
2	Horsekeep	400 00	400 00	400 00
3	Incidentals	1,726 24	1,679 50	2,174 37
4	Purchase and maintenance of two automobiles		9,991 43	3,966 35
	Total	$27,496 20	$41,350 93	$37,835 72

In concluding this report, I desire to thank you for the valuable assistance and advice you have always given me in the performance of the multifarious duties of this office and to express my appreciation of the loyal support I have received from the Chiefs and employees of the several Bureaus in my efforts to add to the success of your administration.

Respectfully submitted,

GEO. R. STEARNS,

Director.

ANNUAL REPORT

OF THE

BUREAU OF WATER

FOR THE

YEAR ENDING DECEMBER 31, 1909

OFFICERS

OF THE

BUREAU OF WATER

Chief:
FREDERICK C. DUNLAP.

General Superintendent:
ALLEN J. FULLER.

Assistants to Chief,
WILLIAM WHITBY. H. J. JOHNSON,
LAMONTE LLOYD.

Chief Clerk.
J. T. HICKMAN.

Assistant to Chief Clerk,
THOMAS SPENCE.

Assistant in Charge Inspection and Water Rents,
JAMES F. McCRUDDEN.

Chief Draughtsman,
JOHN E. CODMAN.

Assistant Engineers,
T. NELSON SPENCER, SETH M. VAN LOAN,
JOHN S. ELY.

Mechanical Engineers,
CHARLES B. BUERGER. FRANCIS L. HEAD.

Chemists,
GEORGE EDWARD THOMAS. FRANCIS D. WEST,
Belmont. Torresdale.

In Charge of Filters,

JOS. S. V. SIDDONS,
Torresdale.

ALFRED STEAD,
Belmont.

ALBERT TOLSON,
Roxborough.

Search Clerk—John S. Todd.

Pipe Inspector—Max M. Segl.

Messenger—Haines Lewis.

Superintendent of Shop—James H. Dean.

Chief Inspector—Edward Harshaw.

PURVEY DISTRICTS.

FIRST DISTRICT OFFICE, 1120 Wharton Street.

Purveyor—Richard A. James.
General Foreman—Harry Mintzer.

SECOND DISTRICT OFFICE, 918 Cherry Street.

Purveyor—J. H. Bilyeu.
General Foreman—Fred. J. Gheen.

THIRD DISTRICT OFFICE, Beach St. and Susquehanna Ave.

Purveyor—Charles J. Lowry.
General Foreman—Robert Glenn.

FOURTH DISTRICT OFFICE, Twenty-sixth and Master Streets.

Purveyor—Chas. T. Moore.
General Foreman—Geo. W. Showaker.

FIFTH DISTRICT OFFICE, 4377 Manayunk Avenue.

Purveyor—H. A. Markley.
General Foreman—W. H. Dawson.

SIXTH DISTRICT OFFICE, Town Hall, Germantown.

Purveyor—George W. Bardens.
General Foreman—Joseph B. Fowler.

SEVENTH DISTRICT OFFICE, Thirtieth and South Streets.

Purveyor—Michael Young.
General Foreman James H. Tawney.

Telephone Operators,

Jennie M. Hannings, Calvin Cramer.

WORKS—GENERAL.

Assistant to General Superintendent—John F. Collins.
Paymaster—A. I. Flomerfelt.
Foreman Machinist—Harry S. Mellen.
Foreman Bricklayer—Jos. F. Ogden.
Foreman Carpenter—Henry Guest.
Foreman Plumber—Chas. H. Green.
Foreman Stonemason—Joseph Connor.
Foreman Painter—Joseph Fleming.
Foreman Rigger—Lewis Pedersen.
General Storekeeper—Theo. Homan.
Foreman Laborer—Wm. Calhoun.
Electrician—Henry F. Morgan.
Lineman—Edward J. Cavanaugh.

ANNUAL REPORT

OF THE

BUREAU OF WATER

FOR THE YEAR 1909

TWENTY-THIRD ANNUAL REPORT

OF THE

BUREAU OF WATER

ONE HUNDRED AND EIGHTH ANNUAL REPORT

OF

OPERATIONS CONNECTED WITH THE CITY WATER SUPPLY

Philadelphia, January 1, 1910.

MR. GEORGE R. STEARNS,
Director, Department of Public Works.

DEAR SIR:—I respectfully submit the following report of the work performed by the Bureau of Water during the year ending December 31, 1909:

The past year marked the completion of the several filtration plants for filtering the City's water supply, and on March 1 the last link was completed and the entire City supplied with filtered water.

The work of laying the great system of water mains necessary for the distribution of filtered water to the sev-

eral districts, comprising in all over *seventy-five miles of pipe* ranging from 16 to 60 inches in diameter, was also completed.

The preliminary filters at Torresdale, capacity 240,000,000 gallons per day, were finished on February 9, and have since been in continuous service.

The last two of the twelve 20,000,000 gallon pumping engines at Lardner's Point pumping station were installed and put into service early in the year. Two new engines, of 10,000,000 gallons capacity, at Belmont; two, of 5,000,000 gallons capacity, at Roxborough, were also completed, making an addition during the year of 70,000,000 gallons daily pumping capacity.

On February 18 the pumps at Fairmount and at Spring Garden stations, aggregating 183,000,000 gallons daily pumping capacity, were shut down and the pumpage of raw water therefrom discontinued.

On May 1 the Queen Lane pumping station, aggregating 80,000,000 gallons daily pumping capacity, was shut down and all sections of the City supplied with filtered water. As the season advanced, however, and the demands for water increased, it was found to be impossible to maintain sufficient pressure on the mains from Lardner's Point station to supply the high levels of the Queen Lane district, and it became necessary to cut out part of this section and to supply it, as formerly, from the Queen Lane station.

In this connection it should be remembered that ten years have elapsed since the inception of the plans for filtering the City's water supply, and that, owing to the magnitude of the work, the necessity for utilizing it at the earliest date possible and its great cost, the plans were necessarily limited to the immediate requirements. Moreover, during this period the population of the City has in-

creased 298,350, a rapidity of growth that is fast overtaking the capacity of the engines, mains and filters to meet the demands for water. Either new construction or the adoption of meters for reducing the excessive waste of water must be provided for in the immediate future. In the meantime a filter plant, of 70,000,000 gallons capacity, to filter the water pumped at the Queen Lane pumping station, is being constructed in the north section of the Queen Lane reservoir. This water will supply the high levels of the old Queen Lane district, and furnish a small surplus to meet some of the increasing demands in other localities.

The total collections from water rents and from all other sources paid into the City Treasury and credited to this Bureau were $4,440,574.19, an amount equal to 21.6 per cent. of the collections for City taxes, and nearly 16 per cent. of the City's total revenue.

The collections in excess of the preceding year amounted to $207,528.70.

Consumption.

The consumption of water during 1909 was 111,696,176,909 gallons, a decrease as compared with that of 1908 of 6,171,922,931 gallons. The average daily consumption was 306,016,923 gallons, and the rate per capita, 197.2 gallons per day.

The above decrease is attributed to the fact that the pumpage as recorded for last year at Belmont, Queen Lane and Roxborough stations was determined by meter measurements, while the supply at Lardner's Point was pumped by new engines. The quantity recorded as pumped during 1909 is believed to be much more accurate than that recorded in 1908.

If allowance be made for the "slip" of the pumps during the latter year, the approximate quantities would be:

Million gallons consumption, 1909	111.696
Estimated million gallons consumption, 1908	104,027
Estimated million gallons increased 1909	7,669

representing an increase of over 21 million gallons per day, a quantity that undoubtedly would be required to supply the additional population (for 1909) and to furnish the water wasted by the increase of pressure on the mains since the districts have been supplied with filtered water from Lardner's Point.

Of the total supply, 86.6 per cent. was filtered and 13.4 per cent. raw water, the latter being furnished principally before the turning on of the filtered water supply in February last. Sixty-five (65) per cent. was pumped from the Delaware river and 35 per cent. from the Schuylkill.

The average daily consumption from the pumping stations was as follows:

	Gallons.
Belmont	39,044,000
Queen Lane	29,164,000
Roxborough	27,626,000
Lardner's Point	197,129,000
Fairmount and Spring Garden	13,054,000
	306,017,000

The total quantity filtered during the year was 96,183 million gallons, divided as follows:

	Gallons.
Lower Roxborough	3,880,000,000
Upper Roxborough	4,982,000,000
Belmont	13,763,000,000
Torresdale	73,558,000,000
Total	96,183,000,000

The completion of the filtration system has been followed by a gradual decrease both in the number of typhoid fever cases and deaths. The deaths last year numbered 333, a decrease of 200, or 37.5 per cent., from 1908 and a

reduction of 62.6 per cent. and 68.6 per cent. from 1907 and 1906 respectively. The typhoid death rate for the year was 21.5 per 100,000 of population.

The number of typhoid cases was 2,406, a reduction of 1,246 and 4,306 cases from 1908 and 1907 respectively, the reduction being 35 per cent. and 64 per cent.

Revenue Collected.

The revenue collected from all sources amounted to $4,440,574.19, exceeding that of the preceding year by $207,528.49

The total collections during 1909 and the amounts for the several items, as compared with those of the preceding year, were as follows:

	1908.	1909.	Increase.	Decrease.
Water rents	$3,643,677 58	$3,829,119 06	$185,441 48	
Meter rents	348,479 64	396,016 79	47,537 15	
Frontage	127,955 41	104,046 54		$23,908 87
Collected by City Solicitor	38,672 24	36,099 64		2,572 60
Penalties	40,266 98	41,588 88	1,321 90	
New connections	12,615 00	24,118 00	11,503 00	
Searches	2,573 75	2,523 50		50 25
Miscellaneous	18,804 89	7,061 78		11,743 11
Totals	$4,233,045 49	$4,440,574 19	$245,803 53	$38,274 83
			38,274 83	
Net increased collections, 1909			$207,528 70	

In addition to the above there was collected by the Department of Supplies from the sale of Bureau material, $4,215.49, and by the Highway Bureau for ferrules $8,174.00, making the total receipts from all sources $4,452,963.68.

Expenditures.

The expenditures for maintenance, service mains, etc., from appropriation to Bureau of Water were	$1,604,340 27
The expenditures for maintenance, service mains, etc., from appropriation to Department of Supplies were	962,963 15
Expenditures for improvements and extensions were	1,222,859 63
Total expenditures	$3,790,163 05

Total Expenditures.

Total expenditures for maintenance and construction, including amounts expended for improvements, and the extension and filtration of the water supply, from 1799 to December 31, 1909	$90,631,005 27

Total Earnings of the Bureau of Water.

Total revenue from water rents, etc., from the installation of the Water Works in 1799 to December 31, 1909	$107,960,065 63

Net Profit Earned by the Bureau of Water.

Net profit earned by the Bureau of Water from the installation of the works in 1799 to December 31, 1909	$17,329,060 36

This does not include cost of collection, 1887 to 1909.

Statement of Appropriations and Expenditures for the Year 1909.

Annual appropriation for maintenance	$950,651 00
Additional appropriation for maintenance	602,553 28
Balance from 1908, for maintenance	17,700 95
Appropriation from loans	1,525,000 00
Balance from previous years—loan	1,426,255 45
Total	$4,522,160 68

Expenditures for Maintenance.

From annual and additional appropriations	$1,521,802 07
From loans	82,538 20
Total	$1,604,340 27
Transferred	13,570 00
Merging	27,050 77
Not merging	8,482 39

Loan Funds.

Balance from previous years	$1,426,255 45
Additional appropriations	1,525,000 00
Total	$2,951,255 45

Expenditures from Loans.

For improvement, extension and filtration	$1,169,717 74
For extension of fire main	53,141 89
For maintenace	82,538 20
Set aside to meet contracts	1,351,609 88
Balance available	294,247 74
Total	$2,951,255 45
Warrants drawn for maintenance	$1,604,340 27
Warrants drawn for improvements	1,222,859 63
Total	$2,827,199 90
Number of warrents drawn for maintenance	3,149
Number of warrants drawn from loans	1,028
Number of employes, December 31, 1909	2,100

Bonds of Philadelphia—January, 1910—Water.

Date of Ordinance.	Total Loan.	Amount for Water.	Amount for Filtration.	Per cent. Rate Interest.
April 1, 1890	$4,600,000	$645,000		3
September 16, 1892	1,000,000	1,000,000		3
February 6, 1893	3,500,000	1,000,000		4
April 3, 1894	3,000,000	360,000		3½
June 18, 1895	1,200,000	960,000		3
June 17, 1898	11,200,000		$3,700,000	$8,400,000 at 3 1,400,000 at 3½
March 15, 1900	12,000,000		12,000,000	3,000,000 at 3 9,000,000 at 3½
June 11, 1902	5,000,000		1,300,000	3½
May 18, 1904	16,000,000		5,000,000	3½
February 9, 1907	13,500,000	500,000	4,000,000	6,000,000 at 4 125,000 at 3½
June 30, 1908	10,000,000		800,000	
July 19, 1909	3,539,700		725,000	
		$4,465,000	$27,525,000	
			4,465,000	
Total for water and filtration			$31,990,000	

In addition to the above, $500,000 was appropriated by Councils December 29, 1902, from the current funds, making the total amount appropriated for filtration $28,025,000.

Of the funds appropriated directly for the Improvement, Extension and Filtration of the Water Supply, the following amounts have been expended or charged off on account of pending contracts:

Paid on completed contracts	$21,382,549 84
Paid on uncompleted contracts	1,153,603 66
Limits of uncompleted contracts, less payments	1,216,896 34
Land damages	876,435 55
Expenses, supplies, advertisements, etc.	427,129 10
Inspections	23,746 24

Salaries and wages	$1,523,986 35
Expended by Water Bureau	1,013,149 89
Damages to property on account of pipe laying	18,876 55
Repaving over pipe trenches	100,053 99
Available balances on hand	288.572 49
Total	$28,025,000 00

Land Appropriated.

The land appropriated for filters and other works comprises 471.738 acres, divided as shown below. Under the caption "Land Damages" is included the jurors' and experts' fees, and other legal expenses incident to the land takings.

Section.	Acres Appropriated.	Land Damages and Costs.
Upper Roxborough	34.578	$78,768.66
Shawmont Pumping Station (account Bureau of Water)	2.800	16,810.13
Belmont	60.572	351,664.39
Torresdale	343.500	323,737.18
Lardner's Point	9.525	40,250.21
Oak Lane	20.823	65,204.98
Total		$876,435.55

Coal.

The total quantity of coal consumed at the several pumping stations was 214,956 tons, a decrease during the year of 16,819 tons, or 7.25 per cent.

The increase and decrease in the consumption of coal and the corresponding increase or decrease of pumpage at the several pumping stations as compared with the preceding year was as follows:

Stations.	Coal—Tons.		Pumpage—M. Gals.	
	Increase.	Decrease.	Increase.	Decrease.
Fairmount		75		4,321
Spring Garden		43,915		29,782
Belmont		3,112		1,677
Queen Lane		13,005		9,204
Roxborough		7,355	106	
Frankford	40,919		38,123	
Total	40,919	67,462	38,229	44,984
Belmont H. S.		595	104	
Roxborough H. S.	128		111	
Mt. Airy	141		24	
Chestnut Hill	7			
Frankford H. S.		71		45
Total	276	666	239	45
Roxborough L. S.	51		185	
Torresdale L. S.	10,901		40,616	
Total	10,952		40,801	
Belmont Filters		838		
Grand totals	52,147	68,966	79,269	45,029

The above decrease in the quantity of coal used was due largely to the bituminous coal being purchased on a heat unit basis. Every shipment of coal was tested and that accepted was of a good quality.

The improvements made in the boilers, pumping machinery and general operation of the stations also contributed largely to this result.

The decrease is larger than the figures indicate, as 40,618 million gallons additional of water was pumped at Torresdale over that of 1908.

PUMPING STATIONS.

Fairmount and Spring Garden.

Upon the completion of the Delaware system for supplying filtered water from Lardner's Point, the two oldest pumping stations, Fairmount and Spring Garden, erected in 1823 and 1846, respectively, were shut down (February 18), since which time there has been no pumpage at these stations except at Fairmount, to keep the Fairmount basin full and to supply one large manufacturing establishment.

The total pumpage for the year at Fairmount was 1,048,742,639 gallons, or equal to about one-twentieth of the whole pumpage at that station during the preceding year.

The pumpage at the Spring Garden works was 3,456,051,055 gallons, a little over one-tenth of the quantity pumped during 1908.

While it is problematical as to what will eventually be done with these two stations, they will, in the meantime, be kept in condition for use in case of emergency.

Belmont.

The work of erecting two ten-million gallon engines at the Belmont station has been completed. The first, or No. 1 engine, was put into service April 27, and the second, No. 2, on October 19. Both engines run smoothly and equally well, even when pumping 25 per cent. above their normal capacity.

The total pumpage at this station was 14,244,782,548 gallons. The average daily pumpage was 39,026,801 gallons.

There was a reduction in the quantity of coal consumed of 3,112 tons, amounting to $9,896.16. This reduction was principally due to the greater economy of the new en-

gines referred to above; also to a number of minor improvements made in the boilers and engines.

Queen Lane.

This station was kept in operation until May 1, when pumpage was discontinued, with a view to supplying the Queen Lane district with filtered water from Lardner's Point, but as the season advanced and the demands for water increased, it was found necessary to run one or two of the engines to supply the higher levels.

The total pumpage was 10,426,545,000 gallons, or 28,565,877 gallons per day, a decrease of over 25,000,000 gallons per day. The "slip" on the pumps, as measured by meter, decreased from 7.8 to 4.72 per cent.

The total quantity of coal consumed was 21,100 tons, a decrease of 13,005 tons, due to less pumpage, as stated above.

The work of rebuilding No. 2 engine, in accordance with plans made in this Bureau, has been completed. The substructure of this engine is now solid and free from the excessive tremors and vibrations which were formerly characteristic, and which were the cause of so many accidents and interruptions to the running of the pump.

Similar work in connection with the rebuilding of No. 1 engine is in progress, and re-erection is about 50 per cent. completed.

Roxborough.

The total pumpage at this station was 10,064,160,918 gallons, or 27,573,044 gallons per day, an increase of 289,544 gallons per day.

The "slip" on the pumps, as determined by meter measurement, was 10.9 per cent., or 1.6 per cent. less than during 1908.

The coal consumptoin was 38,382 tons, a decrease of

7,355 tons, due to new engines, boilers and other improvements, also to a somewhat better quality of coal.

The most important improvements made at this station were the installation of two five-million gallon Snow pumping engines, of the cross-compound, horizontal and fly-wheel type

On the duty trial No. 8 engine developed a duty of 141.446 million foot pounds, and No. 9 engine, 144.23 million foot pounds.

The last two of four 500 horse-power Edge Moor boilers have been installed, and No. 7 Worthington high duty engine received a thorough overhauling, including new pump chambers, plungers, pump and piston rods, also many repairs to minor parts. The pump was also equipped with a new style of valve seat upon which the valves rotate slightly at each displacement of the plunger. This action tends to make the valves wear evenly, and, judging from previous experiments, about quadruples the life of the valves.

No. 5 engine is receiving repairs similar to those made to No. 7, and upon its completion Nos. 4 and 6 will be overhauled in like manner.

Lardner's Point Pumping Station.

The pumping machinery in house No. 1 was overhauled and placed in good condition, and the station was in operation the larger portion of the year. The pumpage amounted to 2,975 million gallons. This station is not an economical one to operate; the machinery and boilers are old, and the cost per million gallons for water pumped from this station is three times that of houses Nos. 2 and 3, consequently the station is not used except in cases of necessity.

In house No. 2 the six Holly engines were in service

during the entire year, and a similar number of the same engines were placed in service previous to March 1, 1909, in house No. 3, since which date the average daily pumpage has been 217 million gallons.

The coal and ash handling system, including a new concrete wharf, coal and ash tower, overhead bunkers in boiler rooms Nos. 2 and 3, with accessories, was completed and placed in service in June, and has proven economical in the handling of coal and ashes, as well as a great convenience.

The pumpage for the year was 71,889,485,350 gallons.

The quantity of water pumped 100 feet high per pound of coal was 1,019 gallons, and the station duty per 100 pounds coal, including all coal used at the station for any purpose, was 88,000,000 foot pounds for houses Nos. 2 and 3.

On May 28, 1909, a duty trial was run on one of the six Holly 20,000,000 gallon vertical triple expansion pumping engines in house No. 3. The results of the trial are given below:

Data and Results.

Engine tested, contractor's number	596
Department number	16
Date of test	May 27-28, 1909
Duration of test	24 hours

Capacity.

Average revolutions per minute	20.764
Average diameter of plungers	33.0048 in.
Average stroke	5.506 ft.
Number of plungers	3
Displacement per 24 hours, gallons	21,951,093
Water used to lubricate plungers, per hour, gallons	157

Work Done.

Head pumped against:

Pressure, corrected gauge	85.946 lbs.	=198.53 ft.
Suction lift to center of pressure gauge	10.528 lbs.	= 24.32 ft.
	96.474 lbs.	=222.85 ft.
Work done per hour	1,698,586,507.7 ft. lbs.	

Duty.

$$\text{Duty} = \frac{\text{Foot lbs. per hour} \times 1000}{\text{Net feed water per hour}}$$

$$= \frac{1.698.586,507.657 \times 1000}{9805.833}$$

$$= 173,222,051$$

Pressures.

Throttle gauge reading 191.5 lbs. corrected for height 180.87 lbs. per sq. in.

First receiver reading 33.38 lbs. corrected for height 25.02 lbs. per sq. in.

Second receiver reading 2.75 lbs. corrected for height 5.0 lbs. per sq. in.

Vacuum, 26.4 inches mercury.

Jacket Pressures.

High pressure	180.9	lbs. per sq. in.
Intermediate	34.6	lbs. per sq. in.
Low pressure		Atm.
Temperature water pumped	65	F.
Temperature exhaust steam	122	F.
Temperature L. P. jacket water	168	F.
Drip from L. P. jacket, approximate, per hour.	830	lbs.
Temperature air in engine room	79	F.

Coal.

Kind	Lanc. Bituminous
Total weight fired	28,350 lbs.
Total ash weighed	2,390 lbs.
Per cent. ash	8.4

Analysis of Coal.

	As Received.	Dry.	Ash.
Moisture	2.11	.....	0.11
Volatile combustible	18.86	19.26	3.28
Fixed carbon	69.90	71.41	9.95
Ash	9.13	9.33	86.66
	100.00	100.00	100.00
Sulphur	1.77	1.81	
B. T. U.	13,888	14,187	

Heat given to steam per lb. dry coal.....9922.5 B. T. U.
Boiler efficiency 69.94%

Evaporation.

Water evaporated per hour, corrected for leakage, lbs...9846.400
Average boiler horsepower developed..... 344.400
Rated horsepower of boiler..... 500.000
Water evaporated at 65° F. per lb. dry coal, lbs..... 8.515
Water evaporated from and at 212° F. per lb. dry coal.. 10.275

The boiler was an Edge Moor water tube boiler, fitted with Wetzel Stokers. For details of boiler, stoker, etc., see acceptance test made by A. C. Wood and Francis Head, October 2 and 3, 1908.

Indicated Power.

Indicator cards were taken every two hours during the test, and sample cards are shown in the accompanying diagram. The cards are arranged corresponding to the position of the cylinders from which they were taken. The distribution of power between the different cylinders, as determined from the cards, is shown in the following table:

Indicated Horse Power.

Steam.	Head.	Crank.	Total.	Water.
High Pressure cylinder	198.6	188.9	387.5	284.9
Intermediate cylinder	147.9	152.0	299.9	284.6
Low pressure cylinder	118.1	115.3	233.4	287.2
	464.6	456.2	920.8	856.7

Mechanical efficiency	93.04%
Horsepower from volume and head of water	857.36
Steam used per indicated horsepower, hour lbs.	10.59
Heat units from steam pressure to vacuum temperature used per minute per I. H. P., B. T. U.	195.5
Efficiency from heat in steam used to work in discharge main	19.22%
Efficiency from dry coal to work in discharge main	13.33%
Dry coal per I. H. P. per hour	1.256

The above results from the indicator cards are given for what they may be worth, as it is obvious that the indicated water horsepower is too small as compared with the horsepower from volume and head of water.

Engine Data.

The following general data for each pump supplied by the makers of the pumps is added for reference purposes:

	High.	Intermediate.	Low.
Cylinder diameter	30″	60″	90″
Piston rods	7½″	7½″	7½″
Clearance vol., top	0.901%	1.51%	0.852%
Clearance vol., bottom	0.930%	1.58%	0.856%

	First.	Second.
Receiver volume	205 cu. ft.	304 cu. ft.
Receiver heating surface	166 sq. ft.	304 sq. ft.

	Diameter, Inches.	Length, Inches.
Crosshead pins	12	11
Crank pins	12	11
Shaft bearings	17½	32
Shaft at center	20¾	..

Distance rods—Four (4), each 5 inches diameter.

Air pump—One (1), 28 inches diameter, 66 inches stroke.

Feed pump—One (1), 3¼ inches diameter, 66 inches stroke.

Feed water heater—One (1) in exhaust, 308 square feet.

Flywheels—Two (2), 20 feet diameter, and weighing approximately 32 tons each.

Throttle valve, 8 inches diameter.

Exhaust pipe, 24⅜ inches diameter.

Suction pipe—Main 42 inches diameter; branch 30 inches diameter.

Discharge pipe—Main 42 inches diameter; branch 30 inches diameter.

Suction injection—Eight inches and 10 inches diameter.

Force injection—Three inches and 3½ inches diameter.

Overflow—Eighteen inches diameter.

FRANCIS HEAD,
H. M. HILLEGAS,
E. G. HILL.

High Service Stations.

The total pumpage at the High Service stations was 3,202,300,942 gallons, an increase of 193,804,786 gallons.

The following table shows the pumpage at the several High Service stations:

Stations.	Pumpage Gallons.	Increase Gallons.	Decrease Gallons.
Belmont	889,445,940	103,842,775	
Roxborough	1,784,124,900	110,641,035	
Mt. Airy	68,768,487	24,295,987	
Chestnut Hill	Out of service		355,570
Frankford	459,961,615		44,619,441
Totals	3,202,300,942	238,779,797 44,975,011	44,975,011
Increase		193,804,786	

Roxborough Low Service Station.

The total pumpage at this station was 4,982,151,000 gallons, an increase of 185,011,000 gallons.

The increase of pumpage at the High Service stations and at the Roxborough Low Service station averaged 4.63 per cent., with 187 less tons of coal consumed.

Torresdale Pumping Station.

The Torresdale Pumping Station, containing six 40,000,000 gallon R. D. Wood & Company's centrifugal pumps and one, same capacity, Allis-Chalmers Company pump; nine 350 horse power Heine boilers with Murphy Stokers and Sturtevant Economizers; three 75 K. W. generators; five sand washer pumps and necessary accessories, during the past year pumped 75,189,485,350 gallons of water, an average of 205,998,590 gallons per day, with an average lift of 42 feet.

The total cost of operation was $150,635.90, or $2.00 per million gallons of water pumped to the filters.

The above cost includes the cost of electric lighting for the plant, the pumping of water for filter washing and a certain amount of construction work done by the station mechanics.

The six R. D. Wood and Company centrifugal pumps are still in the hands of the contractor and are being operated under their direction by Bureau employes.

One DeLaval turbine driven centrifugal pump of 45,000,000 gallons daily capacity is being installed, Dravo-Doyle Company, Contractor. A large amount of construction work has been done around the station, a suspension bridge erected to the outer gate house, a large basin dredged to connect the inner gate house and considerable grading and filling of the low ground in the vicinity of the station.

The results of the duty trial of the Allis-Chalmers 40 million gallon centrifugal pump are given below:

"*March 24, 1909.*

"Subject: Duty Trial. Contract No. 128.

"MR. FRED. C. DUNLAP,
Chief, Bureau of Water.

"DEAR SIR:—I beg to report as follows on the 24 hour duty trial of the centrifugal pump and Bates engine furnished at Torresdale by the Allis-Chalmers Company under Contract No. 128.

"The duty guaranteed was seventy-eight milllion foot pounds, and that obtained was 79.77 foot pounds per 1,000 pounds of steam.

"The quantity pumped was at the rate of 42.19 m. g. d. against a total average head of 42.36 feet measured from the water surface in the intake at an average speed of 159.8 r. p. m.

"The engine operated smoothly and without stopping during the test, which formed part of the thirty day trial and occurred in its third week.

"You will note that the vacuum, superheat and pressure furnished were less than that called for in the specifications, as was also the head pumped against, as the discharge gate was wide open.

"The contractors were represented by Mr. E. H. Brown.

"The general conditions governing the installation and test are given in the specifications as follows:

"PRINCIPAL DATA. Section 7:

Number of pumps required, one (1).

Capacity of pump at contract speed, in U. S. gallons, per 24 hours, 40,000,000 gallons.

High water in pump well, above Torresdale Datum, 200 feet.

Low water in pump well, above Torresdale Datum, 190 feet

Test head, 45 feet.

Steam pressure at throttle, 170 pounds.

Superheat at throttle, 90 degrees Fahr.

Engine room floor, above Torresdale Datum, 205 feet.

Minimum temperature of the condenser water, 34 degrees Fahr.

Maximum temperature of the condenser water, 72 degrees Fahr.

Vacuum at condenser, 26 inches.

"58. *Duty Trial.* During the period of probation and before its final acceptance the machinery shall be subjected to a duty test of twenty-four (24) hours' duration. * *

"During the test the engine will be operated at its full rated capacity, and shall pump against a total head of forty-five (45) feet, to be obtained, if necessary, by the partial closing of the valve in the discharge pipe, with a steam pressure of one hundred and seventy (170) pounds per square inch by gauge at the throttle.

"59. *Measurement of Quantities.* The capacity of the pump during test will be determined by pitometer, placed in the discharge pipe. The water used for the condenser will not be credited to the pump.

"The head for computation of duty will be the sum of the pressure head in feet indicated on a gauge attached to the discharge main and the vertical elevation of the center of this gauge above the mean level of water in the pump well during the test. No correction or allowance will be made for any friction or losses between these points.

"Steam used will be measured by measuring water from condenser.

"Superheat will be measured by thermometer in well at throttle."

"The pressure head was not raised to 45 feet, as called

for above, as closing the discharge gate would have interfered with the accuracy of the pitometer; otherwise the measurements were made as per the spsecifications. A detailed log of the test is given in attached blue print.

"Very truly yours,

"FRANCIS HEAD,

"*Mechanical Engineer.*"

Pumpage and Itemized Cost for 1909.

Station.	Pumpage.	Average Lift.	Labor.		Coal.		Oil, Grease and Waste.		Packing, Rubber, Valves, Etc.		Sundries.		Total Cost of Station.	Cost per M. G. 100 ft. High.	Averages, 1908.
			Cost.	Per M. G. 100 ft. High.	Cost.	Per M. G. 100 ft. High.	Cost.	Per M. G. 100 ft. High.	Cost.	Per M. G. 100 ft. High.	Cost.	Per M. G. 100 ft. High.			
‡Fairmount	1,048,742,639	112.48	$14,578 62	$12 35		-------	$61 13	$0 05	$29 06	$0 02	$653 11	$0 57	$15,321 92	$12 99	$4 82
‡Spring Garden	3,456,051,055	144.11	38,252 30	7 68	$29,539 02	$5 93	352 42	07	313 22	06	2,916 36	59	71,373 32	14 33	6 99
Belmont	*14,244,782,548	296.51	95,177 31	2 26	121,075 32	2 86	1,852 15	04	5,253 94	12	15,177 95	36	238,536 67	5 64	5 28
Queen Lane	*10,426,545,000	255.54	60,844 92	2 28	72,795 00	2 73	2,007 69	08	1,768 46	06	9,295 32	35	146,711 39	5 50	4 85
Roxborough	*10,064,160,918	393.77	99,166 67	2 50	111,545 04	2 81	1,951 58	05	4,759 57	12	16,027 31	41	233,450 17	5 89	7 33
§Frankford No. 1	2,975,211,110	181.64	37,888 71	7 02	11,789 85	2 19	647 98	11	825 34	15	2,564 02	47	53,715 90	9 94	
Frankford No. 2	36,826,310,990	215.33	110,015 41	1 39	99,204 19	1 25	2,926 00	04	2,759 56	03	7,439 79	09	222,344 95	2 80	2 68
Frankford No. 3	32,087,963,250	241.95	69,683 41	90	81,551 84	1 05	1,577 45	02	1,622 52	02	5,706 60	07	160,141 82	2 06	20 56
Belmont H. S.	889,445,940	135.76	15,236 22	12 61	4,731 00	3 92	534 85	44	56 20	05	814 30	67	21,372 57	17 69	25 87
Roxborough H. S.	1,781,124,900	117.53	14,927 37	7 12	6,984 00	3 33	189 26	09	508 39	24	2,717 58	1 30	25,326 60	12 08	12 91
Mt. Airy	68,768,487	99.21	6,546 20	96 26	1,700 40	25 01	29 24	43	23 60	35	194 12	2 85	8,493 56	124 90	181 63
Chestnut Hill	----------	------	2,278 38	------	229 10	------	14 26	------	----------	------	76 91	------	2,598 65		
Frankford H. S.	459,961,615	140.28	11,941 07	18 51	3,519 34	5 45	184 36	29	178 73	28	1,670 87	2 59	17,494 37	27 12	28 95
Roxborough L. S.	4,982,151,000	25.81	5,321 41	4 14	15,669 75	12 18	403 64	31	147 82	11	908 82	70	22,451 44	17 46	17 29
Torresdale	†75,189,485,350	42.00	68,506 84	2 17	68,923 40	2 18	2,105 67	07	736 08	02	10,363 91	33	150,635 90	4 77	13 39
Totals and averages	194,503,704,802	161.38	$650,364 81	$2 07	$629,257 25	$2 01	$14,837 68	$0 05	$18,982 49	$0 06	$76,526 97	$0 24	$1,389,969 23	$4 43	$5 58

* Meters. † Frankford, plus 275,000,000 gallons per month. ‡ Fairmount and Spring Garden, shut down February 15, 1909. Are kept in reserve.
§ Frankford No. 1, occasionally used. High cost due to being kept ready for operation.

Operation of Filters.

Lower Roxborough Filters.

This station consists of a storage reservoir of 12,838,000 gallons capacity, giving a period of 1.26 days' sedimentation; five covered filter beds, having a combined area of 2.65 acres; eleven preliminary filter tanks, with a combined area of 0.2586 acres, and a covered clear water basin of 3,000,000 gallons capacity.

During the year there were filtered at this station 3,880,399,000 gallons of water, or a daily average of 10,631,230 gallons, corresponding to an avegare rate of 4.01 million gallons per acre per day. The filters are operated at rates between five and six million gallons per acre per twenty-four hours.

The total cost of operation, not including the cost of the wash water, was $16,462.65, or $4.24 per million gallons filtered, of which the laboratory cost was 54 cents per million gallons filtered.

The preliminary filters were operated at an average rate of 45,220,000 gallons per twenty-four hours per acre, at a total cost of $1.45 per million gallons of water filtered by the sand filters. The cost of labor and wash water was $1.08; replacing slag and furnishing new sponge cost 37 cents per million gallons. The average turbidity of the applied water for the year was 30, and the effluent averaged 12.00, the average reduction in turbidity being 58.22 per cent. The removal of bacteria by the preliminary filters for the year averaged 60.7 per cent. The water, before passing to the filters, had an average sedimentation of 1.25 days.

The maximum quantity filtered by the sand filters in one day was 12,900,000 gallons, equivalent to a rate of 4.9 million gallons per day per acre. The filters were washed

for the entire year by the "Brooklyn" method. The total number of runs or washings of the sand filters for the year was 57, an average of 11 per filter. The average time between scrapings was 32.4 days, and the average amount filtered between cleanings was 68.4 million gallons, equivalent to 129 million gallons per acre.

There was no resanding during the year.

A DeLaval turbine driven centrifugal pump has been placed in the low service pumping station to be used to furnish wash water under 100 pounds pressure, for sand removal and washing. There has been no occasion during the past year to use this pump as the "Brooklyn" method of washing has proven satisfactory, but experience at our other plants shows that after using this method of washing for from twelve to eighteen months, it is then necessary to remove and wash from six to nine inches of the upper layer of sand, and from present indications it will be necessary to follow this plan here.

Previously water has been taken from the stand pipe for washing purposes, but the pressure was not sufficient to be economical. The cost of labor and water for washing by the "Brooklyn" method was only $0.40 and about 1,400 gallons of wash water were used per million gallons filtered.

Comparing the filtered water and the water flowing from the preliminary filters, the reduction for the past year was as follows:

	Per cent.
Average reduction, turbidity	98.79
Average reduction, bacteria	99.37
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.98
Minimum reduction, turbidity	95.45
Minimum reduction, bacteria	92.31

In the following table a comparison is made, showing the reduction of the bacteria and turbidity in the water received from the Schuylkill river. This is the work of the combined plant, consisting of a sedimentation basin (where the water is allowed to stand for an average period of 1.25 days), preliminary filters and the final filters:

	Per cent.
Average reduction, turbidity	99.56
Average reduction, bacteria	99.80
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.99
Minimum reduction, turbidity	96.15
Minimum reduction, bacteria	99.07

Upper Roxborough Filters.

This station consists of a storage reservoir of 147,032,000 gallons capacity, giving a period of about 9.3 days' sedimentation; eight covered filter beds of a combined area of 5.6 acres and a covered clear water basin of 8,000,000 gallons capacity.

During the year there were filtered at this station 4,982,151,000 gallons of water, an average of 13,649,730 gallons per day, corresponding to an average rate of 2.437 million gallons per acre per day.

The total cost of operation was $15,829.30, or $3.18 per million gallons, of which the laboratory cost was 44 cents per million gallons filtered. This includes all the items connected with the operation of the station, but does not include the cost of pumping water from the storage reservoir or sedimentation basin to the filters.

In Filters Nos. 1, 3, 4, 6 and 8, 3,407 cubic yards of sand were replaced at a cost of 23 cents per cubic yard.

Comparing the filtered water and the water flowing from the Upper Roxborough sedimentation reservoir, the reductions were as follows:

	Per Cent.
Average reduction, turbidity	99.42
Average reduction, bacteria	99.18
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.69
Minimum reduction, turbidity	95.00
Minimum reduction, bacteria	88.47

Comparing the effluent from the filters with the water pumped from the Schuylkill river, the reductions were as follows:

	Per Cent.
Average reduction, turbidity	99.74
Average reduction, bacteria	99.92
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.98
Minimum reduction, turbidity	92.31
Minimum reduction, bacteria	99.72

The total number of runs or cleanings during the year was 65, an average of 8 runs to each filter, the average time between scrapings being 45 days. The average amount filtered between cleanings was 76.6 million gallons, or 109.5 million gallons per acre.

Three methods of washing were used during the year, and their average runs were as follows:

Scraping and ejecting.....16 runs—average 43.7 days each
Brooklyn method .....18 runs—average 55.4 days each
Nichols separators .....31 runs—average 41.6 days each

and the cost of labor and wash water was respectively $0.49, $0.28 and $0.61 per million gallons of water filtered, or an average price of $0.48.

The average amounts filtered between runs for the three above methods of washing were 90.2, 85.7 and 74.9 million gallons, and the wash water required was 2,200, 1,300 and 1,200 gallons per million gallons of water filtered respectively.

The storage reservoir from which these filters are

supplied is so large that the water was subsided for an average of 9.3 days before going upon the filters. The results obtained from this sedimentation are very good. The average turbidity of the water before being stored was for the year 34, while the effluent from the reservoir averaged 16.

The percentage of reduction in turbidity was 54.85 per cent., and the reduction in bacteria from the above storage was 90 per cent. The maximum turbidity of the raw Schuylkill river water at the Roxborough station was 500, the minimum 7, and the average for the year 35.

Belmont Filters.

The Belmont Filter Station is comprised of a sedimentation basin of 70,000,000 gallons capacity, giving a period of 1.8 days' sedimentation; preliminary filters consisting of nine filter tanks, having a capacity of 40,000,000 gallons per twenty-four hours; eighteen covered sand filters, having a combined area of 13.23 acres, and a covered clear water basin with a capacity of 16,500,000 gallons.

The filters are operated at a nominal rate of 3,000,000 gallons per acre per twenty-four hours, and the total quantity filtered during the past year was 13,762,700 gallons, at an average yield of 37,706,000 gallons per day, corresponding to an average rate of 2.79 million gallons per acre per twenty-four hours.

The maximum amount of water filtered in any one day was 44,467,000 gallons.

Filter No. 4 was continued during the year at a rate of 6,000,000 gallons per acre per day, with results as good as those obtained from filters operating at the usual 3,000,000 rate.

The preliminary filters were started on October 23,

1907. They were operated at a rate of 75,000,000 gallons per acre per twenty-four hours this year, and have materially increased the length of runs or time between scrapings of the slow sand filters without any decrease in efficiency.

The total cost of operation was $44,441.38, or $3.23 per million gallons filtered, which included a charge of $8,233.73 for operation of the preliminary filters and $4,348.68 for laboratory expenses, the cost of preliminary filtration being $0.60 per million gallons and the laboratory charge $0.316 per million gallons.

The reduction in turbidity and bacteria by the action of the preliminary filters was 52.83 per cent. and 60 per cent., respectively.

Two methods of cleaning the filters were used. During the year sixteen filters were washed by the Brooklyn method, the remaining two being cleaned by the usual method of scraping and ejecting.

There were one hundred and sixty-five runs or cleanings during the year, an increase of eighty-two runs over the previous year; one hundred and fifty-two of these runs were on filters cleaned by the Brooklyn method and thirteen by the usual method.

The average length of runs by the Brooklyn method was 40 days, the amount filtered between runs being 89,130,000 gallons, or 118,520,000 gallons per acre.

The average length of runs by the usual method of cleaning was 59.2 days, the average amount filtered between scrapings being 135,493,000 gallons, or 181,507,000 gallons per acre.

While the length of runs and quantity filtered with the Brooklyn method was not so large as with the usual method, it proved economical on account of the short time it was necessary to have the bed out of service, the low labor cost of cleaning and the saving in not having to replace the sand.

Sixteen filters were operated for the entire year by the Brooklyn method. The items of cost, etc., in the process of cleaning are as follows:

Number of runs	152
Average length of runs, days	39.7
Average m. g. filtered per run	89.13
Average m. g. filtered per acre per run	118.52
Average cost of water to wash per m. g. filtered	$0 05
Average cost of labor to wash and spade per m. g. filtered	$0 65
Total cost of washing and spading sand in place (water and labor), per m. g. filtered	$0 70
Average gallons water used to wash sand in place per m. g. filtered	3,630

One filter was cleaned by the usual method of scraping and ejecting for the entire year and another one for a portion of the year. The items of cost, etc., were as follows:

Number of runs	13
Average length of runs, days	59.2
Average m. g. filtered per run	136.5
Average m. g. filtered per acre per run	181.5
Average cubic yards sand scraped per m. g. filtered	0.94
Average cost to scrape per m. g. filtered	$0 28
Average cost to remove per m. g. filtered	0 14
Average cost to wash per m. g. filtered	0 03
Average cost to scrape, remove and wash per m. g. filtered	0 45
Average cost to clean, including replacing sand, per m. g. filtered	0 70
Average gallons of water used to remove and wash per m. g. filtered	2.320

In Filters Nos. 4, 5, 6, 8, 9, 11, 15 and 16, 7,225 cubic yards of sand were placed during the year at a cost of $0.27 per cubic yard.

Comparing the effluent from the Belmont Filters with the applied water, the reductions were as follows:

	Per Cent.
Average reduction, turbidity	97.93
Average reduction, bacteria	99.19
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.77
Minimum reduction, turbidity	92.86
Minimum reduction, bacteria	91.50

Comparing the effluent of the plain sand filters and the water from the Schuylkill river, the reductions were as follows:

	Per Cent.
Average reduction, turbidity	99.24
Average reduction, bacteria	99.76
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.98
Minimum reduction, turbidity	96.00
Minimum reduction, bacteria	98.45

During the year filtered water continued to be stored in the George's Hill Reservoir, which has a capacity of 39,760,000 gallons. This reservoir is not covered, and determinations made weekly failed to show any ill effects from this open storage.

A Blaisdell Filter Washing Machine was installed for cleaning the preliminary filters, and its operation has been of great benefit to the filters.

Torresdale Filters.

The Torresdale Filter Station consists of sixty-five 0.75 acre covered beds, a covered clean water basin of 50,000,000 gallons capacity, preliminary filter plant consisting of 120 concrete tanks, approximately 60 x 20 feet, and containing 1,140 square feet of filtering surface, with a capacity of 240,000,000 gallons of water per twenty-four hours; a low lift pumping station, containing seven 40,000,000 gallon centrifugal pumps; three 75 K. W.

generators, and five sand washing pumps, with full complement of boilers, economizers, mechanical stokers, etc.

The district supplied by filtered water on January 1, 1909, included all that territory east of Sixth street, between Vine and Spring Garden streets, and all east of Broad street and north of Spring Garden street.

On March 1 the district was extended to include the entire City east of the Schuylkill river, excluding Manayunk, Germantown and Tioga, which were supplied from the Roxborough Filters.

From this date until June 4 the entire City of Philadelphia was supplied with filtered water, but owing to the extremely heavy consumption it was not possible to maintain sufficient pressure to give satisfactory service in the old Queen Lane district, and on the above date the district north of Girard avenue, bounded on the west by Fairmount Park, the north by Allegheny avenue and on the east by the Norristown branch of the Philadelphia and Reading Railroad, the connecting branch of the Pennsylvania Railroad and Twenty-seventh street, was made into a raw water district and supplied with water treated by "Bleach" from the Queen Lane Reservoir.

The total amount of water filtered during the year was 73,558,000,000 gallons, a daily average of 201,528,800 gallons, equivalent to a rate of 4.05 million gallons per acre per day. The daily average amount filtered since March 1, 1909, was 217,000,000 gallons, and the maximum amount filtered in any one day was 248,000,000 gallons.

The cost of operation, not including the cost of operating the low lift Pumping Station or the cost of wash water (which is included in the expense of the Pumping Station), was $125,594.47, or $1.70 per million gallons of water filtered. Of this amount $19,580.18 was the cost of operating the preliminary filters and $10,858.52 the cost

of the Laboratory, or $0.26 and $0.15 per million gallons filtered, respectively.

Since February 15 the filters have been operated at rates approximating 6,000,000 gallons per day per acre, the average rate since the above date being 4.2 million gallons per acre per day.

Two methods of cleaning were employed, *i. e.,* the regular or scraping and ejecting method and the use of Nichols' Separators.

The total number of runs or cleanings was 840 during the year, an average of about 13 cleanings per filter, having an average length of 26.2 days.

The Nichols method was used for 695 cleanings and the average cost was as follows:

Number of cleanings by Nichols method	695
Average length of runs, days	27.3
Average million gallons filtered per run	91.7
Average m. g. filtered per acre per run	119.8
Average cost of water to wash per m. g. filtered	$0 01
Average cost of labor to scrape and wash per m. g. filtered	0 40
Cost of water wasted	0 01
Total cost per m. g. filtered	0 42
Average number of gallons wash water per m. g. filtered	1,000
Average depth scraped per run, inches	0.71

In Filters Nos. 2, 4, 5, 6, 9, 10, 11, 12, 15, 16, 17, 20, 21, 22, 23, 26, 27, 28, 30, 35, 36, 37, 39, 40, 42, 45, 47, 53, 55, 56, 57, 58, 60, 61, 63, 64 and 65, 45,016 cubic yards of sand were replaced at an average cost of $0.23 per cubic yard.

Comparing the effluent from the Torresdale final filters with the applied water taken directly from the Delaware river the reductions were as follows:

	Per Cent.
Average reduction, turbidity	98.70
Average reduction, bacteria	99.01
Maximum reduction, turbidity	100.00
Maximum reduction, bacteria	99.81
Minimum reduction, turbidity	92.50
Minimum reduction, bacteria	95.71

The Torresdale preliminary filters were placed in service on January 21, 1909, and since this date all water filtered by the sand filters has passed through these filters. They normally filter at the rate of 80,000,000 gallons per acre per day, but have given satisfactory results from rates of 100,000,000 gallons per acre per day. The daily average reductions in turbidity and bacteria for the year were 67.6 and 62.6 per cent., respectively.

The average turbidity of the applied water to the prefilters was 38.9 and the maximum 350. The average daily amount filtered from April 15 to December 31, 1909, was 222.6 million gallons. The per cent. of wash water used for the year averaged one-half of one per cent. of the amount filtered.

The number of cleanings was 12,648, an average of 105 cleanings to each filter, or about 3.4 days between cleanings for the year.

The total amount prefiltered was 58,099 million gallons, requiring 311 million gallons of wash water.

"*Torresdale Laboratory.*

"*January 21, 1910.*

"MR. FRED C. DUNLAP,
"Chief, Bureau of Water.

"DEAR SIRS—Work at Torresdale Laboratory started July, 1907, and continued in temporary quarters until November, 1909, when the new building was completed. The work of the chemical laboratory started on December 1.

"Force.

Francis D. West, Chemist in Charge.
John A. Murphy, Bacteriologist.
Granville A. Lawrence, Assistant Bacteriologist.
Wilson S. Yerger, Assistant Chemist (since Dec. 1st).

Five per diem men employed as sample collectors and helpers in the laboratories. Their work is divided as follows:

1. Collector of bacteria samples from plant.
2. Collector of turbidity samples from plant.
3. Collector of bacteria samples in the district and helper in laboratory.
4. Helper in bacteriological laboratory.
5. Helper in chemical laboratory.

"It has been a source of gratification to me that not only the salaried men, but the per diem men as well, have felt that their work was an essential part of the success of the laboratory and have worked accordingly. If samples are not properly collected the laboratory is useless. In cases when our results were questioned (which has happened but seldom) I have found on personal investigation that my collectors were getting the water at the proper places. I think we have succeeded in making the laboratory not one of "record," but an active working unit and an essential help in the management of the plant; at least that has been the aim of each member of my force, whom I wish to thank.

"Work.

"The tests made during 1909 follow:

(a) Total gelatine counts (48 hours at 19° C.) Delaware river, applied to final filters, filtered water basin Lardner's Point and effluents of filters	46,000
(b) Samples from filtered water district, plated as above	1,488
(c) Special gelatine and agar counts	914
(d) Microscopical examinations	304
(e) Turbidity determinations of same water given under (a)	23,000
(f) Tests for B. Coli Communis, Delaware River, applied final filters, filtered water basin, Lardner's Point, and five places in filtered water district	890
(g) Chemical tests (month of December)	120

"And the following special work:

(1) Methods of determining B. Coli Communis.
(2) Effects of washing pre-filters on number of micro-organisms in effluent.
(3) Tests on effect of hypochlorite of sodium and calcium on bacteria (3 reports).
(4) Tests of action of electrolytic hypochlorite of soda on pre-filter No. 119.
(5) Comparison of sedimentation of applied waters with pre-filtration.
(6) Chemical reactions during disinfection of water.
(7) Report of water on steamship Manchester Trader.
(8) Report of turbidities of sands at different depths in filters.
(9) Report on pump well No. 1, Lardner's Point. (The report on effect of micro-organisms on filtration will be forwarded within a month.)

"Cost of Operation.

Total cost for salaries	$8,396 67
At a rate of 210 million gallons a day, cost is about 11 cents per million gallons filtered.	
(a) Cost for ice for year	$98 18
(b) Cost for gas for year	212 60
(c) Cost for meat, etc., expense account	210 91
(d) Cost for supplies	1,667 26
Miscellaneous expenses	794 59
Total cost, salaries, supplies, etc	$10,858 52
Cost of laboratory, per million gallons filtered	0 15

"Thanking you for your kindness and interest in our work during the past year, I am respectfully yours,

(Signed) "FRANCIS D. WEST,
"Chemist in Charge,
"Torresdale Laboratory."

Cost of Operation of Filters for 1909.

	Upper Roxboro.	Lower Roxboro.	Belmont.	Torr'sdale.	Total.
Office	$1,769 24	$1,778 80	$2,436 25	$6,855 49	$12,839 78
Filter attendants	2,736 48	1,536 01	2,944 25	12,962 64	20,179 39
Cleaning filters	4,832 19	1,834 32	16,111 16	52,663 99	75,441,66
Labor on grounds	1,223 23	1,005 71	2,011 92	1,951 39	6,192 25
Janitors and w'chmen	1,189 74	1,189 24	1,494 76	4,749 51	8,623 28
Maint. and repairs	1,796 48	1,277 28	3,218 18	12,615 94	18,907 88
Laboratory	2,220 68	2,112 64	4,318 68	10,858 52	19,510 52
Lighting	61 26	75 90	3,642 45	3,356 78	7,136 39
Totals for final filters	$15,829 30	$10,809 90	$36,207 65	$106,014 29	$168,861 14

Pre-Filters.

	Upper Roxboro.	Lower Roxboro.	Belmont.	Torr'sdale.	Total.
Filter attendants		$1,262 03	$2,464 56	$10,779 74	$14,506 33
Labor		816 79	112 13	2,354 21	3,283 13
Maint. and repairs		3,573 93	5,657 04	6,446 23	15,677 20
Totals for pre-filters		$5,652 75	$8,233 73	$19,580 18	$33,466 66
Low service station					22,451 44
Total cost for plants	$15,829 30	$16,462 65	$44,441 38	$125,594 47	$224,779 24
Million gals. filtered	4,982	3,880	13,763	73,558	96,183
Cost per million gals. — Final filters	$3 18	$2 79	$2 63	$1 44	$1 75
Cost per million gals. — Pre-filters		1 45	60	26	37
Cost per million gals. — Pumping station					4 50
Total cost per M. G.	$3 18	$4 24	$3 23	$1 70	$2 34

Cleaning filter charges include restoring sand under Contract 160.
Belmont pre-filter maint. and repair charge includes sand furnished under Contract 151.

Comparison of Pumpage for 1908-1909.

	GALLONS.			
	1908.	1909.	Increase.	Decrease.
Annual pumpage from rivers	117,885,662,022	*111,129,767,510		6,755,894,512
Average daily pumpage from rivers	322,091,973	304,465,116		17,626,857
Pumpage per capita	210.2	196.2		8.2
Maximum daily pumpage from rivers during months of greatest consumption	341,650,000	362,348,840	20,698,840	
Pumpage per capita during months of greatest consumption	223.0	233.5	10.5	
Total supplementary pumpage at high service stations	7,805,636,156	8,184,451,942	378,815,786	
Low service station, Torresdale, pumpage from Delaware river	31,573,397,000	75,189,485,350	40,616,088,350	

* Meters at Roxborough, Belmont and Queen Lane stations, Plunger displacements at other stations.

Volume and Cost of Direct Pumpage for the Years 1899 to 1909 inclusive.

Years.	Number of Gallons Pumped.	Number of Gallons Pumped 100 Feet High.	Cost per Million Gallons Pumped 100 Feet High.	Gallons Pumped per Capita per day.	Population, Estimated.
1899	105,876,751,022	229,015,044,626	$2 80	199.7	1,425,843
1900	104,704,533,711	215,632,475,308	3 58	221.7	*1,293,697
1901	101,836,624,094	208,180,044,738	3 99	211.1	1,321,304
1902	114,460,164,379	236,842,612,454	4 64	232.0	1,349,500
1903	119,600,619,200	244,997,189,170	5 04	238.0	1,378,298
1904	120,386,160,615	247,368,530,965	4 93	234.0	1,407,690
1905	119,483,641,811	257,447,392,820	4 42	227.7	1,437,750
1906	116,732,205,859	253,264,725,466	4 86	217.8	1,468,411
1907	110,406,858,007	238,268,054,129	5 44	201.7	1,499,717
1908	117,885,662,022	256,334,927,765	5 11	210.2	1,531,752
1909	†111,129,767,510	277,020,429,051	4 12	196.2	1,552,000

†Meters used at Belmont, Queen Lane and Roxborough. *U. S. Census.

Volume and Cost of High Service Pumpage for the Years 1899 to 1909 inclusive.

Years.	Number of Gallons Pumped.	Number of Gallons Pumped 100 Feet High.	Cost per Million Gallons Pumped 100 Feet High.
1899	2,114,620,582	2,798,642,002	$11 35
1900	2,811,042,344	2,487,057,313	14 94
1901	1,968,833,130	2,276,802,775	17 86
1902	2,338,260,121	2,855,932,559	18 02
1903	2,484,635,469	3,119,047,084	17 01
1904	2,309,693,874	2,904,640,639	18 07
1905	2,231,646,920	2,847,970,028	18 04
1906	2,195,711,849	2,821,442,386	25 58
1907	2,681,156,615	3,307,403,147	18 88
1908	3,008,496,156	3,781,371,423	27 76
1909	3,202,300,942	4,017,996,096	18 74

Volume and Cost of Low Service Pumpage for the Years 1903 to 1909 inclusive.

Years.	Number of Gallons Pumped.	Number of Gallons Pumped 100 Feet High.	Cost per Million Gallons Pumped 100 Feet High.
1903	* 1,930,680,000	652,569,840	$3 63
1904	3,485,172,000	940,996,440	13 71
1905	3,652,158,445	986,082,780	14 95
1906	4,380,947,000	1,182,855,690	13 02
1907	†12,534,198,000	2,895,132,432	26.26
1908	39,370,537,000	8,306,843,417	14 02
1909	‡80,171,636,350	32,865,400,640	5.27

*Roxborough Low Service Station, started 7-3-1903.
†Torresdale Station, started 7-15-1907.
‡Frankford Plus 3,360,000,000 Gallons.

Cost of Raising 1,000,000 Gallons 100 Feet During 1908 and 1909.

Pumping stations.	1908.	1909.	Increase.	Decrease.
Fairmount	$4 82	*$12 99	$8 17	
Spring Garden	6 99	*14 33	7 34	
Belmont	5 28	5 64	36	
Queen Lane	4 85	5 50	65	
Roxborough	7 33	5 89		1 44
Frankford, No. 1		†9 94	9 94	
Frankford, No. 2	2 68	2 80	12	
Frankford, No. 3	20 56	2 06		18 50
Average	$5 11	$4 12		$0 99
High Service Stations.				
Belmont	$25 87	$17 69		$8 18
Roxborough	12 91	12 08		83
Mt. Airy	181 63	124 90		56 73
Chestnut Hill				
Frankford	28 95	27 12		1 83
Average	$27 76	$18 74		$9 02
Low Service Stations.				
Roxborough	$17 29	$17 46	$0 17	
Torresdale	13 39	4 77		8 62
Total averages	$5 58	$5 27		$0 31

* Fairmount and Spring Garden stations were shut down on February 15, 1909, and increased cost is due to keeping stations in reserve.

† Frankford, No. 1, is only occasionally used and extreme cost is due to keeping the station ready for operation.

Comparison of the Capacity and Average Daily Pumage for 1908 and 1909.

Pumping Stations.	CAPACITY.		AVERAGE.	
	1908.	1909.	1908.	1909.
Fairmount	33,290,000	33,290,000	14,671,642	2,873,268
Spring Garden	150,000,000	170,000,000	90,813,856	9,468,630
Belmont	62,500,000	73,500,000	43,502,421	43,152,588
Queen Lane	80,000,000	80,000,000	53,636,347	29,873,008
Roxborough	41,500,000	51,500,000	27,208,955	31,078,962
Total from Schuylkill	367,290,000	408,290,000	229,833,221	116,446,456
Increase		41,000,000		
Decrease				113,386,765
Frankford, No. 1	57,000,000	57,000,000		8,151,263
Frankford, No. 2	120,000,000	120,000,000	91,704,314	100,894,003
Frankford, No. 3	120,000,000	120,000,000	554,487	82,432,776
Total from Delaware	297,000,000	297,000,000	92,258,801	191,478,042
Increase				99,219,241
Decrease				
Total from Delaware and Schuylkill rivers	664,290,000	705,290,000	322,092,022	307,924,498
Increase		41,000,000		
Decrease				14,167,524
High Service Stations				
Belmont	7,000,000	11,000,000	2,146,457	2,436,838
Roxborough	10,000,000	10,000,000	4,572,360	4,888,013
Mt. Airy	3,000,000	3,000,000	121,510	188,407
Chestnut Hill	750,000	750,000	972	
Frankford	7,000,000	7,000,000	1,378,637	51,107,270
Total High Service	27,750,000	31,750,000	8,219,936	58,620,528
Increase		4,000,000		50,400,592
Decrease				

Comparison of the Capacity and Average Daily Pumage for 1908 and 1909—Continued.

Pumping Stations.	Capacity,		Average.	
	1908.	1909.	1908.	1909.
Low Service Stations				
Roxborough	30,000,000	30,000,000	13,106,940	13,649,730
Torresdale	240,000,000	280,000,000	94,462,833	205,998,590
Total Low Service	270,000,000	310,000,000	107,569,773	219,648,320
Increase		40,000,000		112,078,547
Decrease				
Total Daily	962,040,000	1047,040,000	437,881,731	586,193,346
Increase		85,000,000		148,312,615
Decrease				

Distribution.

The total quantity of pipe laid was 137,179 feet, of which 125,195 feet were service mains from 4 to 16 inches in diameter, 4,962 feet pumping and supply mains from 12 to 48 inches in diameter, in addition to which 7,022 feet of pipe were laid for fire hydrants and other connections.

The total length of new pipe laid was 137,179 feet, equal to 25.34 miles, making in addition to that previously laid 1,612.15 miles now in use.

Of the above 14.43 miles were laid by private contract on account of the Bureau being without pipe and having no funds from which it could be purchased.

The total number of additional fire hydrants put in during the year was 393, making the total number in use 15,561.

The total number of drills for attachments, from ½ to 6 inches in diameter, was 8,139.

The total number of meters in use was 1,759.

The total number of dwellings with water is 302,922, an increase of 10,357 during the year.

I wish here to testify to the faithful and valuable services rendered the City by the employees of the Bureau, and it was only by their efforts that the supply of water, both as to quality and quantity, was maintained sufficiently to meet the demand.

Thanking you for the valuable assistance and support given me, I am,

Very respectfully yours,

FRED C. DUNLAP,
Chief of Bureau.

APPENDIX A

REPORT OF CHIEF CLERK

Philadelphia, January 21, 1910.

FRED. C. DUNLAP, ESQ.,
Chief, Bureau of Water.

DEAR SIR:—I have the honor to submit herewith detailed statement of the expenditures of the Bureau from the appropriations made thereto and an itemized list of miscellaneous receipts.

A statement taken from the books of the City Controller shows the appropriation for supplies and the expenditures therefrom by the Department of Supplies.

Yours respectfully,
J. T. HICKMAN,
Chief Clerk.

Detailed Expenditures of the Bureau for 1909.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
An ordinance to make an appropriation to the Bureau of Water, approved December 31, 1908 $950,651.00				
Balance from books of 1908 1,443,956.40				
Increased by additional appropriations and transfers 2,127,553.28				
$4,522,160.68				
Diminished by transfers 13,570.00				
Net appropriation	$4,508,590.68			
Item 1—Salaries $520,555.00				
Increased by additional appropriation 1,750.00				
$522,305.00				
Diminished by transfer 32,000.00				
Net appropriation	490,305.00			
Chief of Bureau	10,000.00	$10,000.00		
Chief clerk and assistants	5,000.00	5,000.00		
Stenographers	2,700.00	2,700.00		
Correspondence clerk	1,000.00	1,000.00		
Time clerk	1,000.00	1,000.00		
Messenger	720.00	720.00		
Draughtsman	7,200.00	4,804.24		
Superintendent and assistant	5,000.00	5,000.00		
Clerks and paymasters	2,200.00	2,155.36		
Assistant clerks	4,000.00	3,118.05		
Assistants to chief	7,800.00	7,565.93		
Foremen filter attendants	2,000.00	2,000.00		
Chemists and assistants	4,920.00	4,819.39		
Bacteriologists and assistants	4,170.00	4,170.00		
Assistant clerk	3,600.00	3,375.00		
Pipe inspector and clerk	2,500.00	2,500.00		
Search clerk	1,300.00	1,300.00		
Chief inspector	1,200.00	1,200.00		
Inspectors	22,000.00	17,878.51		
Permit clerk and assistant	2,500.00	2,500.00		
Purveyors	10,360.00	10,360.00		
Purveyors' clerks	6,300.00	6,224.81		
Purveyors' assistant clerks	5,600.00	5,595.24		
Yard keeper	915.00	915.00		
Hydrant inspectors	8,000.00	6,567.81		
General foreman	8,400.00	8,367.74		
Foremen of repairs	7,650.00	7,638.58		
Superintendent of shop and clerk	2,400.00	2,400.00		
Stop attendants	3,000.00	3,000.00		
Storekeepers	3,200.00	3,200.00		
Foreman machinist	2,000.00	2,000.00		
Foreman bricklayer	1,600.00	1,600.00		
Foreman, city shop	1,400.00	1,400.00		
Foreman carpenter	1,200.00	1,200.00		
Foreman plumber	1,000.00	1,000.00		
Foreman stonemason	1,000.00	1,000.00		
Foreman painter	1,000.00	892.88		
Foreman rigger and assistant	1,900.00	1,900.00		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 1—Continued.				
Foreman of laborers	$960.00	$960.00		
Watchmen, offices and yards	6,480.00	6,389.42		
Janitor, main office	720.00	720.00		
Lineman	1,200.00	1,200.00		
Telephone operators	1,600.00	1,600.00		
Electrician	1,400.00	1,400.00		
General storekeeper	1,000.00	981.17		
	$181,345.00	$161,319.11		
Salaries at Pumping and Filter Stations.				
Fairmount		8,181.51		
Spring Garden		24,141.17		
Belmont		50,543.12		
Queen Lane		20,394.30		
Roxborough		46,844.88		
Frankford		101,437.33		
Belmont High Service		8,531.98		
Roxborough High Service		12,742.62		
Frankford High Service	337,410.00	11,641.32		
Mt. Airy		5,077.24		
Chestnut Hill		2,250.00		
Belmont Filters		10,421.05		
Upper Roxborough Filters		6,903.33		
Lower Roxborough Filters		3,120.09		
Torresdale Filters		2,638.29		
Uniforms for policemen and watchmen	1,800.00	1,730.00		
		$477,920.35	$12,384.65	
Item 2, 2a and 2½. For wages of mechanics, laborers and other workmen employed upon repairs to machinery and the maintenance of and repairs to Buildings, Grounds and Reservoirs and the transportation of workmen incident thereto.				
Balance, Jan. 1	$5,817.68			
Annual appropriation	150,000.00			
Increase by additional appropriations	176,000.00			
Net appropriation to Item	331,817.68			
Wages:				
Boiler makers		11,530 39		
Bricklayers		13,202 66		
Carpenters		12,519 29		
Crane runner		1,577 15		
Helpers		9,987 30		
Horses, carts and men		6,717 26		
Laborers		190,949 05		
Machinists		64,178 07		
Painters		5,961 40		
Pump erector		1,234 10		
Stonemasons		5,397 74		
Tinsmiths		2,625 35		
Waste water inspector		948 94		
Transportation		4,103 27		
		$330,881 97		$935 71

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 3, 3a and 3½. For wages of mechanics, laborers and other workmen connected with repairs to and improvement of the distribution and the laying of service mains and the transportation of workmen engaged in repairs and the traveling expenses of pipe inspector. Bal., Jan. 1 $4,335 50				
Annual appropriation 150,000 00				
Increased by additional appropriations 271,000 00				
Net appropriation to item	$425,335 50			
Transportation		$1,931 92		
Traveling expenses		850 59		
Wages:				
Improvement		72,892 69		
First District		35,345 67		
Second District		29,269 83		
Third District		106,162 46		
Fourth District		33,780 14		
Fifth District		28,684 80		
Sixth District		50,591 91		
Seventh District		58,086 63		
		$417,596 64	$2,000 00	$5,733 86
Item 4, 4a and 4½. For wages of mechanics, helpers and other workmen at the City construction and repair shop.				
Balance, January 1 $583 77				
Annual appropriation 20,000 00				
Additional appropriations 20,000 00				
Net appropriation to item	$40,583 77			
Wages		40,290 90		$292 87
Item 5. For wages of hydrographic corps and expenses incident thereto	1,596 00			
Wages		1,596 00		
Item 6. Repairs to boilers.				
Balance, January 1 $307 00				
Annual appropriation 5,000 00				
$5,307 00				
Diminished by transfer $3,000 00				
Net appropriation to item	$2,307 00			
Boiler tubes		1,433 02		
Damper regulator		400 00		
Fire brick		227 50		
Repairs		76 20		
Spray for boiler		85 00	85 28	
		$2,221 72		
Item 7. For hauling water pipe and machinery $2,500 00				
Increased by additional appropriation and transfer 6,500 00				
Net appropriation to item	$9,000 00			
Hauling		7,681 10	1,318 90	

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging	Amount Not Merging.
Item 8 and 8½. For repairs to roofs.				
Balance, January 1 $75 00				
Annual appropriation 1,000 00				
$1,075 00				
Diminished by transfer 500 00				
Net appropriation to item	$575 00			
Galvanized roofing		$180 40	$319 60	$75 00
Item 9. For extra clerk hire in writing up duplicates $500 00				
Increased by additional appropriation 2,828 86				
Net appropriation to item	3,328 86	3,328 86		
Item 10. For keep of horse for general superintendent and assistant to chief and for keep of automobile for chief of bureau	2,000 00	2,000 00		
Item 11, 11a and 11½. For advertising, postage, horse-shoeing, miscellaneous expenses, repairs to wagons, carts, harness, tools, pipe and pavements, ground rent, 918 Cherry street, and electric current.				
Balance, January 1 $42 48				
Annual appropriation 2,000 00				
Increased by additional appropriation and transfers 11,500 00				
Net appropriation to item	13,542 48			
Advertising		269 55		
Affidavits		9 00		
Badges		21 00		
Binding books		19 25		
Brass checks		2 50		
Carriage lamps		10 00		
Care of clocks		62 00		
Cleaning well		30 00		
Drain pipe		18 13		
Disinfector, rental		144 00		
Electric current		368 95		
Electric supplies		44 90		
Engineer supplies		89 06		
Freight		271 46		
Fire extinguisher, rental		67 50		
Furnishing meals		5 50		
Frames for drawing		28 00		
Ground rent, 918 Cherry st.		26 66		
Gum goods		160 28		
Hardware		134 34		
Hauling		61 50		
Hire of automobile		29 00		
Horse shoeing		2,100 52		
Hose		18 00		
Incidentals		163 96		
Incidentals, hydrographic		72 90		
Inspecting pipe		32 00		
Keys		15 87		
Laboratory supplies		268 85		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 11, 11a and 11½—Continued.				
Maps		$370 25		
Money bags		33 00		
Office supplies		7 60		
Oil		3 00		
Oxygen		71 75		
Photographic supplies		91 43		
Parts of meters		17 56		
Pipe cutter		4 50		
Pinions		18 75		
Postage stamps		729 13		
Printing		113 20		
Professional services, V. S.		108 50		
Pump valves		7 20		
Repairs, chairs		14 40		
Repairs, dynamo		5 95		
Repairs, gauge		21 00		
Repairs, harness		589 93		
Repairs, pavement		5 75		
Repairs, pipes		48 95		
Repairs, range		4 25		
Repairs, typewriter		11 75		
Repairs, wagons		1,840 48		
Repairs, watch		4 00		
Rubber stamps		17 70		
Serving morning papers		15 60		
Stationery		147 30		
Subscriptions (periodicals)		39 00		
Telegrams		6 48		
Telephone, rental		930 84		
Test gauge		50 00		
Text books		29 18		
Time recording equipment		536 00		
Transportation		555 52		
Traveling expenses		106 61		
Use of dump		20 00		
Use of poles, telegraph		7 00		
Window shades		9 00		
Wood rollers		10 50		
		$11,148 04	$1,004 91	$1,389 53
Item 12. For hauling ashes from pumping stations	$3,000 00			
Increased by additional appropriations	2,500 00			
	$5,500 00			
Diminished by transfer	70 00			
Net appropriation to item	$5,430 00	5,033 00	397 00	
Item 12½. For emergencies.				
Balance, January 1	653 35			
Bushings		75 75		
Crane shaft		32 50		
Damages		30 00		
Freight		97 28		
Lumber		55 00		
Machine work		14 00		
Plungers		133 00		
Repairs, boilers		20 80		
Valve		195 00		
		$653 33		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging	Amount Not Merging.
Item 13 and 13½. For the purchase of material connected with the repairs to machinery, mains, buildings and sidings.				
Balance, January 1 $392 41				
Annual appropriation 2,500 00				
Increased by additional appropriation and transfer 7,000 00				
Net appropriation to item	$9,892 41			
Ash buckets		$54 00		
Ash chutes		161 00		
Bevel gears		275 00		
Brass fittings		96 65		
Boring bar, etc.		98 00		
Car replacers		16 00		
Castors		2 96		
Cement		42 79		
Chain		3 00		
Changing rails		6 43		
Chutes and chains		125 00		
Cylinder covers		11 75		
Cylinder head		21 56		
Drill		70 00		
Electrical material		615 60		
Expansion set		4 96		
Fittings		886 04		
Forgings		30 00		
Gears		65 00		
Globes		15 20		
Governor		30 00		
Grate bars		31 00		
Grates and plates		53 05		
Hardware		185 12		
Hose and couplings		215 76		
Iron castings		215 11		
Iron fittings		174 43		
Iron pipe		38 28		
Jet exhauster		28 00		
Lead wire		5 50		
Load chain		31 19		
Lumber		117 00		
Machine work		383 93		
Mahler bomb		235 00		
Material for recorder		6 55		
Oil pump		72 00		
Paints		18 45		
Packing		90 90		
Parts of meters		759 73		
Pencils for gauge cocks		10 80		
Pipe and fittings		200 00		
Piston castings		27 38		
Piston rings		18 57		
Railroad ties		772 15		
Repairs, boilers		45 05		
Repairs, calorimeter		5 92		
Repairs, copper pipe		375 31		
Repairs, crank shaft		32 00		
Repairs, gauge		19 83		
Repairs, hoists		35 02		
Repairs, scales		98 18		
Repairs, siding		9 16		
Repairs, thermometer		2 25		
Revolution counter		5 00		
Sand		24 08		
Screens		498 64		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging	Amount Not Merging.
Item 13 and 13½—Continued.				
Shanklers and screws		$27 74		
Sponge baskets		64 20		
Spur gears		31 34		
Steel castings		13 90		
Steel plates		32 75		
Steel pipe		15 69		
Steel springs		2 65		
Steel tubes		34 06		
Steel worms		160 00		
Stone		334 77		
Straight edges		100 00		
Supporting tracks		351 86		
Tempering springs		7 20		
Valves		1,043 63		
Valve yokes		13 00		
Wire rope		146 25		
		$9,850 82		$41 59
Item 14, 14a and 14½. For wages of mechanics, laborers and other workmen employed in the maintenance and operations of the Upper Roxborough, Lower Roxborough, Belmont and Torresdale filter stations, the Belmont and Torresdale laboratories and the Torresdale pumping station.				
Balance, January 1 $83 54				
Annual appropriation 80,000 00				
Increased by additional appropriations and transfer 112,000 00				
Net appropriation to item	$192,083 54			
Salaries: Torresdale		36,300 48		
Wages:				
Lower Roxborough		7,436 62		
Upper Roxborough		8,204 64		
Belmont		16,325 38		
Torresdale		117,684 75		
		$186,051 87	$6,000 00	31 67
Item 15 and 15½. For resanding filters, painting and incidental expenses for operating filter plants.				
Balance, January 1 $1,361 49				
Annual appropriation 10,000 00				
Increased by transfer 1,000 00				
Net appropriation to item	$12,361 49			
Adjusting valves		8 16		
Demurrage		8 00		
Gas for fuel		378 20		
Hauling ashes		28 48		
Hoists		144 00		
Ice		13 60		
Incidentals		423 59		
Laboratory supplies		92 75		
Post drill		12 12		
Printing		240 50		
Sample collector		19 00		
Steel rope		41 80		
Steel spur		16 00		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging	Amount Not Merging.
Item 15 and 15½—Continued.				
Subscription, periodical		$85 00		
Telephone, rental		46 50		
Text books		61 70		
Towel service		36 00		
Transportation		211 40		
Restoring sand, Contract No. 160		7,714 89		
		$9,501 69	$2,859 80	
Item 16. For filtration.				
Balance, January 1	$425 12			
Traveling expenses		53 12		$372 00
Item 17. For completion of high pressure fire main.				
Balance, January 1	63 75			
Steel covers		45 00		18 75
Item 18. For furnishing and laying mains for filtered water				
Balance, January 1—$3,119 83				
Diminished by transfer 3,037 43				
Net appropriation to item	82 40			
Filling washout		35 00		
Hauling		15 00		
Repairing drain pipe		32 40		
		$82 40		
Item 19. For sand filtration purposes, Torresdale Beds.				
Balance, January 1	$10,603.62			
Restoring sand, Contract No. 160		8,000.00		2,603.62
Item 20. For repairs to pumping engines.				
Balance January 1	3,985.00			
Air rammers		105.26		
Check valves		390.00		
Bushings		19.95		
Connecting rod		391.25		
Cylinder head		23.74		
Expansion joints		420.00		
Floats		10.50		
Gate valves		92.93		
Iron pipe and fittings		645.51		
Machine work		1,053.82		
Piston		111.50		
Rod brasses		15.50		
Steel plates		97.00		
Tubes		9.00		
		$3,345.96	639.54	
Item 21. For the purchase of and repairs to machinery.				
Balance, January 1	244,846.31			
Air pump and fittings		157.65		
Brass fittings		118.53		
Bolts		3.23		
Bricks and plates		166.39		
Cast iron ram		174.00		
Centrifugal engine		497.10		
Coal handling machinery		106.00		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 21—Continued.				
Dials		9.00		
Electric pump		496.00		
Electric supplies		401.11		
Electric equipment		376.29		
Flange pipe		23.00		
Floats		84.50		
Fittings for blower		143.83		
Fittings for economizer		74.40		
Fittings for stokers		565.09		
Gaskets		54.50		
Grate bars		594.00		
Grate rackers		167.36		
Governor and fittings		28.00		
Hire of tapping machines		490.00		
Iron fittings		1,541.08		
Links and buckets		114.22		
Packing		975.93		
Pipe covering		38.71		
Piston rod, etc		309.77		
Repairs to crane		123.29		
Repairs to machinery		2,853.57		
Slip indicator		375.00		
Sole plates		52.90		
Steel pipe and fittings		87.00		
Steel for spur gears		298.75		
Valves		398.15		
Valve seats		495.00		
Worms and wheels		595.50		
Boiler equipment, Cont. No. 127		5,998.30		
Auxiliary pump, Cont. No 130		1,953.31		
Boiler equipment, Cont. No. 135 E.		15,518.55		
Foundations for engine, Cont. No. 138 S.		405.22		
Foundations for engine, Cont. No. 138 E.		2,705.59		
Pumping engines, Cont. No. 138 SP.		40,091.22		
Pumping engines, Cont. No. 138 B.		3,717.84		
Pump ends, Cont. No. 139 M.		23,791.02		
Pump ends, Cont. No. 143		9,809.27		
		$116,479.17		$128,367.14
Item 22. For the extension of the High Pressure Fire System.				
Balance, January 1	$64,977.54			
Extension of fire main system, Contract No. 140		53,141.89		11,835.65
Item 23. For the Improvement, Extension and Filtration of the Water Supply.				
Balance, January 1...$472,026.88				
Increased by transfer.. 3,037.43				
Net appropriation to Item	475,064.21			
Advertising		452.70		
Affidavits		15.00		
Binding books		62.00		
Brass fittings		113.82		
Bricks and gravel		453.16		
Bridge jacks		80.00		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 23—Continued.				
Blast and ventilating pipe		$305.00		
Cement		53.55		
Carpet steps		42.00		
Carpenter work		139.00		
Chain blocks		49.26		
Charts		10.98		
Chandlery		23.79		
Coal		144.35		
Copper joints		31.90		
Dredging		473.75		
Drills, etc		214.00		
Electric supplies		545.07		
Engineer supplies		577.67		
Exhaust joint		98.30		
Feed water regulator		500.00		
Freight		192.15		
Fire brick		130.00		
Fittings for stoker		118.40		
Files, bevel		43.50		
Grates		105.30		
Grass seed		84.70		
Gum goods		334.60		
Hardware		134.41		
Hand hold rings		70.00		
Hoists		167.25		
Incidentals		349.17		
Indicator		125.66		
Iron pipe and fittings		336.49		
Iron beams		81 84		
Iron steps		16.50		
Index cards		10.80		
Keys		16.63		
Lead wool		100.00		
Lightering and discharging coal		174.93		
Lockers		294.00		
Lumber		240.64		
Machine Tools		435.59		
Motor		406.89		
Oak stakes		92.80		
Photographic supplies		44.14		
Printing		163.18		
Packing		485.25		
Parts of valves		194.30		
Pulley		4.30		
Recording cards		20.00		
Recording equipment		268.99		
Removing engine		100.00		
Repairs, arthometer		12.50		
Repairs, mains		64.31		
Repairs, valve		98.50		
Rope		46.93		
Sand ejector		802.02		
Scraper		4.00		
Spur gear		9.50		
Steel lockers		127.26		
Steel plates		285.10		
Steel rope		22.69		
Stone		372.46		
Text books		11.40		
Towel service		36.00		
Tool steel		14.34		
Transportation		$54.20		
Traveling expenses		485.29		
Type		3.00		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 23—Continued.				
Valves		$496.62		
Water governor		16.00		
Water-proofing material		152.00		
Stationery, Contract		580.25		
Pumping engines, Cont. No. 93		88,319.62		
Economizer, Cont. No. 95 G.		2,087.30		
Electric machinery, Cont. No. 110		2,945.42		
Pumping engines, Cont. No. 128		18,700.00		
Suspension bridge, Cont. No. 153		1,557.00		
Locomotive, Cont No. 155		2,650.00		
		$129,931.42		$345,132.89
Item 24. For furnishing and laying mains.				
Balance, January 1	$55,608.45			
Diminished by transfer	23,013.15			
Net appropriation to Item	$32,595.30			
Iron pipe and specials		$2,762.67		
Additional work, etc., Cont. No. 69		7,087.78		
Additional work, etc., Cont. No. 70 S		9,543.53		
Additional work, etc., Cont. No. 70 P		13,201.32		
		$32,595.30		
Item 25. For the Improvement, Extension and Filtration of the Water Supply.				
Balance, January 1	$460,225.54			
Increased by transfer	23,013.15			
Net appropriation to Item	$483,238.79			
Affidavits		18.00		
Cedar tanks		65.00		
Drawing		125.00		
Electrical conduit		459.21		
Floor plates		669.86		
Freight		16.40		
Gum goods		236.30		
Incidentals		198.47		
Installing Pitometer System		391.50		
Laboratory basins		324.00		
Lockers		420.00		
Prime bleach		1,212.24		
Printing		466.00		
Railroad ties		472.40		
Salt		27.00		
Scale		162.00		
Screens and fittings		571.00		
Stone		48.68		
Transportation		329.55		
Traveling expenses		310.79		
Triple blocks		128.00		
Ash and coal handling machinery, Cont. No. 94		$2,043.70		
Preliminary Filters, Cont. No. 102		230,742.79		
Electric machinery, Cont. No. 109		17,959.92		
Sluice gates, Cont. No. 147		241.50		

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 25—Continued.				
Apparatus for cleaning filters, Cont. No. 152 B		$5,500.00		
Apparatus for cleaning filters, Cont. No. 152 N		11,500.00		
Partitions, etc., Cont. No. 161		7,331.49		
Dredging, Cont. No. 165		9,631.48		
Electric cable, Cont. No. 166		1,290.20		
Salaries:		56,577.50		
Wages, Caulkers $272.63				
Wages, Carpenters 380.70				
Wages, Horses, Carts and Men 1,500.74				
Wages, Laborers 23,044.97				
Wages, Machinists 110.62		25,309.66		$28,459.05
		$454,779.64		
Item 26. For furnishing and laying mains and for other purposes connected with the Improvement, Extension and Filtration of the Water Supply.				
Balance, January 1	$114,422.16			
Damages, laying main		$375.00		
Freight		9.70		
Interest		132.32		
Partitions, Torresdale		202.00		
Stone		135.25		
Pumping engines, Cont. No. 126		20,695.22		
		$21,549.49		98,872.67
Item 27. For the construction of a Filter Plant at Queen Lane Reservoir	$00,000.00			
Lamps		8.10		
Lumber		186.77		
Queen Lane Filters, Cont. No. 154		467,593.34		
Salaries		19,898.69		
Wages		1,098.50		
		$188,785.40		311,214.60
Item 28. For the construction of a Filter Plant at Queen Lane Reservoir	725,000.00			725,000.00
Item 29. To refund to Thomas J. Ward the sum if $596.05 paid by him for water pipe in Hunting Park Avenue and Bristol Street between 5th and 6th Streets and in Reese Street between Fairhill Street and Hunting Park Avenue and to Thomas S. Boyle the sum of $653.37 paid by him for water pipe on Edgewood and Millick Streets north of Locust Street. Ordinance Dec. 19, 1909	1,249.42	1,249.42		
Item 30. To reimburse John Gallon for stock destroyed by				

Detailed Expenditures of the Bureau—Continued.

General Appropriation.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Item 30—Continued.				
the bursting of a water main at 22nd and York Streets, $225.00 and to reimburse Edward Connor for damages to his property by the laying of a water main in 1907, $3,800.				
Ordinance December 19, 1909	$4,025.00	$4,025.00		
Item 31. To reimburse the Bethany Collegiate Presbyterian Church for damages caused by the breaking of a water main at 22nd and Bainbridge Streets.				
Ordinance December 17, 1909	7,200.00	7,200.00		

Statement of the Amount Expended by the Department of Supplies for the Bureau of Water.

Taken from the books of the City Controller.	Amount Appropriated.	Amount Expended.	Amount Merging.	Amount Not Merging.
Items 11, 11a and 11½. For stationery, office and engineer supplies, printing and text books	$9,726 56	$9,273 11	$93 62	$359 80
Item 12. For coal and hauling same	290,000 00	282,697 89	7,302.11	
Items 13,13a and 13½. For oil, lubricants, paints, brushes, wood and coke	9,465 77	9,464 77	1 00	
Items 14 and 14½. For iron water pipe, special castings, and pig lead	33,895 08	33,412 86	482 22	
Items 15 and 15½. For hardware, bolts, nuts, iron, steel and malleable castings	26,872 35	26,819 80	52 55	
Items 16 and 16½. For gum goods and packing	32,146 43	32,137 69	8 74	
Item 17 and 17½. For chandlery	4,003 69	4,002 25	1 44	
Items 18 and 18½. For wrought iron pipe and fittings	5,671 78	5,520 47	151 31	
Item 19. For fire brick and fire clay	1,000 00	998 60	1 40	
Items 20 and 20½. For brass fittings and castings, cocks and valves for steam and water, expansion metal and lead castings	12,636 02	12,149 12	486 90	
Item 21. For covering for steam pipes and boilers	500 00	491 89	8 11	
Item 22. For lumber	10,000 00	9,760 59	239 41	
Item 23. For forage	5,500 00	5,499 74	26	
Items 24 and 24½. For iron and steel	2,524 12	2,473 00	51 12	
Items 25 and 25½. For stone, cement, bricks, lime, sand and building stone	2,562 10	2,552 97	9 13	
Item 26. For electrical supplies	4,000 00	3,988 87	11 13	
Item 27. For tapping and pipe cutting machines and fittings	500 00	448 51	51 49	
Item 28. For horses, wagons, carts, stable supplies and harness	1,800 00	1,798 11	1 89	
Item 29. For donkey pumps, machine tools and condensers	500 00	232 00	268 00	
Item 30. For special articles and small stores	4,500 00	4,258 26	241 74	
Item 31. For lead pipe, block tin and sheet lead	5,000 00	4,359 85	640 15	
	$462,803 90	$452,340 38	$10,103 72	$359 80

Recapitulation.

Balance from books of 1909	$1,443,956 40		
Additional appropriations	2,127,553 28		
Annual appropriation	950,651 00		
Appropriation, Department of Supplies	462,803 90		$4,984,964 58
Expended for improvements	1,222,859 63		
Expended for maintenance	1,604,340 27		
Expended, Department of Supplies	452,340 38	$3,279,540 28	
Amount merging	27,050 77		
Amount merging, Department of Supplies	10,103 72		
Transferred	13,570 00		
Amount not merging	1,654,340 01		
Amount not merging, Department of Supplies	359 80	1,705,424 30	4,984,964 58

APPENDIX B

REPORT

OF THE

GENERAL SUPERINTENDENT

SUBMITTING

TABLES OF EXPENSES, PUMPAGE AND CONSUMPTION OF WATER DURING 1909

Philadelphia, January 1, 1910.

FRED. C. DUNLAP, ESQ.,
Chief, Bureau of Water.

DEAR SIR:—I respectfully submit the following report on the operations and the expenses in connection with the work performed at the several pumping stations during 1909:

During the past year the pumpage from the Schuylkill river has decreased from 84 to 39 billion gallons, and that from the Delaware river has been increased from 34 to 72 billion gallons.

From the two rivers 6.8 billion gallons less water was pumped than during the preceding year.

The price of coal averaged 22 cents per ton less than that purchased in 1908, and this, together with the decrease in the quantity of coal consumed, represents a reduction for this item of $100,115.38.

The pumpage at the high service stations averaged 530,972 gallons per day in excess of that during the preceding year, and for the same period there was a reduction of 390 tons in the coal consumed.

The following tables show the several items of expenditures and the details of pumpage, etc., all of which are respectfully submitted.

Very respectfully yours,

ALLEN J. FULLER,
General Superintendent.

Coal Consumed During 1909.

Pumping Stations.	Classification.	Tons.	Price per Ton	Cost.	Total Cost.
*Fairmount	Egg	40	$5 43	$218 56	$218 56
Spring Garden	Pea	9,289	3 18	29,539 02	29,539 02
Belmont	Pea	38,074	3 18	121,075 32	121,075 32
Queen Lane	Pea	21,100	3 45	72,795 00	72,795 00
Roxborough	Pea	16,934	3 18	53,848 84	
Roxborough	Bituminous	21,448	2 69	57,696 20	111,545 04
Frankford, No. 1	Bituminous	3,872	2 79	10,802 32	
Frankford, No. 1	Bituminous	398	2 48	987 53	11,789 85
Frankford, No. 2	Bituminous	25,940	2 79	72,372 32	
Frankford, No. 2	Bituminous	10,819	2 48	26,831 87	99,204 19
Frankford, No. 3	Bituminous	22,992	2 79	63,982 28	
Frankford, No. 3	Bituminous	7,084	2 48	17,569 56	81,551 84
Totals and averages		177,990	$2 96		$527,718 82
High Service Stations.					
Belmont	Pea	1,245	$3 80	$4,731 00	$4,731 00
Roxborough	Pea	1,862	3 75	6,984 00	6,984 00
Mount Airy	Pea	436	3 90	1,700 40	1,700 40
Chestnut Hill	Pea	58	3 95	229 10	229 10
Frankford	Pea	941	3 74	3,519 34	3,519 34
Totals and averages		4,542	$3 78		$17,163 84
Low Service Stations.					
Roxborough	Pea	4,179	$3 75	$15,669 75	$15,669 75
Torresdale	Bituminous	28,132	2 45	68,923 40	68,923 40
Totals and averages		32,311	$2 62		$84,593 15
Belmont Filters	Pea	113	$3 80	$429 40	$429 40
Grand totals		214,956	$2 93		$629,905 21
Decrease		16,819	$0 22		$100,115 38

*For heating only.

Cost of Pumpage, Gallons Pumped and Percentage of Work Done at Stations, 1909.

Pumping Stations.	Total Expenses.	Total Gallons Pumped.	Lift in feet, including suction.	Gallons pumped 100 feet high, including suction.	Cost of raising 1,000,000 gallons 100 feet high.	Percentage of work done.
Fairmount	$15,321 92	1,048,742,639	112.48	1,179,569,744	$12 99	.94
Spring Garden	17,373 32	3,156,051,055	144.11	4,980,469,835	14 33	3.11
Belmont	238,536 67	*14,214,782,548	296.51	42,237,559,217	5 64	12.82
Queen Lane	146,711 39	*10,426,545,000	255.54	26,653,459,943	5 50	9.38
Roxborough	233,450 17	*10,034,160,918	393.77	39,630,595,027	5 89	9.05
Frankford, No. 1	53,715 90	2,975,211,110	181.64	5,404,322,261	9 94	2.68
Frankford, No. 2	222,344 95	36,826,310,090	215.33	79,297,744,037	2 80	33.14
Frankford, No. 3	160,141 82	32,087,963,250	241.95	77,636,708,987	2 06	28.88
Totals and averages	1,111,596 14	111,129,767,510	249.28	277,020,429,051	4 12	100.00
High Service Stations.						
Belmont	$21,372 57	889,145,940	135.76	1,207,600,295	$17 69	27.77
Roxborough	25,326 60	1,784,124,000	117.53	2,006,923,999	12 08	55.72

Cost of Pumpage, Gallons Pumped and Percentage of Work Done at Stations, 1909—Continued.

Pumping Stations.	Total Expenses.	Total Gallons Pumped.	Lift in feet, including suction.	Gallons pumped 100 feet high, including suction.	Cost of raising 1,000,000 gallons 100 feet high.	Percentage of work done.
Mt. Airy	8,493 56	68,768,487	99.21	68,224,378	121 90	2.15
Chestnut Hill	2,598 65					
Frankford	17,491,37	459,961,615	110.28	615,248,024	27 12	14.36
Totals and averages	75,285 75	3,202,300,942	125.47	4,017,996,696	18 74	100.00
Grand totals	1,216,881 89	114,332,038,452	245.81	281,038,425,747	4 33	
Increase for 1909			78.31	12,615,283,142		
Decrease for 1909	338,704 39	45,932,626,726			1 25	
Low Service Stations.						
Roxborough	$22,451 44	1,982,151,000	27.81	1,285,816,794	$17 46	6.21
Torresdale	150,635 90	175,189,485,350	42.00	31,579,583,846	4 77	93.79
Totals and averages	173,087 34	80,171,636,350	40.09	32,865,400,640	5 27	100.00

Meters.

4 Frankford plus 3,300,000,000 gallons.

Pumpage from rivers, 57.13 per cent. of total pumpage; pumpage high service, 1.65 per cent. of total pumpage; pumpage low service, 41.22 per cent. of total pumpage.

No. 1. All is Chalmers Cross Compound. Capacity 6,000,000 gallons per day.

BELMONT HIGH SERVICE STATION 1909.

Total Capacity 11,000,000 gallons per day.

No. 2. Worthington High Service. Capacity 5,000,000 gallons per day.

1909.	Running Time of Each Engine in Hours.		Gallons Pumped by Each Engine.		Total Pumpage for each Month.	Average Pumpage per Day.	Coal.		Lubricants.			Mean Water Pressure per Square Inch less Mean Pressure on Suction Pipe.		Gallons Raised 100 feet High per Pound Coal.
									Grease and Tallow.	Cylinder Oil.	Engine Oil.			
Months.	No. 1.	No. 2.	No. 1.	No. 2.	Gallons.	Gallons.	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	
January	744	.....	76,823,640	.....	76,823,640	2,478,183	141	170	39	184	616	59	.....	229.90
February	672	.....	61,389,900	.....	61,389,900	2,192,496	108	430	35	672	628	59	.....	343.74
March	744	.....	72,540,360	.....	72,540,360	2,340,012	112	2,200	31	184	560	59	.....	338.95
April	667	54	69,867,360	5,106,710	74,974,100	2,499,137	121	110	38	196	512	59	59	375.21
May	310	433	32,280,120	37,946,120	70,226,240	2,265,363	111	910	47	188	232	59	59	371.86
June	25	695	3,013,200	65,247,280	68,260,480	2,275,349	107	1,330	33	188	8	59	59	381.31
July	674	120	76,736,160	11,072,420	87,808,580	2,832,535	110	2,130	31	256	620	59	59	479.44
August	.....	744	.....	83,310,120	83,310,120	2,687,423	105	110	31	184	560	.....	59	480.44
September	710	11	83,533,689	1,134,180	84,668,660	2,822,289	100	1,510	32	180	504	59	59	509.49
October	447	297	51,138,540	27,542,360	78,689,900	2,538,094	104	940	34	248	356	59	59	457.19
November	270	450	28,403,460	40,596,640	69,000,100	2,300,003	98	1,370	35	236	328	59	59	424.83
December	151	593	15,573,060	46,189,800	61,762,860	1,992,350	109	240	5	132	28	59	59	343.66
Totals and averages	5,364	3,397	571,299,480	318,146,460	889,445,940	2,436,838	1,215	.....	391	2,848	4,952	59	59	433.02

Total Coal Reduced (89 tons—25 lbs.) as per Stock Account.

Jonval Turbine No. 1 Capacity 2,000,000 Gals. per Day.
Jonval Turbine No. 3 Capacity 5,330,000 Gals. per Day.
Jonval Turbine No. 4 Capacity 5,330,000 Gals. per Day.
Jonval Turbine No. 5 Capacity 5,330,000 Gals. per Day.

FAIRMOUNT PUMPING STATION 1909.

Total Capacity 33,290,000 Gallons per day.

Jonval Turbine No. 7 Capacity 5,100,000 Gals. per Day.
Jonval Turbine No. 8 Capacity 5,100,000 Gals. per Day.
Jonval Turbine No. 9 Capacity 5,100,000 Gals. per Day.

1909.	Running Time of Each Turbine in Hours,							Gallons Pumped by Each Turbine.							Total Pumped for Each Month.	Average Pumpage per Day.	Lubricants.		
																	Grease and Tallow.	Cylinder Oil.	Engine Oil.
Months.	No. 1.	No. 3.	No. 4.	No. 5.	No. 7.	No. 8.	No. 9.	No. 1.	No. 3.	No. 4.	No. 5.	No. 7.	No. 8.	No. 9.	Gallons.	Gallons.	Lbs.	Qts.	Qts.
January		68	640	546	590	662	575		14,781,504	139,655,340	118,567,817	114,664,225	130,962,975	112,862,750	631,494,611	20,370,794	20	72	160
February		26	271	212	263	281	242		5,495,120	58,493,985	46,143,334	50,779,950	54,101,450	45,708,000	260,721,839	9,311,494	10	16	56
March	15	68						1,131,520	14,677,779						15,809,299	509,977	1	4	4
April	24	72						2,110,720	15,840,882						17,951,602	598,387		8	12
May	8	88						622,336	20,224,070						20,846,406	672,465		8	12
June		96							22,533,219						22,533,219	751,107		12	12
July		5							1,107,322						1,107,322	35,720		16	
August	3	4						294,400	746,820						1,041,220	33,588		2	4
September	38	1	60					3,011,712	245,252	14,317,277					17,574,241	585,808		4	4
October	40	32	80					3,059,456	7,208,196	18,410,496					28,678,148	925,102		20	16
November			69							16,250,711					16,250,711	541,690		4	6
December			61							14,734,021					14,734,021	475,291		4	6
Totals and averages	128	460	1,181	758	853	943	817	10,230,144	102,860,164	261,861,830	164,711,151	165,444,175	185,064,425	158,570,750	1,048,742,639	2,873,268	31	170	292

No. 5—Southwark Vertical Compound. Capacity 2,0000,000 Gallons per day.
No. 6—Simpson Rotary Compound. Capacity 10,000,000 Gallons per day.
No. 7—Cramp Marine Rotary Compound. Capacity 20,000,000 Gallons per day.
No. 8—Worthington Duplex Compound. Capacity 10,000,000 Gallons per day.
No. 11—Gaskill Compound. Capacity 20,000,000 Gallons per day.

SPRING GARDEN PUMPING STATION, 1909.

Total Capacity, 170,000,000 Gallons per Day.

No. 2—Holly Vertical Triple Expansion. Capacity 30,000,000 Gallons per day.
No. 3—Holly Vertical Triple Expansion. Capacity 30,000,000 Gallons per day.
No. 9—Worthington Duplex Expansion. Capacity 15,000,000 Gallons per day.
No. 10—Worthington Duplex Expansion. Capacity 15,000,000 Gallons per day.

1909.	RUNNING TIME OF EACH ENGINE IN HOURS.									GALLONS PUMPED BY EACH ENGINE.									Total pumpage for each month.	Average pumpage per day.	Coal.		LUBRICANTS.			MEAN WATER PRESSURE AND MEAN SUCTION LIFT IN POUNDS PER SQUARE INCH.									Gallons Raised 100 Feet High Per Pound Coal.
	OLD HOUSE					NEW HOUSE.				OLD HOUSE.					NEW HOUSE																		
Months.	No. 5.	No. 6.	No. 7.	No. 8.	No. 11.	No. 2.	No. 3.	No. 9.	No. 10.	No. 5.	No. 6.	No. 7.	No. 8.	No. 11.	No. 2.	No. 3.	No. 9.	No. 10.	Gallons.	Gallons.	Tons.	Pounds.	Grease and tallow. Pounds.	Cylinder oil. Quarts.	Engine oil. Quarts.	No. 5.	No. 6.	No. 7.	No. 8.	No. 11.	No. 2.	No. 3.	No. 9.	No. 10.	
January	402	744		703		479		691	667	340,333,200	275,280,000		330,692,200		500,955,000		472,339,240	457,176,010	2,376,775,650	76,670,182	4,276	1,778	128	924	1,356	62	62		62		62		63	63	368.10
February	11	309		271		374		296	339	9,520,100	114,515,000		127,674,400		391,335,000		207,361,165	228,869,740	1,079,275,405	38,545,550	2,115	1,640	384	616	216	65	55		62		62		63	63	305.74
March																					290	560			124									
April																					284	600		200										
May																					239													
June																					186	560												
July														Station shut down February 18th.							216													
August																					280	20			220									
September																					289	2												
October																					354	14			208									
November																					347	266			220									
December																					364	2,205												
Totals and averages	413	1,053		974		853		987	1,006	349,853,300	389,795,000		458,366,600		892,290,000		679,700,405	686,045,750	3,456,051,055	9,468,630	9,289		512	1,740	2,344	64	64		62		62		63	63	

Total coal increased (53 tons) as per stock account.

No. 1—Bethlehem Cross Compound. Capacity 10,000,000 Gallons per day.
No. 2—Bethlehem Cross Compound. Capacity 10,000,000 Gallons per day.
No. 3—Worthington Duplex. Capacity 6,500,000 Gallons per day.
No. 4—Worthington Duplex. Capacity 17,000,000 Gallons per day.

BELMONT PUMPING STATION 1909.

Total Capacity 73,500,000 Gallons per day.

No. 5—Holly Rotary Duplex Horizontal Compound. Capacity 10,000,000 Gallons per day.
No. 6—Holly Rotary Duplex Horizontal Compound. Capacity 10,000,000 Gallons per day.
No. 7—Holly Rotary Duplex Horizontal Compound. Capacity 10,000,000 Gallons per day.

1909.	Running Time of Each Engine in Hours.							Gallons Pumped by Each Engine.							Total Pumpage for Each Month.	Average Pumpage per Day.	Coal.		Lubricants.			Mean Water Pressure and Mean Suction Lift in Pounds per Square Inch.							Gallons Raised 100 ft. High per lb. Coal Based on Meters.
																			Grease and Tallow.	Cylinder Oil.	Engine Oil.								
Months.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	Gallons.	Gallons.	Tons.	Pounds.	Pounds.	Quarts.	Quarts.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	
January	------	------	674	717	674	357	560	------	------	172,077,500	535,670,720	264,413,800	127,760,150	220,824,625	1,320,746,795	42,604,735	3,438	2,015	314	872	1,084	------	------	124	125	126	126	126	434.70
February	------	------	192	587	432	662	578	------	------	49,973,000	439,578,880	161,832,300	249,260,550	223,349,350	1,123,994,080	40,142,646	2,802	970	158	876	1,142	------	------	124	125	126	126	126	470.52
March	------	------	------	710	682	703	590	------	------	------	532,945,920	259,484,400	263,754,750	223,268,500	1,279,453,570	41,272,696	2,962	2,000	162	760	1,384	------	------	------	125	126	126	126	506.44
April	13	------	31	697	658	643	544	6,767,800	------	8,771,000	523,627,520	250,909,400	238,705,950	205,417,800	1,234,199,470	41,139,932	2,753	25	211	740	1,268	128	------	129	130	131	131	131	537.65
May	484	------	176	718	697	572	102	194,424,920	------	47,257,000	549,602,560	264,369,700	203,575,400	33,248,950	1,292,478,530	41,692,856	2,867	650	171	348	912	128	------	129	130	131	131	131	539.84
June	690	------	------	569	647	506	225	303,890,660	------	------	427,173,760	241,837,050	183,203,650	80,558,450	1,236,663,570	41,222,119	2,543	1,455	159	772	1,541	128	------	------	130	131	131	131	585.63
July	718	------	------	627	483	699	515	333,701,860	------	------	436,342,400	180,202,400	262,042,200	185,789,625	1,398,078,485	45,099,306	2,950	696	258	884	1,563	128	------	------	130	131	131	131	567.72
August	717	------	------	619	507	624	644	321,062,240	------	------	432,781,440	188,427,050	227,609,900	235,179,175	1,405,059,805	45,324,510	3,114	1,846	214	1,068	1,340	128	------	------	130	131	131	131	539.86
September	653	------	------	637	476	708	644	265,377,220	------	------	445,719,040	175,638,050	260,116,500	236,765,550	1,383,616,360	46,120,545	3,304	350	189	944	1,396	128	------	------	130	131	131	131	503.79
October	677	182	------	713	512	459	518	290,470,140	65,444,900	------	521,863,680	191,567,950	168,319,900	193,339,300	1,431,005,870	46,161,480	3,518	1,993	171	1,096	1,196	128	128	------	130	131	131	131	499.32
November	395	446	------	560	661	535	432	163,380,720	181,053,720	------	401,989,120	247,844,450	194,997,950	159,585,650	1,348,851,610	44,961,720	3,526	170	122	924	1,336	128	128	------	130	131	131	131	453.21
December	553	612	------	172	607	685	593	221,005,660	253,945,940	------	116,962,560	229,689,950	252,465,150	222,477,150	1,296,546,410	41,824,078	3,428	2,190	158	1,228	1,624	128	128	------	130	131	131	131	480.67
Totals and averages	4,900	1,240	1,073	7,326	7,036	7,153	5,945	2,100,081,220	500,444,560	278,078,500	5,364,257,600	2,656,216,500	2,631,812,050	2,219,804,125	15,750,694,555	43,152,588	38,074	------	2,287	10,512	15,786	128	128	127	129	130	130	130	495.25

Pumpage based on plunger displacement. Total coal increased (863 tons) as per stock account.

No. 1. Southwark Vertical Triple Expansion Capacity 20,000,000 gallons per day.
No. 2. Southwark Vertical Triple Expansion Capacity 20,000,000 gallons per day.

QUEEN LANE PUMPING STATION 1909.

Total Capacity 80,000,000 gallons per day.

No. 3. Southwark Vertical Triple Expansion Capacity 20,000,000 gallons per day.
No. 4. Southwark Vertical Triple Expansion Capacity 20,000,000 gallons per day.

1909.	Running Time of Each Engine In Hours.				Gallons Pumped By Each Engine.				Total Pumpage For Each Month.	Average Pumpage Per Day.	Coal		Lubricants.			Mean Water Pressure and Mean Suction Lift in Lbs. Per Square Inch.				Gallons raised 100 ft. high per lb. coal. Based on meters.
Months.	No. 1.	No. 2.	No. 3.	No. 4.	No. 1.	No. 2.	No. 3.	No. 4.	Gallons.	Gallons.	Tons.	Lbs.	Grease and Tallow. Lbs.	Cylinder Oil. Qts.	Engine Oil. Qts.	No. 1.	No. 2.	No. 3.	No. 4.	
January	614	------	700	667	483,987,200	------	557,177,600	536,620,800	1,577,785,600	50,896,310	2,909	740	655	804	418	111	------	111	111	584.60
February	463	------	518	562	367,276,800	------	420,729,600	450,400,000	1,238,406,400	44,228,800	2,397	1,920	770	828	850	111	------	111	111	558.18
March	------	------	48	523	------	------	39,174,400	417,772,800	456,947,200	14,740,232	1,072	354	385	404	212	------	------	111	111	460.64
April	------	------	114	581	------	------	91,392,000	471,430,400	562,822,400	18,760,747	1,210	1,400	387	608	412	------	------	111	111	503.48
May	------	------	------	95	------	------	------	77,536,000	77,536,000	2,501,161	334	640	15	20	232	------	------	------	111	251.18
June	------	------	285	428	------	------	229,644,800	340,998,400	570,643,200	19,021,440	1,051	1,360	444	420	408	------	------	111	111	580.74
July	------	142	669	659	------	108,582,400	527,129,600	515,315,200	1,151,027,200	37,129,910	1,850	1,600	380	1,624	1,028	------	111	111	111	666.21
August	------	464	404	417	------	367,654,400	320,460,800	326,003,200	1,014,118,400	32,713,497	1,711	1,960	1,004	2,224	1,024	------	111	111	111	653.79
September	------	321	367	551	------	248,377,600	287,417,600	432,505,600	968,300,800	32,276,693	1,628	1,080	794	1,016	836	------	111	111	111	634.99
October	------	627	348	528	------	497,100,800	276,921,600	418,348,800	1,192,371,200	38,463,587	1,985	1,000	790	1,436	416	------	111	111	111	668.29
November	------	636	255	455	------	497,260,800	196,313,600	358,035,200	1,051,609,600	35,053,653	1,986	160	781	1,028	236	------	111	111	111	597.86
December	------	491	366	478	------	385,209,600	284,620,800	372,249,600	1,042,080,000	33,615,483	1,941	1,960	758	816	204	------	111	111	111	597.89
Totals and averages	1,077	2,681	4,074	5,944	851,264,000	2,104,185,600	3,230,982,400	4,717,216,000	10,903,648,000	29,873,008	21,100	------	7,163	11,228	6,276	111	111	111	111	563.93

Pumpage based on plunger displacement.

Total coal increased (1,020 tons) as per stock account.

No. 1—Caskill Compound. Capacity, 10,000,000 gallons per day.
No. 2—Worthington Duplex. Capacity, 5,000,000 gallons per day.
No. 3—Worthington Duplex. Capacity, 6,500,000 gallons per day.
No. 4—Worthington High Duty Duplex. Capacity, 5,000,000 gallons per day.
No. 5—Worthington High Duty Duplex. Capacity, 5,000,000 gallons per day.

ROXBOROUGH PUMPING STATION, 1909.

Total Capacity, 51,500,000 gallons per day.

No. 6—Worthington High Duty Duplex. Capacity, 5,000,000 gallons per day.
No. 7—Worthington High Duty Duplex. Capacity, 5,000,000 gallons per day.
No. 8—Holly Cross Compound. Capacity, 5,000,000 gallons per day.
No. 9—Holly Cross Compound. Capacity, 5,000,000 gallons per day.

1909.	Running Time of Each Engine in Hours.									Gallons Pumped by Each Engine.									Total Pumpage for Each Month.	Average Pumpage per Day,	Coal.		Lubricants.			Mean Water Ppessure and Mean Suction Lift in Pounds per Square Inch.									Gallons Raised 100 Feet High per lb. of Coal —Based on Meters.
																							Grease and Tallow.	Cylinder Oil.	Engine Oil.									
Months.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	Gallons.	Gallons.	Tons.	Pounds.	Pounds.	Quarts.	Quarts.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	
January	692	634	733	619	421	472	308	-------	-------	268,301,320	135,951,040	194,297,250	114,992,100	67,408,700	86,919,100	49,949,840	----------	----------	917,819,350	29,607,076	3,848	520	375	1,112	312	171	149	149	171	171	171	171	-------	-------	329.40
February	663	372	665	521	504	469	140	-------	-------	253,933,050	80,456,600	177,393,300	82,290,740	60,588,100	81,859,260	22,522,720	----------	----------	759,043,770	27,108,706	3,144	1,270	275	892	272	171	149	149	171	171	171	171	-------	-------	357.06
March	717	431	737	654	667	444	494	43	-------	271,250,140	92,281,440	200,916,030	98,536,900	79,173,900	74,915,380	76,606,460	9,684,840	----------	903,365,090	29,140,809	3,349	1,490	262	1,060	392	171	149	156	171	171	171	171	182	-------	387.29
April	126	653	718	677	688	540	614	651	59	48,523,370	144,682,240	197,485,260	96,886,020	83,053,200	69,822,040	92,062,020	132,722,880	12,152,280	877,389,310	29,246,310	3,323	1,080	222	800	292	171	149	149	171	171	171	171	182	182	376.76
May	461	210	738	671	692	636	241	721	705	176,908,550	57,294,080	205,667,700	98,370,740	90,722,020	79,266,360	36,449,340	155,640,300	150,733,260	1,051,055,350	33,905,011	3,664	950	449	736	292	171	151	158	171	171	171	171	182	182	448.94
June	716	-------	719	431	511	467	6	662	665	274,814,330	----------	198,374,190	60,710,040	63,427,560	59,304,380	793,286	142,925,228	144,247,260	944,596,260	31,486,542	3,045	1,580	504	840	188	171	-------	164	171	171	171	171	182	182	511.28
July	730	423	725	689	416	667	-------	708	735	313,144,860	78,782,080	185,886,330	87,997,800	45,139,240	75,746,180	----------	179,775,360	182,535,360	1,149,007,210	37,064,749	3,830	2,200	547	1,484	284	171	168	171	171	171	171	-------	182	182	471.77
August	711	300	558	624	211	639	-------	696	720	319,922,190	57,636,800	144,006,660	85,751,960	23,818,500	69,391,900	----------	181,579,020	198,515,760	1,080,622,790	34,858,800	3,598	430	486	1,308	244	171	150	159	171	171	171	-------	183	183	474.53
September	530	239	647	652	531	620	-------	716	711	232,824,620	48,396,960	172,616,640	100,098,000	64,395,040	77,604,760	----------	175,708,500	185,049,720	1,056,694,240	35,223,141	3,501	1,440	365	1,092	308	171	151	163	171	171	171	-------	183	183	485.00
October	733	42	702	384	144	466	-------	702	734	319,129,230	9,016,800	186,993,030	56,740,960	18,064,540	59,650,100	----------	153,026,820	163,927,440	966,548,920	31,178,997	3,556	1,200	525	904	280	171	151	164	171	171	171	-------	183	183	449.97
November	623	-------	371	355	1	465	81	663	678	284,784,150	----------	98,482,020	57,770,080	107,200	65,102,560	9,814,160	155,437,680	156,958,440	828,456,290	27,615,210	3,006	2,120	377	1,168	312	171	-------	169	171	171	171	171	183	183	455.61
December	691	-------	40	183	-------	230	526	697	724	286,069,320	----------	10,631,460	30,026,720	----------	34,975,340	90,366,920	175,047,480	182,114,460	809,222,700	26,103,958	2,417	250	454	1,260	824	166	-------	154	171	-------	171	171	183	183	565.31
Totals and averages.	7,393	3,274	7,353	6,460	4,786	6,115	2,410	6,259	5,731	3,049,596,130	704,498,040	1,972,749,870	970,172,060	595,898,000	834,557,360	378,564,740	1,461,551,100	1,376,233,980	11,343,821,280	31,078,962	38,382	----------	4,861	12,656	4,000	171	152	158	171	171	171	171	183	183	469.98

Pumpage based on plunger displacement. Total coal decreafsed (1,905 tons) as per stock account.

No. 1. Cramp Marine Compound Rotary.
Capacity 10,000,000 gallons per day.
No. 2. Corliss Compound Rotary.
Capacity 10,000,000 gallons per day.

FRANKFORD PUMPING STATION No. 1, 1909.

Total Capacity 57,000,000 gallons per day.

No. 3. Southwark Vertical Compound Rotary.
Capacity 22,000,000 gallons per day.
No. 4. Southwark Vertical Compound Rotary.
Capacity 15,000,000 gallons pe day.

1909.	Running Time of Each Engine in Hours.				Gallons Pumped by Each Engine.				Total Pumpage For Each Month	Average Pumpage Per Day	Coal.		Lubricants.			Mean Water Pressure and Mean Suction Lift in Lbs. Per Square Inch.				Gallons Raised 100 Feet High per Pound of Coal.
													Grease and Tallow.	Cylinder Oil.	Engine Oil.					
Months.	No. 1.	No. 2.	No. 3.	No. 4.	No. 1.	No. 2.	No. 3.	No. 4.	Gallons.	Gallons.	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	No. 3.	No. 4.	
January											42	620	2	36	36					
February											54	2,085		44	24					
March											96	540	10	48	12					
April	34	163		14	11,870,653	48,375,252		8,029,475	68,275,380	2,275,846	204	1,810	91	68	80	83	82		86	284.07
May	81	126		312	25,857,720	41,628,660		176,383,430	243,869,810	7,866,768	343	1,790	92	212	272	72	77		78	558.13
June	374	496		222	116,220,720	158,937,000		130,333,050	405,490,770	13,516,359	512	1,480	181	572	564	80	80		80	651.83
July	392	426		277	125,736,970	141,151,680		173,663,820	440,552,470	14,211,370	509	588	119	668	684	77	77		77	680.48
August	302	298		371	100,862,280	100,421,400		234,650,010	435,933,690	14,062,377	558	360	114	612	1,080	78	78		78	628.86
September	449	280		265	147,189,080	93,005,580		158,008,710	398,203,370	13,273,446	509	785	113	568	604	78	78		78	629.41
October	234	387		318	75,517,650	124,290,780		174,957,370	374,765,800	12,089,219	526	1,540	110	500	528	80	80		80	583.54
November	423	465		183	140,453,230	155,062,620		108,083,990	403,599,840	13,453,328	547	1,900	106	568	636	79	79		79	601.19
December	246	182		116	79,926,570	62,812,200		61,781,210	204,519,980	6,597,419	363	1,695	66	232	192	82	82		82	477.15
Totals and averages	2,535	2,823		2,078	823,634,873	925,685,172		1,225,891,065	2,975,211,110	8,151,263	4,270	1,753	1,004	4,128	4,712	79	79		80	565.04

Six Holly Vertical Triple Expansion, Capacity 20,000,000 gallons per day.

FRANKFORD PUMPING STATION No. 2, 1909.

Total Capacity, 120,000,000 gallons per day.

1909.	Running Time of Each Engine in Hours.						Gallons Pumped by Each Engine.						Total Pumpage for Each Month.	Average Pumpage per Day	Coal		Lubricants.			Mean Water Pressure and Mean Suction Lift in Pounds per Square Inch.						Gallons Raised 100 Feet High per Pound Coal.
																	Grease and Tallow	Cylinder Oil	Engine Oil							
Months.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	No. 10.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	No. 10.	Gallons.	Gallons.	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	No. 10.	
January	529	641	712	696	346	692	422,525,970	520,331,130	568,778,670	554,722,200	274,943,700	557,580,420	2,898,882,090	93,512,325	2,588	60	76½	1,672	1,676	86	86	86	86	86	86	995.10
February	556	538	480	590	595	559	450,973,080	440,009,460	396,830,430	481,254,570	488,179,710	446,266,260	2,703,513,510	96,554,054	2,322	520	8	1,484	1,284	83	83	83	83	83	83	999.75
March	602	718	489	668	718	562	505,698,750	596,756,520	409,578,660	569,368,800	596,941,380	463,252,050	3,141,596,160	101,341,812	2,964	1,640	------	1,868	1,920	93	93	93	93	93	93	1,012.35
April	547	563	600	700	523	564	441,111,510	454,855,140	499,911,210	583,667,010	430,915,770	457,677,810	2,868,138,450	95,604,615	2,944	000	82	1,728	3,160	95	95	95	95	95	95	952.65
May	735	499	501	704	743	657	585,416,070	309,640,500	407,772,720	579,905,820	595,220,760	525,699,180	3,003,655,050	96,892,098	3,038	-------	95	1,832	1,956	94	94	94	94	94	94	954.71
June	664	560	714	699	650	708	511,991,100	456,426,450	573,585,030	562,116,600	516,733,470	558,014,130	3,178,866,780	105,962,226	3,250	-------	90	1,984	2,640	95	95	95	95	95	95	959.12
July	690	702	591	717	713	692	547,804,170	580,419,740	481,233,240	584,235,810	574,772,400	551,956,410	3,320,421,770	107,110,380	2,790	-------	95	2,044	2,048	96	96	96	96	96	96	1,171.41
ugust	650	697	723	740	739	701	517,416,030	569,759,850	589,433,220	613,735,200	605,942,640	559,898,280	3,456,185,220	111,489,846	2,945	-------	94	1,992	2,308	99	99	99	99	99	99	1,195.42
ptember	703	661	521	706	691	712	554,871,510	534,067,650	411,526,800	571,260,060	545,152,140	562,976,910	3,179,855,070	105,995,169	2,910	-------	95	1,812	2,372	96	96	96	96	96	96	1,080.44
tober	638	646	713	548	719	705	503,821,710	531,017,460	572,603,850	452,124,900	574,921,710	557,246,250	3,191,735,880	102,959,222	2,945	-------	94	1,888	1,992	95	95	95	95	95	95	1,056.68
ovember	698	697	706	547	712	706	557,722,620	557,836,380	570,392,640	446,422,680	559,606,770	564,974,820	3,256,955,910	108,565,197	2,945	-------	90	1,432	3,116	97	97	97	97	97	97	1,104.65
ecember	545	493	663	424	579	677	419,852,610	391,128,210	517,735,980	338,329,350	445,306,410	514,152,540	2,626,505,100	84,725,971	3,069	-------	99	1,296	1,728	88	88	88	88	88	88	777.49
Totals and averages	7,557	7,415	7,413	7,739	7,728	7,935	6,019,205,130	5,942,248,490	5,999,382,450	6,337,143,000	6,208,636,860	6,319,695,060	36,826,310,990	100,894,003	36,759	-------	918½	21,032	26,200	93	93	93	93	93	93	963.05

Coal Total Increased (2048 tons) as per Stock Account.

6 Holly Vertical Triple Expansion Capacity
20,000,000 gallons per day each

FRANKFORD PUMPING STATION No. 3, 1909.

Total Capacity 120,000,000 gallons per day.

1909	Running Time of Each Engine in Hours.						Gallons Pumped by Each Engine.						Total Pompage For Each Month	Average Pumpage Per Day.	Coal.		Lubricants.			Mean Water Pressure and Mean Suction Lift In Lbs. Per Square Inch.						Gallons Raised 100 Feet High per Lb. of Coal.
Months.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	Gallons.	Gallons	Tons.	Lbs.	Grease & Tallow. Lbs.	Cylinder Oil. Qts.	Engine Oil. Qts.	No.11	No.12	No.13	No14	No15	No16	
January	19	37	40	-------	-------	160	15,300,720	32,122,980	34,632,810	----------	----------	132,089,580	214,146,090	6,907,938	356	1,710	-----	-------	-------	131	131	131	96	96	96	754.80
February	29	349	53	286	57	420	21,770,820	290,905,650	43,264,350	245,195,460	46,854,900	357,597,450	1,005,588,630	35,913,880	934	800	-----	-------	-------	85	85	85	83	83	83	932.05
March	592	235	656	691	676	723	476,327,340	187,846,200	530,889,480	575,390,970	571,629,780	604,435,320	2,946,519,090	95,049,003	2,850	1,450	-----	80	376	125	125	125	92	92	92	1,115.88
April	563	263	610	708	684	709	460,941,300	295,128,990	516,712,140	602,657,820	581,704,650	601,804,620	3,058,949,520	101,964,984	2,942	-------	-----	136	676	117	117	117	95	95	95	1,113.82
May	732	716	727	713	841	560	578,334,510	567,008,280	588,089,430	604,037,160	598,356,270	447,723,810	3,383,549,460	109,146,757	2,945	-------	28	244	332	112	112	112	95	95	95	1,223.96
June	714	673	716	680	361	671	567,982,350	526,296,420	577,474,200	559,777,410	289,526,310	576,194,400	3,097,251,090	103,241,703	2,800	-------	60	28	472	115	115	115	96	96	96	1,206.84
July	742	741	743	622	491	688	596,713,860	593,571,240	603,660,330	530,384,670	395,145,360	584,242,920	3,303,718,380	106,571,561	2,542	-------	10	108	1,056	113	113	113	93	93	93	1,426.85
August	667	536	563	698	726	720	521,120,340	423,300,960	442,206,450	553,954,320	596,137,950	601,100,730	3,137,820,750	101,220,024	2,542	-------	94	1,980	2,336	116	116	116	100	100	100	1,360.37
September	708	717	637	408	679	639	560,054,700	572,994,900	518,745,600	336,132,360	576,187,290	547,626,420	3,111,741,270	103,724,709	2,550	-------	150	1,220	2,528	116	116	116	97	97	97	1,342.56
October	686	701	737	664	500	679	530,086,050	549,012,870	593,770,320	561,227,850	416,333,160	572,291,010	3,222,721,260	103,958,750	2,697	-------	156	1,412	2,488	116	116	116	98	98	98	1,322.90
November	575	603	502	498	582	508	431,349,480	450,446,940	391,384,170	380,129,040	470,234,070	410,403,420	2,533,947,120	84,464,904	2,697	-------	95	1,000	1,844	115	115	115	93	93	93	1,009.23
December	741	740	730	538	615	463	576,493,020	579,337,020	588,494,700	448,726,320	503,252,910	375,706,620	3,072,010,590	99,097,116	2,945	-------	120	1,100	2,060	117	117	117	87	87	87	1,114.20
Totals and averages	6,768	6,411	6,714	6,506	6,212	6,940	5,336,474,490	5,067,972,450	5,429,323,980	5,397,613,380	5,045,362,650	5,811,216,300	32,087,963,250	82,432,776	30,076	1,720	713	7,308	14,168	115	115	115	94	94	94	1,152.39

Total Coal Includes (12275 tons) as per Stock Account.

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

ROXBOROUGH HIGH SERVICE STATION 1909.

Total Capacity 10,000,000 gallons per day.

No. 2—Worthington High Duty Duplex. Capacity 5,000,000 gallons per day.

1909.	Running Time of Each Engine in Hours.		Gallons Pumped by Each Engine.		Total Pumpage for Each Month.	Average Pumpage per Day.	Coal.		Lubricants.			Mean Water Pressure per Square Inch Less Mean Pressure on Suction Pipe.		Gallons Raised 100 feet High per Pound Coal
									Grease and Tallow.	Cylinder Oil.	Engine Oil.			
Months.	No. 1.	No. 2.	No. 1.	No. 2.	Gallons.	Gallons.	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	
January	6	738	1,634,400	128,331,800	129,966,200	4,192,458	139	1,840	27	136	24	51	..	0
February	4	668	1,112,400	117,649,320	118,761,720	4,241,490	133	1,980	21	140	.....	51	51	464.51
March	10	734	2,797,200	127,695,300	130,492,500	4,209,436	133	180	27	156	24	51	51	513.48
April	425	295	98,035,200	52,643,240	150,678,440	5,022,615	161	1,460	9	176	24	51	51	488.11
May	728	4	183,333,600	888,420	184,222,020	5,942,646	183	1,880	19	204	24	51	51	524.75
June	259	460	65,619,600	91,807,420	157,457,020	5,248,567	146	2,060	18	196	24	51	51	561.22
July	3	741	874,800	157,886,840	158,761,640	5,121,343	141	1,060	23	188	24	51	51	587.65
August	...	744	.....	154,823,600	154,823,600	4,994,310	112	920	23	168	24	51	51	569.30
September	5	715	1,504,800	143,973,620	145,478,420	4,849,281	148	280	22	140	24	51	51	514.30
October	89	655	24,048,000	131,372,260	155,420,260	5,013,557	160	1,300	23	140	24	51	51	507.70
November	299	421	79,437,600	82,440,820	161,878,420	5,395,947	213	980	25	128	20	51	51	397.12
December	51	739	1,328,400	134,856,260	136,184,660	4,393,054	154	1,540	23	.....	28	51	51	471.01
Totals and averages.	1,889	6,914	459,756,000	1,324,368,900	1,784,124,900	4,888,013	1,862	.....	260	1,772	264	51	51	502.75

Total coal increased (2 tons) as per stock account.

No. 1 Davidson Rotary, Capacity 1,000,000 gallons per day.

MOUNT AIRY PUMPING STATION 1909.

Total Capacity 3,000,000 gallons per day.

No. 2. Davidson Rotary, Capacity 1,000,000 gallons per day.

No. 3. Knowles Rotary Capacity 1,000,000 gallons per day.

1909	Running Time of Each Engine in Hours			Gallons Pumped by Each Engine.			Total Pumpage for Each Month.	Average Pumpage Per Day.	Coal		Lubricants			Mean Water Pressure per sq. in. Less Mean Pressure on Suction Pipe			Gallons Raised 100 feet High per Pound Coal.
											Grease and Tallow	Cylinder Oil.	Engine Oil.				
Months.	No. 1.	No. 2.	No. 3.	No. 1.	No. 2.	No. 3.	Gallons.	Gallons.	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	No. 3.	
January	1	2		45,000	90,000		135,000	4,355	17	1,720		8	2	44	44		3.40
February	5	2		225,000	90,000		315,000	11,250	17	2,020				44	44		7.95
March	6	2		270,000	90,000		360,000	11,613	19	1,540		12	8	44	44		6.55
April	45	35		2,025,000	1,575,000		3,600,000	120,000	23	480	9	12	28	44	44		70.06
May	52	100		2,340,000	4,598,537		6,938,537	223,824	32	2,020	1	24	8	44	44		95.27
June	15	26		680,000	1,170,000		1,850,000	61,667	28	1,280		8	4	44	44		29.27
July	91	246		4,296,250	11,782,500		16,078,750	518,669	46	160	2	28	12	44	44		157.67
August	32	258		1,483,750	12,518,700		14,002,450	451,692	47	1,944	2	32	4	44	44		132.13
September	34	243		1,657,500	11,482,500		13,140,000	438,000	43	1,680	2	80	8	44	44		135.69
October	42	177		1,980,000	8,201,250		10,181,250	328,427	40	1,200				39	39		100.80
November	9	33		457,500	1,485,000		1,942,500	64,750	21	860		24	2	39	39		36.46
December	5			225,000			225,000	7,285	21	460		2	2	44			4.82
Totals and averages.	337	1,124		15,685,000	53,083,487		68,768,487	188,407	436		16	230	78	43	43		69.86

Total cost increased (71 tons) as per stock account.

No. 1—Knowles. Capacity, 250,000 gallons per day.

CHESTNUT HILL PUMPING STATION, 1909.

Total capacity, 750,000 gallons per day.

No. 2—Worthington Duplex. Capacity, 500,000 gallons per day.

1909.	Running Time of Each Engine in Hours.		Gallons Pumped by Each Engine.		Total Pumpage for Each Month.	Average Pumpage per Day.	Coal.		Lubricants.			Mean Water Pressure per Square Inch Less Mean Pressure on Suction Pipe.		Gallons Raised 100 Feet High per Pound Coal.
									Grease and Tallow.	Cylinder Oil.	Engine Oil.			
Months.	No. 1.	No. 2.	No. 1.*	No. 2.*	Gallons.*	Gallons.*	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	
January							4	340						
February							3	1,680						
March							4	340						
April							4	40						
May							4	340						
June							4	40						
July							4	340						
August							4	340						
September							4	40						
October							4	340						
November							5	450						
December							5	1,200						
Totals and averages							58							

*No Pumpage. Total Coal Increased (7 tons) as per Stock Account.

No. 1. Holly Rotary Duplex. Capacity 3,000,000 gallons per day.

FRANKFORD HIGH SERVICE STATION 1909.

Total Capacity 7,000,000 gallons per day.

No. 2. D'Auria Horizontal Compound. Capacity 4,000,000 gallons per day.

1909.	Running Time of Each Engine in Hours.		Gallons Pumped by Each Engine.		Total Pumpage for Each Month.	Average Pumpage per Day.	Coal.		Lubricants.			Mean Water Pressure per sq. in. Less Mean Pressure on Suction Pipe.		Gallons Raised 100 feet High per Pound Coal.
									Grease and Tallow.	Cylinder Oil.	Engine Oil.			
Months.	No. 1.	No. 2.	No. 1.	No. 2.	Gallons.	Gallons.	Tons.	Lbs.	Lbs.	Qts.	Qts.	No. 1.	No. 2.	
January	282	462	11,785,840	26,933,780	38,719,630	1,249,020	86	400	13	36	40	61	61	281.40
February	356	71	12,841,945	18,235,620	31,077,560	1,109,913	61	1,820	.....	60	28	61	61	311.88
March	160	585	6,122,430	33,977,190	40,099,620	1,293,536	80	2,210	.....	116	44	61	61	310.12
April	415	304	18,206,105	17,987,580	36,253,685	1,208,456	70	1,140	.....	84	68	61	61	322.04
May	375	353	17,609,730	22,229,220	39,838,950	1,285,127	72	2,230	.....	356	180	61	61	341.84
June	411	309	19,139,010	19,402,110	38,541,120	1,284,704	66	2,030	.....	272	124	61	61	360.80
July	504	241	29,658,710	16,722,810	46,381,520	1,496,178	71	1,520	.....	76	48	61	61	405.29
August	407	316	21,126,230	23,035,740	44,161,970	1,424,580	77	150	.....	96	184	61	61	338.91
September	35	679	1,678,550	41,285,010	42,963,560	1,432,119	73	510	.....	92	40	61	61	365.17
October	223	519	9,466,550	28,306,590	37,773,140	1,218,488	71	1,010	.....	96	56	61	61	331.83
November	378	541	13,105,080	20,157,930	33,263,010	1,108,767	69	1,915	.....	60	48	61	61	298.87
December	567	177	20,967,420	9,920,430	30,887,850	996,382	75	2,120	.....	72	72	61	61	255.26
Totals and averages	4,113	4,387	181,767,505	278,194,020	459,961,615	15,107,270	941	.....	13	1,416	932	61	61	306.12

Total Coal Increased (62 tons) as per Stock Account.

TOTAL GALLONS PUMPED AND CONSUMED DURING THE YEAR 1909.

Months.	Main Pumping Stations.								Consumption.			High Service Stations.							Low Service Stations.				Total Pumpage and Auxiliary Pumpage.	Average per Day.	Per-centage of Pumpage.	Total Steam Pumpage.	Total Water Pumpage.
	Fairmount.	Sp. Garden.	Belmont. Meters.	Queen Lane. Meters.	Roxborough. Meters.	Frankford.	Total.	Average per day.	Stored in Reservoirs at End of Each Month.	Total.	Average per Day.	Belmont.	Roxborough.	Mt. Airy.	Chestnut Hill.	Frankford.	Total.	Average per day.	Roxborough.	Torresdale.	Total.	Average per Day.					
December, 1908									1,463,240,890																		
January, 1909	631,494,611	2,376,775,650	1,163,027,370	1,491,132,500	749,571,254	3,113,028,180	9,525,029,565	307,259,018	1,480,934,270	9,507,336,185	306,688,264	76,823,640	129,966,200	135,000		38,719,630	245,644,470	7,924,015	389,837,000	3,388,028,180	3,777,865,180	136,065,939	13,548,539,215	437,049,652	6.97	12,917,044,604	631,494,611
February	260,721,839	1,079,275,405	1,025,949,712	1,173,432,500	663,790,090	3,709,102,140	7,912,271,656	282,581,131	1,194,179,259	8,199,026,667	292,822,381	61,389,900	118,761,720	315,000		31,077,560	211,544,180	7,555,149	337,611,000	3,984,102,140	4,321,713,140	161,459,159	12,455,528,976	444,483,178	6.37	12,184,807,137	260,721,839
March	15,809,299		1,163,036,580	432,972,500	764,727,954	6,088,115,250	8,464,661,583	273,053,599	1,015,193,636	8,643,647,206	278,827,329	72,540,360	130,492,500	360,000		40,099,620	243,492,480	8,116,416	360,933,000	6,363,115,250	6,724,048,250	233,046,814	15,432,202,313	497,812,978	7.93	15,416,393,014	15,809,299
April	17,951,602		1,109,999,805	534,375,000	723,312,047	5,995,363,350	8,381,001,804	279,366,727	1,015,429,010	8,380,766,430	279,358,881	74,974,100	150,678,440	3,600,000		36,253,685	265,506,225	8,850,207	394,186,000	6,270,363,350	6,664,549,350	222,151,645	15,311,057,379	510,368,579	7.87	15,293,105,777	17,951,602
May	20,846,406		1,159,609,300	73,615,000	943,916,304	6,631,074,320	8,829,061,230	284,808,427	1,010,164,919	8,834,325,321	284,978,236	70,226,240	184,222,020	6,938,537		39,838,950	301,225,747	9,716,959	354,046,000	6,906,074,320	7,260,120,320	234,197,430	16,390,407,297	528,722,816	8.43	16,369,560,891	20,846,406
June	22,533,219		1,115,230,635	535,420,000	875,974,601	6,681,608,640	9,230,767,065	307,692,235	903,106,840	9,337,825,144	311,260,838	68,260,480	157,457,020	1,850,000		38,541,120	266,108,620	8,870,287	419,337,000	6,956,608,640	7,376,445,640	245,881,521	16,873,321,325	562,444,044	8.68	16,850,788,106	22,533,219
July	1,107,322		1,253,977,612	1,080,957,500	1,014,654,006	7,064,692,620	10,415,389,060	335,980,292	1,051,937,690	10,266,558,210	331,179,297	87,808,580	158,761,640	16,078,750		46,381,520	309,030,490	9,968,725	579,026,000	7,339,692,620	7,918,718,620	255,442,536	18,643,138,170	601,391,554	9.53	18,642,030,848	1,107,322
August	1,041,220		1,258,939,312	981,232,500	978,635,275	7,029,939,660	10,249,787,967	330,638,322	1,015,182,827	10,286,542,830	331,823,962	83,310,120	154,823,600	14,002,450		44,161,970	296,298,140	9,557,359	511,652,000	7,304,939,660	7,816,591,660	252,148,118	18,362,677,767	592,344,444	9.45	18,361,636,547	1,041,220
September	17,574,241		1,246,715,400	906,587,500	953,307,846	6,689,709,710	9,816,984,697	327,232,823	972,720,190	9,859,447,336	328,648,245	84,668,660	145,478,420	13,140,000		42,963,560	286,250,640	9,541,688	449,973,000	6,964,799,710	7,414,772,710	250,284,031	17,518,008,047	583,933,601	9.01	17,500,433,806	17,574,241
October	28,678,148		1,316,704,080	1,161,450,000	867,764,824	6,789,222,940	10,163,819,990	327,865,161	1,227,307,272	9,959,232,908	319,652,674	78,608,900	155,420,260	10,181,250		37,773,140	282,055,550	9,098,566	444,298,000	7,064,222,940	7,508,520,940	242,210,353	17,954,396,480	579,174,080	9.24	17,925,718,332	28,678,148
November	16,250,711		1,196,929,777	1,039,230,000	763,772,641	6,194,502,870	9,210,685,999	307,022,867	1,255,518,788	9,182,474,483	306,082,483	69,000,100	161,878,420	1,942,500		33,263,010	266,084,030	8,869,468	364,385,000	6,469,502,870	6,833,887,870	227,796,262	16,310,657,899	543,688,597	8.39	16,294,407,188	16,250,711
December	14,734,021		1,234,663,095	1,016,140,000	761,734,108	5,903,035,670	8,930,306,804	288,074,416	896,831,493	9,288,994,189	299,644,974	61,762,860	136,184,660	225,000		30,887,850	229,060,370	7,389,044	376,367,000	6,178,035,670	6,554,402,670	211,432,344	15,713,769,934	506,895,804	8.08	15,699,035,913	14,734,021
Totals	1,048,742,639	3,456,051,055	14,244,782,548	10,426,545,000	10,064,160,918	71,889,485,350	111,129,767,510	304,465,116		111,696,176,909	306,016,923	889,445,940	1,784,124,900	68,768,487		459,961,615	3,202,300,942	8,773,427	4,982,151,000	75,189,485,350	80,171,636,350	222,770,854	194,503,704,872	532,886,862	100.00	193,454,962,163	1,048,742,639
Increase during 1909					105,683,511	38,122,764,358						103,842,775	110,641,035	24,295,987			193,804,786	553,492	185,011,000	40,616,088,350	40,801,099,350	115,201,081	34,239,039,624	95,005,181		38,560,088,096	
Decrease during 1909	4,321,078,472	29,781,800,425	1,677,103,484	9,294,369,000			6,755,894,512	17,626,857		6,171,922,931	16,027,066				355,570	44,619,441											4,321,078,472

CURRENT EXPENSES OF PUMPING STATIONS FOR THE YEAR 1909.

PUMPING STATIONS.	REPAIRS.												Total.	Wages of Employees.	Transportation.	OPERATION.											Total Expenses.
	Engines.		Boiler.		Electric Lighting.		Buildings.		Grounds.		Improvement.					Coal Consumed.		Lubricants Grease and Tallow.				Packing.	Oils for Lighting.		Miscellaneous Supplies.	Total.	
	Material.	Wages.	Material.	Wages.	Material.	Wages.	Material.	Wages.	Material.	Wages.	Material.	Wages.				Tons.	Cost.	Gallons.	Cost.	Pounds.	Cost.	Total.		Gallons.	Cost.			
Fairmount	$9 49	$435 63					$103 84	$1,329 00	$74 50	$921 94	$14 20		$2,888 60	$11,892 05	$62 23	40	$218 56	115.5	$23 57	31.	$2 06	$26 63	$29 06	84.	$10 20	$194 59	$12,433 32	$15,321 92
Spring Garden	167 69	3,356 77	$398 11	$1,971 78	$17 28	$52 50	1,002 76	3,698 82	9 50	579 84	47 23	$107 84	11,410 12	28,484 75	72 13	9,289	29,539 02	519.	215 67	512.	51 20	266 87	313 22	214.5	25 74	1,261 47	59,963 20	71,373 32
Belmont	3,485 12	13,569 55	4,391 14	6,486 68	245 17	187 85	2,018 03	6,586 15	81 61	712 69	526 08	1,434 95	39,725 02	66,199 44	147 28	38,074	121,075 32	6,574.5	1,209 92	2,287.	224 81	1,434 73	5,253 94	547.	65 67	4,635 27	198,811 65	238,536 67
Queen Lane	4,928 10	21,587 51	1,025 61	4,976 61	31 76	22 18	543 93	1,461 90	14 30	274 19		113 81	34,979 90	32,408 72	197 48	21,100	72,795 00	4,376.	958 20	7,163.	710 32	1,668 52	1,768 46	349.	41 76	2,851 55	111,731 49	146,711 39
Roxborough	7,105 73	14,701 39	2,855 68	5,438 64	140 20	150 94	1,707 29	4,888 95	800 74	2,833 63	955 18	2,991 71	44,570 08	68,161 41	1,626 96	Bit.,21,448 Pea,16,934	57,606 20 / 53,848 84	4,164.	989 37	4,841.	474 54	1,463 91	4,759 57	397.	47 58	1,275 62	188,880 09	233,450 17
Frankford, No. 1	336 75	5,580 84	256 42	1,418 63	23 30		707 38	800 66	82 58	215 59	339 13	696 80	10,458 08	29,176 19	75 19	4,270	11,789 85	2,210.	467 79	1,004.	97 98	565 77	825 34	64.	7 45	818 03	43,257 82	53,715 90
Frankford, No. 2	782 85	7,768 13	2,304 18	12,474 84	532 47	265 68	316 31	2,666 71	183 67	1,974 36	1,068 24	1,921 04	32,258 48	82,944 65	116 59	36,759	99,204 19	11,808.	2,322 95	918.5	90.46	2,413 41	2,759 56	321.	37 96	2,610 11	190,086 47	222,344 95
Frankford, No. 3	501 96	3,064 39	1,844 88	7,537 98	327 59	20 75	260 23	2,310 41	193 09	170 35	670 04	980 35	17,882 02	55,599 18	106 86	30,076	81,551 84	5,369.	1,082 10	713.	71 40	1,153 50	1,622 52	432.	41 06	2,184 84	142,259 80	160,141 82
Totals	$17,317 69	$70,064 21	$13,076 02	$40,305 16	1,317 77	$699 90	$6,659 77	$23,742 60	$1,439 99	$7,682 59	$3,620 10	$8,246 50	$194,172 30	$374,866 39	$2,404 72	177,990	$527,718 82	35,136.	$7,269 57	17,469.5	$1,723 77	$8,993 34	$17,331 67	2,408.5	$277 42	$15,831 48	$947,423 84	$1,141,596 14
HIGH SERVICE STATIONS.																												
Belmont	$340 06	$2,104 24	$107 16	$780 65			$74 32	$297 54	$48 42	$552 61	$27 25		$4,332 25	$11,501 18	$44 24	1,245	$4,731 00	1,971.	$422 02	391.	$38 15	$460 17	$6 20	74.	$8 88	$238 65	$17,040 32	$21,372 57
Roxborough	753 11	1,508 35	1,503 68	1,658 87	$7 37		121 99	218 03		126 61		$6 00	5,904 01	11,409 51	154 02	1,862	6,984 00	509.	121 48	260.	25 26	146 74	508 39	45.	5 41	214 52	19,422 59	25,326 60
Mount Airy	76 59	200 66	8 46	15 25			42 09	291 10		255 85	4 25		894 25	5,783 34	40 50	436	1,700 40	79.5	18 22	18.	1 80	20 02	23 60	215.	2 58	28 87	7,569 31	8,493 56
Chestnut Hill	1 72		1 06										2 78	2,278 38	58	58	229 10							252.5	30 48	57 33	2,595 87	2,598 65
Frankford	305 98	1,860 06	88 43	244 43	21 83	$15 19	304 20	167 33	26 42	175 10			3,206 97	9,478 96	13 30	941	3,519 34	587.	129.69	13.	85	130 54	178 73	47.	5 69	958 84	14,285 40	17,494 37
Totals	$1,477 46	$5,673 31	$1,708 79	$2,699 20	$29 20	$15 19	$542 60	$974 00	$74 84	$1,110 17	$31 50	$6 00	$14,342 26	$40,451 37	$252 64	4,542	$17,163 84	3,146.5	$691 41	682.	$66 06	$757 47	$766 92	633.5	$53 04	$1,498 21	$60,943 49	$75,285 75
LOW SERVICE STATIONS.																												
Roxborough	$507 42	$937 00		$27 70	$55 73		$4 74	$82 00			$216 50	$10 75	$1,841 84	$4,263 96		4,179	$15,669 75	5,880.	$358 80	22.	$2 24	$361 04	$147 82	5.5	$0 66	$166 37	$20,609 60	$22,451 44
Torresdale	6-6 40	9,103 53	$2,088 42	6,079 56	559 19	$20 90	1,499 94	4,249 49	$316 78	$496 85	1,138 03	386 10	26,625 19	48,170 41	$129 80	28,132	68,923 40	8,646.	$1,802 23	279.	27 90	1,830 13	736 08	292.	$33 61	4,187 28	124,010 71	$150,635 90
Totals	$1,193 82	$10,040 53	$2,088 42	$6,107 26	$614 92	$20 90	$1,504 68	$4,331 49	$316 78	$496 85	$1,354 53	$396 85	$28,467 03	$52,434 37	$129 80	32,311	$84,593 15	14,526.	$2,161 03	301.	$30 14	$2,191 17	$883 90	297.5	$34 27	$4,353 65	$144,620 31	$173,087 34
Grand totals	$19,988 97	$85,778 05	$16,873 23	$49,111 62	$1,961 89	$735 99	$8,707 05	$29,048 09	$1,831 61	$9,289 61	$5,006 13	$8,649 35	$236,981 59	$467,752 13	$2,787 16	214,843	$629,475 81	52,808.5	$10,122 01	18,452.5	$1,819 97	$11,941 98	$18,982 49	3,339.5	$364 73	$21,683 34	1,152,987 64	$1,389,969 23
Increase, 1909		$8,586 61	$4,578 24	$12,717 75	$1,679 02			$4,706 89		$3,150 49	$4,673 00	$5,473 29						5,617.5	$938 49			$758 63	*_____	185.5		*$10,371 47		
Decrease, 1909	*$42,456 47					$2,622 40	$9,369 67		$291 41				$28,152 05	$68,156 56	$2,694 29	15,981	$96,721 76			2,567.5	$179 86		*_____		$4 93		$137,465 00	$165,617 05

*Packing for 1909 is added to material for engine repairs for comparison with 1908.

*Outside current for 1908 is added to miscellaneous supplies for comparison with 1909.

DESCRIPTION OF STEAM BOILERS, BUREAU OF WATER, PHILADELPHIA, 1909.

PUMPING STATION.	TYPE OF BOILERS.	STEAM BOILERS.																		
		Number of Boilers.	Diameter of Shell (inches).	Length of Shell (feet).	Thickness of Shell (inches).	Number of Flues.	Diameter of Flues (inches).	Thickness of Flues (inches).	Length of Flues (feet).	Number of Tubes.	Length of Tubes (feet).	Diameter of Tubes (inches).	Diameter of Steam Drum (inches).	Length of Steam Drum (feet).	Length of Grate (feet).	Area of Grate (square feet).	Area of Heating Surface (square feet).	Estimated Horse-power, at 10 square feet for Shell and Fire Flues, 15 square feet for Tubes and 12 square feet for Drums.	Height of Stack (feet).	Section of Stack (square feet).
Spring Garden	Marine, Steel	24	138	10⅝	1⅛ 1⅛ 5/16	Fox 2	corru 43	gat 3/8	ed. 8	188	8	3	42	12½	6⅛	42	1,551	113	100	49
	Furnace Flue, Tubular	10	102	20	⅝	2	37	⅜	8	90	10	4	.....	.....	6⅛	42	1,116	100	150	27
	Tubular	10	72	12	½	....	.....	....	.....	92	12	4	2 domes 48	14	6	40½	1,371	95.9	95	25
Belmont	Furnace Flue, Tubular	5	102	20	⅝	2	42	⅜	8	90	10	4	.....	.....	6⅛	42	1,116	100	150	38½
	Furnace Flue, Tubular	11	102	20	7/8	2	42	17/32	8	90	9.4	4	.....	.....	6⅛	42	1,116	100	150	38½
	Furnace Flue, Tubular	10	102	20	7/8	2	42	17/32	8	90	9.4	4	.....	.....	8⅛	42	1,116	100	150	38½
Belmont High Service	Furnace Flue	4	102	20	⅝	2	42	⅜	7½	90	10	4	.....	.....	6⅛	42	1,116	80	125	20
Belmont Filters	Furnace Flue, Tubular	4	114	15⅝	¾	2	38	⅜	12	108	12.5	3½	.....	.....	.....	41	1,302	.....	150	
Queen Lane	Furnace Flue, Tubular	24	102	20	⅝	2	42	⅜	8	90	10	4	.....	.....	6⅛	42	1,116	100	202	113
Roxborough	Water Tube	4	.....	.....	.....	.....	.....	.....	.....	254	18	4	3-36	21	8½	102	5,090	500	175	38½
	Furnace Flue, Tubular	8	102	20	7/8	2	42	17/32	8	90	9.4	4	.....	.....	6⅛	42	1,116	100	175	38½
Roxborough High Service	Furnace Flue	4	102	20	⅝	2	42	⅜	7½	90	10	4	.....	.....	6⅛	42	1,116	80	125	20
Mt. Airy	Tubular	3	48	10	5/16	....	.....	....	.....	48	10	3	1 dome..	.....	4	16⅔	475	33	50	7 5/16
Chestnut Hill	Cylinder	2	Connecte 30	d by 1 30	drum	int	he flu	ean	d 1 on	top.	.....	....	30	7½	5	13¾	175	16½		
	Tubular	1	48	14	5/16	....	.....	....	.....	44	14	3	24	24	5	22½	.....	44		
Frankford	Marine, Steel	12	138	10⅝	15/16 3/4	Fox 2	corru 43	gat 3/8	ed. 8	188	8	3	42	12½	.....	42	1,551	113	150 100	38 33
	Furnace Flue, Tubular	12	108	20	15/16	2	41	17/32	8	195	9.25	3½	.....	.....	5¾	40¼	1,811.5	110	150	38½
	Water Tube—Wetzel Stoker	6	.....	.....	.....	.....	.....	.....	.....	254	18	4	2-36	21	8½	102	5,090	500	150	38½
	Water Tube—Wetzel Stoker	8	.....	.....	.....	.....	.....	.....	.....	252	18	4	2-36	21	8½	102	5,080	500	150	38½
Frankford High Service	Furnace Flue, Tubular	3	102	20	7/8	2	42	17/32	8	90	9.4	4	.....	.....	6⅛	37½	1,116	100	125	12
Torresdale Filters	Water Tube—Murphy Stoker	9	.....	.....	.....	.....	.....	.....	.....	189	18	3½	1-48	23	7½	66	3,280	325	250	

DESCRIPTION OF PUMPING MACHINERY OF THE BUREAU OF WATER PHILADELPHIA, 1909

STEAM ENGINES AND PUMPS.

High Pressure Cylinder and Int. Pressure Cylinder

Pumping Station.	Designated Number of Engine or Turbine	Types of Engines.	Designated Capacity—Million Gallons per Day.	High Pressure Cylinder: Number of Cylinders.	Bore (inches).	Stroke (feet).	Number of Revolutions.	Speed (feet per minute).	Diameter of Rod (inches).	Int. Pressure Cylinder: Number of Cylinders.	Bore (inches).	Stroke (feet).	Number of Revolutions.	Speed (feet per minute).	Diameter of Rod (inches).
Spring Garden: (Old Station)	5	Southwark Foundry Quarter-Crank Fly Wheel Pump	20	2	44	4	16⅔	133⅓	8						
	6	Simpson Compound Rotary	10	1	36	5.17	11	133⅔	4						
	7	Cramp Marine Comp. Rotary	20	1	45	6	17	204	8						
	8	Worthington Duplex	10	2	38	4	12½	100	4½						
(New Station)	2	Holly Ver. Triple Expansion	30	1	36	5	20	200	7½	1	62½	5	20	200	7½
	3	Holly Ver. Triple Expansion	30	1	36	5	20	200	7½	1	62½	5	20	200	7½
	9	Worthington Duplex	15	2	38	4	12½	100	4½						
	10	Worthington Duplex	15	2	38	4	12½	100	4½						
Belmont	1	Bethlehem Horz Cross Comp	10	1	34	4	25	200	8						
	2	ethlehem Horz. Cross Comp.	10	1	34	4	25	200	8						
	4	Worthington Duplex	20	2	41	4	16¼	130	7						
	5	Holly Horz. Compound	10	2	20	3.17	28½	180¼	3¾						
	6	Holly Horz. Compound	10	2	20	3.17	28½	180¼	3¾						
	7	Holly Horz. Compound	10	2	20	3.17	28½	180¼	3¾						
Belmont High Service	1	Allis-Chalmers Horz. Comp	6	2	26	3.5	25	175	4⅞						
	2	Worthington Horz. Comp. High Duty	5	2	13	3	26	156							
Queen Lane Station	1	Southwark Foundry Vert. Triple Expansion	20	1	37	4.5	22	198	2 of 5¼	1	62	4.5	22	198	2 of 5¼
	2	Southwark Foundry Vert. Triple Expansion	20	1	37	4.5	22	198	2 of 5¼	1	62	4.5	22	198	2 of 5¼
	3	Southwark Foundry Vert. Triple Expansion	20	1	37	4.5	22	198	2 of 5¼	1	62	4.5	22	198	2 of 5¼
	4	Southwark Foundry Vert. Triple Expansion	20	1	37	4.5	22	198	2 of 5¼	1	62	4.5	22	198	2 of 5¼
Roxborough	1	Gaskill Compound	10	2	33	4	18	144	4½						
	2	Worthington Duplex	5	2	36	4	12	96	4½						
	3	Worthington Duplex	6½	2	38	4	12½	100	4½						
Roxborough (New House)	4	Worthington Hor. Com. High Duty	5	2	18	3	26	156	2 rods 3						
	5	Worthington Hor. Com. High Duty	5	2	18	3	26	156	2 rods 3						
	6	Worthington Hor. Com. High Duty	5	2	18	3	26	156	2 rods 3						
	7	Worthington Hor. Com. High Duty	5	2	18	3	26	156	2 rods 3						
	8	Snow Horz. Cross Comp.	5	2	27	3.505	31	217	5						
	9	Snow Horz. Cross Comp.	5	2	27	3.505	31	217	5						
Roxborough High Service	1	Worthington Duplex	5	2	21	4	12	96	3½						
	2	Worthington Horz. Comp High Duty	5	2	13	3	26	156							
Mount Airy	1	Davidson Pump	1	1	20	1.67	60	200	2¼						
	2	Davidson Pump	1	1	20	1.67	60	200	2¼						
	3	Knowles Pump	1	1	24	2	20	80							
Chestnut Hill	1	Knowles Pump	¼	1	24	1.75	11	38.5	3⅝						
	2	Worthington Duplex	½	2	14	.87			1¾						
Frankford	1	Cramp Marine Comp. Rotary	10	1	40	5	21	210	6¾						
	2	Corliss Compound Rotary	10	1	28	3	37	222	3 15/16						
	3	Southwark Foundry Quarter-Crank Compound Pump	22	1	44	3.5	24	168	2 rods 5						
	4	Southwark Foundry Quarter-Crank Fly Wheel Pump	15	2	44	4	16½	132	8						
	5	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	6	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	7	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	8	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	9	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	10	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	11	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	12	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	13	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
	16	Holly Vert. Triple Expansion	20	1	32	5.5	20	220	7½	1	60	5.5	20	220	7½
Frankford High Service	1	Holly Horz. Compound	3	2	12	2	35	140	2 rods 2¼						
	2	D'Auria Compound Duplex	4	2	10	1.5	70	210	1⅝						
Fairmount	1	Turbine Wheels	2												
	3	" "	5⅛												
	4	" "	5⅛												
	5	" "	5⅛												
	7	" "	5 1/10												
	8	" "	5 1/10												
	9	" "	5 1/10												
Upper Roxborough Filters	1	Buckeye Cross Comp. Vert.	10	1	10	1	260	520	1¾						
Upper Roxborough Filters	2	Buckeye Cross Comp. Vert.	10	1	10	1	260	520	1¾						
Upper Roxborough Filters	3	Buckeye Cross Comp. Vert.	10	1	10	1	260	520	1¾						
	4	DeLaval Horz. Turbine	1												
Torresdale Filters	1	R. D. Wood Cross Comp. Horz.	40	1	16	1.67	190	635	3						
	2	R. D. Wood Cross Comp. Horz.	40		16	1.67	190	635	3						
	3	R. D. Wood Cross Comp. Horz.	40	1	16	1.67	190	635	3						
	4	R. D. Wood Cross Comp. Horz.	40	1	16	1.67	190	635	3						
	5	R. D. Wood Cross Comp. Horz.	40	1	16	1.67	190	635	3						
	6	R. D. Wood Cross Comp. Horz.	40	1	16	1.67	190	635	3						
	7	Allis Chalmer Cross Comp Horizontal	40	1	16	1.67	190	635	3						
	8	DeLaval Horz. Turbine	50												

Low Pressure Cylinder and Air Pumps

Pumping Station.	No.	Low Pressure Cylinder: Number of Cylinders.	Bore (inches).	Stroke (feet).	Number of Revolutions.	Speed (feet per minute).	Diameter of Rod (inches).	Air Pumps: Number of Air Pumps.	Bore (inches).	Stroke (feet).	Number of Revolutions.	Diameter of Rod (inches).	Type—Single [S] or Double [D].
Spring Garden (Old Station)	5	2	88	4	16⅔	133⅓	8	4	24	2	16⅔		S.
	6	1	57	8	11	176	5	1	30	4	11		S.
	7	1	80	6	17	204	8	1	40	3	17		S.
	8	2	66 3/16	4	12½	100	2 rods 4	2 / 2	29¾ / 27	2	12½		S.
(New Station)	2	1	92	5	20	200	8	1	26	5	20		S.
	3	1	92	5	20	200	8	1	26	5	20		S.
	9	2	66	4	12½	100	2 rods 4	2 / 2	29¾ / 27	2	12½		S.
	10	2	66	4	12½	100	2 rods 4	2 / 2	29¾ / 27	2	12½		S.
Belmont	1	1	70	4	25	200	11	1	12	1.33		1¼	S.
	2	1	70	4	25	200	11	1	12	1.33			S.
	4	2	82	4	16¼	130	2 rods 5	2					
	5	2	50	3.17	28½	180¼	2 rods 5¼	1	20	2.5	28½	2½	S.
	6	2	50	3.17	28½	180¼	2 rods 5¼	1	20	2.5	28½	2½	S.
	7	2	50	3.17	28½	180¼	2 rods 5¼	1	20	2.5	28½	2½	S.
Belmont High Service	1	2	50	3.5	25	175	5½	1	12	0.6	60		S.
	2	2	36	3	26	156							S.
Queen Lane Station	1	1	96	4.5	22	198	2 of 5¼	1	28	3		2¾	S.
	2	1	96	4.5	22	198	2 of 5¼	1	28	3		2¾	S.
	3	1	96	4.5	22	198	2 of 5¼	1	28	3		2¾	S.
	4	1	96	4.5	22	198	2 of 5¼	1	28	3		2¾	S.
Roxborough	1	2	66	4	18	144	5	2	24	2.25	18		S.
	2	2	58	4	12	96	4½	2 / 2	29¾ / 23¾	2 / 2	12		S.
	3	2	66	4	12½	100	2 rods 4	2 / 2	29¾ / 27	2 / 2	12½		S.
Roxborough (New House)	4	2	50	3	26	156	2 rods 3						S.
	5	2	50	3	26	156	2 rods 3						S.
	6	2	50	3	26	156	2 rods 3						S.
	7	2	50	3	26	156	2 rods 3						S.
	8	2	60	3.505	31	217	8½	1	18	1.5	16		S
	9	2	60	3.505	31	217	8½	1	18	1.5	16		S.
Roxborough High Service	1	2	36	4	12	96	3½	4	18	1.58	12		S.
	2	2	36	3	26	156							S.
Mount Airy	1												
	2												
	3												
Chestnut Hill	1												
	2												
Frankford	1	1	69	5	21	210	6¾	1	24	2.5	21	3¾	S.
	2	1	56	3	37	222	4 15/16	1	30	1.17	37	Trunk 6	S.
	3	1	88	3.5	24	158	2 rods 5	1	28	1.75	24		S.
	4	2	88	4	16½	132	8	2	24				S.
	5	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	6	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	7	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	8	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	9	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	10	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	11	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	12	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	13	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
	16	1	90	5.5	20	220	7½	1	28	5.5	20	3 11/16	S.
Frankford High Service	1	2	32	2	35	140	2 rods 3¼						
	2	2	20	1.5	70	210	2½						S.
Fairmount	1												
	3												
	4												
	5												
	7												
	8												
	9												
Upper Roxborough Filters	1	1	17½	1	260	520	2⅜	2		0.66			
Upper Roxborough Filters	2	1	17½	1	260	520	2⅜	2		0.66			
Upper Roxborough Filters	3	1	17½	1	260	520	2⅜	2		0.66			
	4												
Torresdale Filters	1	1	32	1.67	190	635	3						
	2	1	32	1.67	190	635	3						
	3	1	32	1.67	190	635	3						
	4	1	32	1.67	190	635	3						
	5	1	32	1.67	190	635	3						
	6	1	32	1.67	190	635	3						
	7	1	32	1.67	190	635	3						
	8							1	12		200		Re'tr

Forcing Pumps (part 1)

Pumping Station.	No.	Type—Single [S], Double [D], Triple [T], Bucket [B], Plunger [P].	Number of Pumps.	Bore (inches).	Area (square inches), A.	Stroke (feet).	Number of single strokes per minute	Diameter of Pump Rod (inches).	Gallons Displaced per Revolution (Theoretical).	Gallons Displaced per Revolution (Actual).	Diameter Suction Pipe (inches).	Diameter Discharge Pipe (inches).
Spring Garden (Old Station)	5	D. P.	2	36½	1,046	4	66⅔	8	848.8	‡827.6	2 x 36	48
	6	B. P.	2	B. 28½ / P. 20⅛	638 / 318	8	22		500.	§500.	None	36
	7	D. P.	2	30	707	6	68	8	850.	†824.5	2 of 30	48
	8	D. P.	2	30	707	4	50	4½	581.	†563.5	30	30
(New Station)	2	T. P.	3	30	707	5	120	6	1080.	‡1053.	48	30
	3	T. P.	3	30	707	5	120	6	1080.	‡1053.	48	30
	9	D. P.	2	37	1,075	4	50	5	885.5	†860.	36	36
	10	D. P.	2	37	1,075	4	50	5	885.5	†860.	36	36
Belmont	1	D. P.	2	21¼	354.6	4	100	6	283	†274.5	30	30
	2	D. P.	2	21¼	354.6	4	100	6	283	†274.5	30	30
	4	D. P.	2	36½	1,046	4	65	7	853.7	‡832.4	36	36
	5	D. P.	2	22½	398	3.17	114	5½	253.8	†246.2	30	30
	6	D. P.	2	22½	398	3.17	114	5½	253.8	†246.2	30	30
	7	D. P.	2	22½	398	3.17	114	5½	253.8	†246.2	30	30
Belmont High Service	1	D. P.	2	17¼	234	3.5	100	3⅝	162.4	‡158.3	24	20
	2	D. P.	2	17	227	3	104	2¾	139.6	†135.5		
Queen Lane Station	1	T. P.	3	34½	935	4.5	66		655.6	‡639.2	48	48
	2	T. P.	3	34½	935	4.5	66		655.6	‡639.2	48	48
	3	T. P.	3	34½	935	4.5	66		655.6	‡639.2	48	48
	4	T. P.	3	34½	935	4.5	66		655.6	‡639.2	48	48
Roxborough	1	D. P.	2	25¾	521	4	72	5⅛	424	‡413.	30	24
	2	D. P.	2	21	346	4	48	4½	281.3	†272.8	30	30
	3	D. P.	2	24	452	4	50	5	368.	†357.	30	30
Roxborough (New House)	4	D. P.	2	17	227	3	104	4	137.6	†133.5		
	5	D. P.	2	17	227	3	104	4	137.6	†133.5		
	6	D. P.	2	17	227	3	104	4	137.6	†133.5		
	7	D. P.	2	17	227	3	104	4	137.6	†133.5		
	8	D. P.	2	16¼	207.4	3.505	124	5½	142.4	†138.	24	20
	9	D. P.	2	16¼	207.4	3.505	124	5½	142.4	†138.	24	20
Roxborough High Service	1	D. P.	2	24	452	4	48	3½	372.	†360.8	30	30
	2	D. P.	2	17	227	3	104	2¾	139.6	†135.5		
Mount Airy	1	Piston	1	10	78.5	1.67	120	2¼	13.25	‡13.	12	10
	2	Piston	1	10	78.5	1.67	120	2¼	13.25	‡13.	12	10
	3	Piston				2	40	3 15/16			42	40
Chestnut Hill	1	Piston	1	18	254.5	1.75	22	3⅜	45.4	‡44.3	10	8
	2		2	10	78.5	.87		1¾	14.	‡13.6		
Frankford	1	D. P.	2	21	346	5	84	6¾	341.3	†331.	2 of 20	30
	2	D. P.	2	20	314	3	148	3 11/16	192.5	†186.7	30	30
	3	D. P.	2	28	616	3.5	96	5½	439.2	‡428.2	42	40
	4	D. P.	2	32	804	4	66	8	647.6	‡631.4	27	36
	5	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	6	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	7	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	8	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	9	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	10	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	11	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	12	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	13	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
	16	T. P.	3	33	855.3	5.5	20		733.	‡715.	42	42
Frankford High Service	1	D. P.	2	13⅞	151	2	140	3¼	61.12	‡59.6	16	16
	2	D. P.	2	13	133	1.5	280	2½	40.6	‡39.6	16	16
Fairmount	1	Piston	1	16	201	6	24	3⅝	122.	‡119.	18	16
	3	Piston	2	22⅜	394.3	6	16	5	470.	‡458.	22½	36
	4	Piston	2	22	380.1	6	16	5	461.6	‡450.	22½	36
	5	Piston	2	22	380.1	6	16	5	461.6	‡450.	22½	36
	7	Piston	2	18 11/16	274.3	6	22	4	333.	‡325.	20	30
	8	Piston	2	18⅝	272.4	6	22	4	331.	‡323.	20	30
	9	Piston	2	18 11/16	274.3	6	22	4	333.	‡325.	20	30
Upper Roxborough Filters	1	Centrifu'l	1								12	12
Upper Roxborough Filters	2	Centrifu'l	1								12	12
Upper Roxborough Filters	3	Centrifu'l	1								12	12
	4	Centrifu'l	1								6	6
Torresdale Filters	1	Centrifu'l	1								2x30	36
	2	Centrifu'l	1								2x30	36
	3	Centrifu'l	1								2x30	36
	4	Centrifu'l	1								2x30	36
	5	Centrifu'l	1								2x30	36
	6	Centrifu'l	1								2x30	36
	7	Centrifu'l	1								2x30	36
	8	Centrifu'l	2								2x24	2x24

Forcing Pumps (part 2)

Pumping Station.	No.	Number of Suction Valves (on each end).	Lift of Suction Valves (inches).	Area of Suction Valves (square inches).	Number of Discharge Valves.	Lift of Discharge Valves (inches).	Total Area, B (square inches).	Relative Speed of Water, A, B (through valves).	Speed (feet per second) through Valves.	Mean Pressure on Pumps at Pressure Gauge (pounds per square inch).	Corresponding Head (feet).	Lift (feet) from Surface of Water to Centre of Gauge.	Total Lift (feet)
Spring Garden (Old Station)	5	78	½	554	78	½	554	1.84	4.05	110	250	19	269
	6	16	1½	424	Check.			1.50	4.04	45	104.6	25	129.6
	7	18	1	631	18	1	631	1.12	3.8	66 / 45	153.5 / 104.6	21	174.5 / 125.6
	8	8	1	280½	8	1	280½	2.50	4.2	86 / 45	200 / 104.6	18	218 / 122
(New Station)	2	72	½	540	60	½	450	1.57	4.22			22	
	3	72	½	540	60	½	450	1.57	4.22			22	
	9	12	1	300¾	12	1	300¾	3.58	5.97	66 / 45	153.5 / 104.6	16	169.5 / 120.6
	10	12	1	300¾	12	1	300¾	3.58	5.97	86 / 45	200 / 104.6	16	216 / 120.6
Belmont	1	140	½	644	140	½				118	272	13	285
	2	140	½	644	140	½				118	272	13	285
	4	36	½	302	36	½	302					22	
	5	79	½	450	79	½	450	1.13	5.	100	233	25	258
	6	79	½	450	79	½	450	1.13	5.	100	233	25	258
	7	79	½	450	79	½	450	1.13	5.	100	233	25	258
Belmont High Service	1	35	⅝	232	35	⅝	232	1.00	3.0	64	147.5	*25.3	122.2
	2		½			½				73	168.2	*25.3	142.9
Queen Lane Station	1	89	½	801.5	89	½	801	1.16	3.6	100	231	33	264
	2	89	½	801.5	89	½	801	1.16	3.6	100	231	33	264
	3	89	½	801.5	89	½	801	1.16	3.6	100	231	33	264
	4	89	½	801.5	89	½	801	1.16	3.6	100	231	33	264
Roxborough	1	126	⅝	500	126	⅝	500	2.70	4.0	164	381	25	406
	2	31	½	232	31	½	232	2.00	4.6			21	
	3	31	½	232	31	½	232	2.50	4.2	148	344	21	
Roxborough (New House)	4		½			½				164	381	25	406
	5		½			½				164	381	25	406
	6		½			½				164	381	25	406
	7		½			½				164	381	25	406
	8	90	⅜	330	90	⅜							
	9	90	⅜	330	90	⅜							
Roxborough High Service	1	8	1	248	8	1	248	1.82	2.91	53	122	*11.5	110.5
	2		½			½				53	122	*11.5	110.5
Mount Airy	1	6	⅝	87	6	⅝	87	0.90	3.00	59	135.9	*25.3	110.6
	2	6	⅝	87	6	⅝	87	0.90	3.00	59	135.9	*25.3	110.6
	3	2			2					36	83.7		
Chestnut Hill	1	2	⅝	34	2		34	7.4	4.74	50	115.1	*2.3	112.8
	2									50	115.1	*2.3	112.8
Frankford	1	10	1	350⅝	10	1	350⅝	9.98	3.45	73	170	16	187.5
	2	12	¾	420¾	12	¾	420¾	0.75	2.77	73	172	15	187.5
	3	20		290	20		290	2.12	.47			25	
	4	60	½	465	60	½	465	1.7	7.2			23	
	5	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	6	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	7	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	8	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	9	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	10	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	11	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	12	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	13	144	9/16	1174	144	9/16	1174	.73	3.7			18	
	16	144	9/16	1174	144	9/16	1174	.73	3.7			18	
Frankford High Service	1	36	½	205	36	½	205	1.3	3.4	71	163.8	*23	140.8
	2		½			½				71	163.8	*23	140.8
Fairmount	1	2		240	2		240	0.88	2.11				
	3	6		528	1	2	441	0.90	1.44				
	4	6		528	1	2	441	0.86	1.37	56	130		130
	5	6		528	1	2	441	0.86	1.37	56	130		130
	7	20	2	264	1	2	264	1.04	2.29	56	130		130
	8	20	2	264	1	2	264	1.04	2.29	56	130		130
	9	20	2	264	1	2	264	1.04	2.29	56	130		130
Upper Roxborough Filters	1												
Upper Roxborough Filters	2												
Upper Roxborough Filters	3												
	4												
Torresdale Filters	1												45
	2												5
	3												45
	4												45
	5												45
	6												45
	7												45
	8												

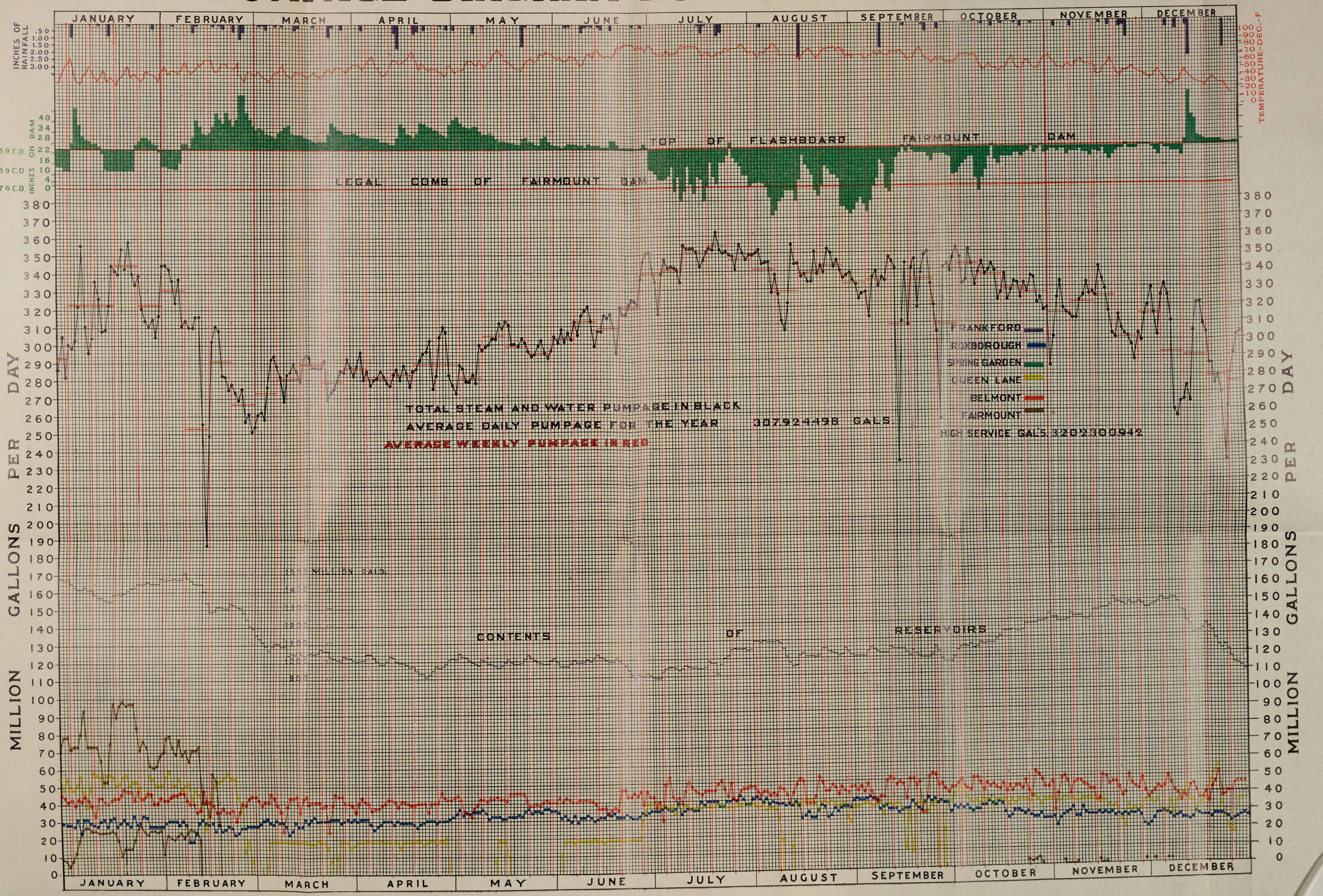
*NOTE—These pumps receive water from Reservoirs and the figures given represent the number of feet on the suction end of the pump.

† 3 per cent. for slip.

‡ 2½ per cent. for slip.

§ No slip.

PUMPAGE DIAGRAM FOR THE YEAR 1909



APPENDIX C

REPORT
OF THE
ASSISTANT IN CHARGE OF DISTRIBUTION

Philadelphia, January 1, 1910.

FRED C. DUNLAP, ESQ.,
Chief, Bureau of Water.

DEAR SIR:—I have the honor to submit the following report on the distribution system for the year 1909:

Mains.

The following is a statement of the mains laid, relaid, taken up, etc.:

New Work.

	Feet.
Service mains laid	125,195
Supply mains laid	4,853
Pumping mains laid	109
Connections, etc.	7,022
Total	137,179

Comparison of Conditions Relative to the Distribution, 1908-1909.

	1908.	1909.	Increase.	Decrease.
Service mains, 4" to 16"	134,754	125,195	----------	9,559
Supply mains, 16" to 48"	8,028	4,853	----------	3,175
Pumping mains, 12" to 48"	247	109	----------	138
Connections and miscellaneous work	7,806	7,022	----------	784
Totals in feet	150,835	137,179	----------	13,656

Of the 125,195 feet of service mains laid, 65,985 feet were laid by the City, for which $1.00 per foot was charged against each property owner fronting thereon; 3,028 feet were laid by private contract, under ordinance of June 19, 1899, by which the property owners along the line are charged $.50 per foot front in addition to the expense of laying the pipe; 56,182 feet were laid by private contract, but under Ordinance of April 12, 1909, which requires no payment to the City by those paying their pro rata share of the cost of laying the pipe, but against those not joining in the expense of laying the pipe, the usual charge of $1.00 per foot front is made.

	1908.	1909.	Increase.	Decrease.
Relaid, 3″ to 30″	22,214	11,170		11,044
Miscellaneous repairs, 3″ to 48″	11,874	3,977		7,897
Taken up, 3″ to 48″	17,819	8,326		9,493
Lowered, raised and shifted, 4″ to 48″	20,546	7,345		13,201
Totals in feet	72,453	30,818		41,635
Pipe cut off and abandoned, 3″ to 20″	6,043	4,631		1,412

Repairs.

	Feet.	Feet.
Mains relaid	11,170	
Repairs and connections	3,977	
		15,147
Old pipe taken up	8,326	
Pipe lowered, raised and shifted	7,345	
		15,671
Total		30,818

Abandoned.

	Feet
Four-inch	1,227
Six-inch	2,041
Ten-inch	6
Twelve-inch	305
Thirty-inch	1,052
Total	4,631

The total quantity of pipe handled for all purposes throughout the year was 167,997 feet, weighing 8,746,092 pounds.

The total quantity of new pipe laid was 135,392 feet, 25.64 miles, making, in addition to that previously laid, 1,612.15 miles now in use.

Fire Hydrants.

New style fire hydrants in new locations	448
New style fire hydrants in place of old style	567
Total	1015
New style fire hydrants taken out	51
Old style fire hydrants taken out	4
Total	55

The total number of new style fire hydrants added to the distribution system was 1,015, and the total number in use December 31, 1909, was 15,561, of which 374 are of the old style and 15,187, or 97.6 per cent., of the new pattern.

Drills for Attachments.

	No. of Openings.	Area Square Inches.
One-half inch	7,286	1,432
Five-eighth inch	438	134
Three-quarter inch	118	52
One-inch	129	101
One and one-quarter inch	41	50

	No. of Openings.	Area Square Inches.
One and one-half inch	25	44
Two inches	64	201
Three inches	7	49
Four inches	11	138
Six inches	20	568
Total	8,139	2,769

For attachments, including ferrules, service pipes and curb valves, which were put in from the street mains to the curb by employes of the Bureau in order to provide for possible future service without breaking of street pavements, see Table "A.'

Tabulations of work performed and of expenditures made are also submitted herewith, together with various other tables, compiled as in previous years.

The report of the Pipe Inspector relative to the inspection of pipe and other castings during the year, in tabulated form, also accompanies this report.

In closing, I desire to give full credit to the assistance rendered this Bureau by Dr. William C. Robinson, Chemist, Bureau of Health. From time to time during the year Dr. Robinson made chemical analyses of samples of water submitted to him, thus enabling us to determine the source of leaks reported to the Bureau of Water by various property owners throughout the City.

Respectfully submitted,

W. WHITBY,

Assistant in Charge of Distribution.

SERVICE AND SUPPLY MAINS LAID DURING 1909.

First District.

Comprising the 1st, 2nd, 3rd, 4th, 26th, 30th, 36th, and 39th Wards.

	Purpose for which used.		Size in Inches. 3	4	6	8	10	12	20	30	Total in Feet and Pounds.
New pipe or feet added.	Service mains				6,549	1,854	1,653				10,056
	Fire hydrant connections				317						317
	Fire connections (private)				39						39
	Supply connections (private)		28	49							77
	Total	Feet	28	49	6,905	1,854	1,653				10,489
		Pounds	420	980	227,865	77,868	90,915				398,048
Pipe used, but adding nothing to ft. in ground.	Pipe relaid		8		99	320		30			457
	Repairs, general		4		316	7	11	20	23	14	395
	Pipe taken up			8	100						108
	Pipe lowered						117		70		187
	Pipe shifted								77		77
	Total	Feet	12	8	515	327	128	50	170	14	1,224
		Pounds	180	160	16,995	13,734	7,040	3,750	26,350	4,620	72,829
	Total handled	Feet	40	57	7,420	2,181	1,781	50	170	14	11,713
		Pounds	600	1,140	244,860	91,602	97,955	3,750	26,350	4,620	470,877
	Pipe cut off and abandoned			329	138						467

Second District.

Comprising the 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 16th, and 17th Wards.

	Purposes for which used.		Size in Inches. 3	4	6	8	10	12	20	30	Total in Feet and Pounds.
New pipe or feet added.	Service mains				205						205
	Supply mains									90	90
	Supply main connections								32		32
	Fire hydrant connections				149						149
	Fire connections (private)				89						89
	Supply connections (private)		13	13							26
	Drains				116						116
	Total	Feet	13	13	559				32	90	707
		Pounds	195	260	18,447				4,960	29,700	53,562
Pipe used, but adding nothing to feet in ground.	Pipe relaid				354						354
	Repairs, general		9	21	416	8	43	13	146	4	660
	Pipe taken up			360	162						522
	Total	Feet	9	381	932	8	43	13	146	4	1,536
		Pounds	135	7,620	30,756	336	2,365	975	22,630	1,320	66,137
Total handled		Feet	22	394	1,491	8	43	13	178	94	2,243
		Pounds	330	7,880	49,203	336	2,365	975	27,590	31,020	119,699
Pipe cut off and abandoned				314	114						428

Third District.

Comprising the 18th, 19th, 23rd, 25th, 31st, 35th, 41st, and parts of the 37th, 42nd, 43rd, and 45th Wards.

	Purposes for which used.		Sizes in Inches. 3	4	6	8	10	12	16	18	20	30	36	48	60	Total in Feet and Pounds.
New pipe or feet added.	Service mains				21,736	1,687	2,789	1,659								27,871
	Supply mains								2,480							2,480
	Service main connections						24									24
	Supply main connections				10		50	18	23			55	22			178
	Fire hydrant connections				1,233											1,235
	Supply connections (private)		44	57	94		10	33	9							247
	Fire connections (private)			52	142											194
	Drains				84											84
	Total	Feet	44	109	23,299	1,687	2,873	1,710	2,512			55	22			32,311
		Pounds	660	2,180	768,867	70,854	158,015	128,250	288,880			18,150	9,240			1,445,096
Pipe used, but adding nothing to feet in ground.	Pipe relaid				4,559							259				4,818
	Repairs general			40	420	21	52	31	9	36	52	179	14	12	13	879
	Pipe taken up			4,016	59			32		45		139				4,291
	Pipe lowered				486					108						594
	Pipe raised					98										98
	Pipe shifted				104											104
	Total	Feet		4,056	5,628	119	52	63	9	189	52	577	14	12	13	10,784
		Pounds		81,120	185,724	4,998	2,860	4,725	1,035	24,570	8,060	190,410	5,880	7,800	14,950	532,132
Total handled		Feet	44	4,165	28,927	1,806	2,925	1,773	2,521	189	52	632	36	12	13	43,095
		Pounds	660	83,300	954,591	75,852	160,875	132,975	289,915	24,570	8,060	208,560	15,120	7,800	14,950	1,977,228
Pipe cut off and abandoned				476	72			305					93			946

Fourth District.

Comprising the 15th, 20th, 28th, 29th, 32nd, and parts of the 37th and 38th Wards.

	Purposes for which used.		Sizes in Inches. 3	4	6	8	10	12	30	48	Total in Feet and Pounds.
New pipe or feet added.	Service mains				11,031	1,586		1,406			14,022
	Supply mains									1,198	1,198
	Supply main connections				34	13		5		115	167
	Fire hydrant connections				502						502
	Fire connections (private)			3	75						78
	Supply connections (private)		19								19
	Drains				16	12					28
	Total	Feet	19	3	11,658	1,610		1,411		1,313	16,014
		Pounds	285	60	384,714	67,620		105,825		853,450	1,411,954
Pipe used, but adding nothing to feet in ground.	Pipe relaid				1,748	30	125	71			1,974
	Repairs, general			4	300	11	17	27		42	401
	Pipe taken up			1,080	1,111		24			34	2,249
	Pipe lowered				1,352				907		2,259
	Total	Feet		1,084	4,511	41	166	98	907	76	6,883
		Pounds		21,680	148,863	1,722	9,130	7,350	299,310	49,400	537,455
Total handled		Feet	19	1,087	16,169	1,651	166	1,509	907	1,389	2,2897
		Pounds	285	21,740	535,577	69,342	9,130	113,175	299,310	902,850	1,949,409
Pipe cut off and abandoned					279						279

Fifth District.

Comprising the 21st and part of the 38th Wards.

	Purposes for which used.		Size in Inches. 4	6	8	10	12	16	30	48	Total in Feet and Pounds.
New pipe or feet added.	Service mains			6,104		1,264					7,368
	Pumping mains				109						109
	Service main connections			8							8
	Supply main connections			31							31
	Fire hydrant connections			219							219
	Fire connections (private)			22							22
	Supply connections (private)		2	17							19
	Drains					60					60
	Total	Feet	2	6,401	109	1,324					7,856
		Pounds	40	211,233	4,578	72,820					288,671
Pipe used, but adding nothing to feet in ground.	Pipe relaid			10							10
	Repairs, general			59			10	6	15	52	142
	Pipe taken up		8								8
	Pipe lowered		260	240					1,085		1,585
	Total	Feet	268	309			10	6	1,100	52	1,745
		Pounds	5,360	10,197			750	690	363,000	33,800	413,797
Total handled		Feet	270	6,710	109	1,324	10	6	1,100	52	9,581
		Pounds	5,400	221,430	4,578	72,820	750	690	363,000	33,800	702,469
Pipe cut off and abandoned			12	44							56

Sixth District.

Comprising the 22nd, and parts of the 33rd, 37th, 38th, and 42nd Wards.

	Purposes for which used.	Size in Inches. 4	6	8	10	12	16	20	30	Total in Feet and Pounds.
New pipe or feet added.	Service mains		24,490	589	3,966	1,850				30,886
	Supply mains						1,085			1,085
	Supply main connections		35	29	68	5	73			210
	Fire hydrant connections		1,280							1,280
	Fire connections (private)	13								13
	Drains		13		14					27
	Total (Feet)	13	25,818	609	4,048	1,855	1,158			33,501
	Total (Pounds)	260	851,994	25,578	222,640	139,125	133,170			1,372,767
Pipe used, but adding nothing to feet in ground.	Pipe relaid				1,312	50				1,362
	Repairs, general	112	379	4	57	262	16	20	35	885
	Pipe taken up	5	315							320
	Pipe lowered		1,698							1,698
	Pipe shifted		237							237
	Total (Feet)	117	2,629	4	1,369	312	16	20	35	4,502
	Total (Pounds)	2,340	86,757	168	75,295	23,400	1,840	3,100	11,550	204,450
	Total handled (Feet)	130	28,447	613	5,417	2,167	1,174	20	35	38,003
	Total handled (Pounds)	2,600	938,751	25,746	297,935	162,525	135,010	3,100	11,550	1,577,217
	Pipe cut off and abandoned	50	1,062							1,112

Seventh District.

Comprising the 24th, 27th, 34th, 40th, 44th, and 46th Wards.

	Purposes for which used.		Size in Inches								Total in Feet and Pounds.
			3	4	6	8	10	12	16	20	30	
New pipe or feet added.	Service mains				27,224	3,580	2,860	563	560			34,787
	Service main connections				72							72
	Supply main connections				6		34					40
	Fire hydrant connections				1,155							1,155
	Fire connections (private)				48							48
	Supply connections (private)		19	21								40
	Motor connections (private)			26								26
	Drains				117			36				153
	Total	Feet	19	47	28,622	3,580	2,894	599	560			36,321
		Pounds	285	940	944,526	150,360	159,170	44,925	61,499			1,364,606
Pipe used, but adding nothing to feet in ground.	Pipe relaid				813	120	278				984	2,195
	Repairs, general				497	67	5	18		8	20	615
	Pipe taken up			402	408						18	828
	Pipe lowered				35							35
	Pipe raised										471	471
	Total	Feet		402	1,753	187	283	18		8	1,493	4,144
		Pounds		8,040	57,849	7,854	15,565	1,350		1,240	492,690	584,588
Total handled		Feet	19	449	30,375	3,767	3,177	617	560	8	1,493	40,465
		Pounds	285	8,980	1,092,375	158,214	174,735	46,275	61,400	1,240	492,690	1,949,194
Pipe cut off and abandoned				46	332		6				959	1,343

Total Feet of Pipe in Use, December 31, 1909.

Size in inches.	Total in use December 31, 1908.	Extension and Relays During 1909			Deductions During 1909			Total in use December 31, 1909.
		Laid.	Relaid.	Total.	Taken up.	Abandoned.	Total.	
1	175	.....	.....	.....	.....	.....	.....	175
1½	3,566	.....	.....	.....	.....	.....	.....	3,566
2	3,655	.....	.....	.....	.....	.....	.....	3,655
3	76,929	123	8	131	.....	.....	.....	77,060
4	168,797	230	.....	236	5,879	1,227	7,106	161,927
6	5,622,048	103,262	7,583	110,845	2,155	2,041	4,190	5,728,607
8	359,689	31,949	470	32,419	.....	.....	.....	392,108
10	520,508	12,792	1,715	14,507	24	6	30	534,985
12	518,407	9,775	151	9,926	32	305	337	527,996
16	189,650	4,230	.....	4,230	.....	.....	.....	193,880
18	16,089	.....	.....	.....	45	.....	45	16,044
20	281,773	32	.....	32	.....	.....	.....	281,805
22	1,084	.....	.....	.....	.....	.....	.....	1,084
23	27	.....	.....	.....	.....	.....	.....	27
24	20,613	.....	.....	.....	.....	.....	.....	20,613
30	298,201	145	1,243	1,388	157	1,052	1,209	298,380
36	102,046	22	.....	22	.....	.....	.....	102,068
48	208,966	1,313	.....	1,313	34	.....	34	210,245
60	9,500	.....	.....	.....	.....	.....	.....	9,500
Total...	8,401,723	163,879	11,170	175,049	8,326	4,631	12,957	8,563,815

Recapitulation of Work on Water Pipes.

	Purposes for Which Used.		Sizes in Inches,												Total in Feet and Pounds.
			3	4	6	8	10	12	16	18	20	30	36	48	60	
New pipe or feet added.	Service mains				97,339	9,286	12,532	5,478	560							125,195
	Supply mains								3,565			90		1,198		4,853
	Pumping mains					109										109
	Service main connections				80		24									104
	Supply main connections				116	42	152	28	96		32	55	22	115		658
	Fire hydrant connections				4,855											4,855
	Fire connections (private)			68	415											483
	Supply connections (private)		123	142	111		10	33	9							428
	Motor connections (private)			26												26
	Drains				346	12	74	36								468
	Total	Feet	123	236	103,262	9,449	12,792	5,575	4,230		32	145	22	1,313		137,179
		Pounds	1,845	4,720	3,407,646	396,858	703,560	418,125	486,450		4,960	47,850	9,240	853,450		6,334,704
Pipe used, but adding nothing to feet in ground.	Pipe relaid		8		7,583	470	1,715	151				1,243				11,170
	Repairs general		13	177	2,387	118	185	381	31	36	249	267	14	106	13	3,977
	Pipe taken up			5,879	2,155		24	32		45		157		34		8,326
	Pipe lowered			260	3,811		117			108	70	1,992				6,358
	Pipe raised					98						471				569
	Pipe shifted				341						77					418
	Total	Feet	21	6,316	16,277	686	2,041	564	31	189	396	4,130	14	140	13	30,818
		Pounds	315	126,320	537,141	28,812	112,255	42,300	3,565	24,570	61,380	1,362,900	5,880	91,000	14,950	2,411,388
	Total handled	Feet	144	6,552	119,539	10,135	14,833	6,139	4,261	189	428	4,275	36	1,453	13	167,997
		Pounds	2,160	131,040	3,944,787	425,670	815,815	460,425	490,015	24,570	66,340	1,410,750	15,120	944,450	14,950	8,746,092
	Pipe cut off and abandoned			1,227	2,041		6	305				1,052				4,631

Recapitulation of Fire Hydrants Set, Renewed and Removed.

		STYLE.				
		O. S.	No. 1.	No. 2.	No. 3.	High Pressure.	Total.
Set.	First		18	1			19
	Second		10	3		91	104
	Third		92	10			102
	Fourth		24	13			37
	Fifth		15				15
	Sixth		78	7			85
	Seventh		73	13			86
	Total		310	47		91	448
Renewed.	First						
	Second		119	27			146
	Third		80	52	6		138
	Fourth		53	37	1		91
	Fifth		20				20
	Sixth		43	4			47
	Seventh		77	48			125
	Total		392	168	7		567
Total new fire hydrant							1,015
Removed.	First	1	6				7
	Second		11	1			12
	Third		7	1	1		9
	Fourth		6	7			13
	Fifth		2				2
	Sixth	1	3				4
	Seventh	2	5	1			8
	Total	4	40	10	1		55
Total added during 1909							393

Fire Hydrants, by Wards.

Wards.	STYLE.							Total.
	O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	High Pressure.	
First	1	201	67	8				277
Second	1	134	90	15				240
Third	3	82	42	6				133
Fourth	1	65	34	14				114
Fifth	15	113	57	4			29	218
Sixth	8	102	38	6			79	233
Seventh	5	154	77	6				242
Eighth	10	139	84	3		1	35	272
Ninth		150	63	3		1	60	277
Tenth		119	58			4	38	219
Eleventh	4	49	22	1				106
Twelfth	7	73	18	4				102
Thirteenth	3	85	49	7				164
Fourteenth		103	76					179
Fifteenth		241	205	5	1	2		454
Sixteenth	2	91	31	3	1			128
Seventeenth	11	97	21	1				130
Eighteenth	12	213	59	9				293
Nineteenth	31	345	117	7				500
Twentieth	16	141	127	3				287
Twenty-first	35	433	38	7				513
Twenty-second	52	1,253	148	19				1,472
Twenty-third	37	366	79	8				490
Twenty-fourth	18	342	150	9				519
Twenty-fifth		304	62	2				368
Twenty-sixth	1	240	123	14				378
Twenty-seventh	5	192	65	6		1		269
Twenty-eighth		174	133	27				334
Twenty-ninth		115	108	5		1		229
Thirtieth	5	130	110	6				251
Thirty-first		259	65	7				331
Thirty-second	5	137	97	7		1		247

Fire Hydrants, by Wards—Continued.

Wards.	Style.						Total.
	O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	High Pressure.	
Thirty-third	15	467	120	10	1			613
Thirty-fourth	6	434	41	6		1		488
Thirty-fifth		175	25	5				205
Thirty-sixth	6	362	101	28				497
Thirty-seventh	2	114	74	4				194
Thirty-eighth	13	504	114	10				641
Thirty-ninth		250	90	7				347
Fortieth	7	347	58	2				414
Forty-first		62	9	10				81
Forty-second		289	13	9				311
Forty-third	7	344	53	7				411
Forty-fourth	6	240	66	9				321
Forty-fifth		335	71	4				410
Forty-sixth		364	61	15				440
Forty-seventh	4	110	104	1				219
Totals	374	11,069	3,513	349	3	12	241	15,561

Fire Hydrants, by Purveyors' Districts.

Districts.	STYLE.							
	O. S.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	High Pressure.	Total.
First	15	1,474	688	101				2,278
Second	78	1,315	591	41	1	6	241	2,273
Third	104	2,787	627	67	1			3,586
Fourth	31	1,153	905	46	1	4		2,140
Fifth	37	556	38	8				639
Sixth	67	1,865	223	39				2,194
Seventh	42	1,919	441	47		2		2,451
Total	374	11,069	3,513	349	3	12	241	15,561

Statement of the Number of Fire Hydrants, by Districts and Wards, during 1909, and Total Previous Thereto.

First District.	Wards. 1	2	3	4	26	30	36	39	Total.
Prior to 1909	----	----	----	----	----	----	----	----	2,266
During 1909	----	1	----	----	----	1	15	2	19
Total	----	----	----	----	----	----	----	----	2,285
Taken out, 1909	4	----	----	----	----	1	2	----	7
Total in City	----	----	----	----	----	----	----	----	2,278

Second District,	Wards. 5	6	7	8	9	10	11	12	13	14	16	17	Total.
Prior to 1909	----	----	----	----	----	----	----	----	----	----	----	----	2,181
During 1909	11	32	1	12	27	16	1	1	3	----	----	----	104
Total	----	----	----	----	----	----	----	----	----	----	----	----	2,285
Taken out, 1909	----	1	----	1	4	1	1	----	4	----	----	----	12
Total in City	----	----	----	----	----	----	----	----	----	----	----	----	2,273

Third District.	Wards. 18	19	23	25	31	33	35	41	42	43	45	Total.
Prior to 1909	----	----	----	----	----	----	----	----	----	----	----	3,493
During 1909	8	6	18	8	7	16	12	2	3	9	13	102
Total	----	----	----	----	----	----	----	----	----	----	----	3,595
Taken out, 1909	----	1	1	6	----	----	1	----	----	----	----	9
Total in City	----	----	----	----	----	----	----	----	----	----	----	3,586

Fourth District	Wards. 15	20	28	29	32	37	38	47	Total.
Prior to 1909	----	----	----	----	----	----	----	----	2,116
During 1909	1	----	2	6	1	6	21	----	37
Total	----	----	----	----	----	----	----	----	2,153
Taken out, 1909	3	3	1	1	1	4	----	----	13
Total in City	----	----	----	----	----	----	----	----	2,140

Fifth District.	Wards. 21	38	Total.
Prior to 1909	----	----	626
During 1909	8	7	15
Total	----	----	641
Taken out, 1909	2	----	2
Total in City	----	----	639

Sixth District.	Wards. 22	37	38	42	43	Total.
Prior to 1909	----	----	----	----	----	2,113
During 1909	53	----	3	20	9	85
Total	----	----	----	----	----	2,198
Taken out, 1909	3	----	1	----	----	4
Total in City	----	----	----	----	----	2,194

Seventh District.	Wards. 24	27	34	40	44	46	Total.
Prior to 1909	----	----	----	----	----	----	2,373
During 1909	3	3	24	23	2	31	86
Total	----	----	----	----	----	----	2,459
Taken out, 1909	2	2	3	1	----	----	8
Total in City	----	----	----	----	----	----	2,451

	Totals.
Prior to 1909	15,168
During 1909	448
Total	15.616
Taken out, 1909	55
Total in City	15,561

Number of attachments for fire purposes previously reported		976
Made during 1909	First District	2
	Second District	6
	Third District	14
	Fourth District	6
	Fifth District	1
	Sixth District	1
	Seventh District	3
Total		1,009

Attachments, etc., Made by the Purveyors, in Accordance with Permits Issued by the Bureau of Water.

Districts.	NEW ATTACHMENTS — SIZE.										SHUT OFF BY PERMIT.					WORK DONE WITHOUT PERMIT.					
														REPAIRS				DRAWN.			
	½-inch.	⅝-inch.	¾-inch.	1-inch.	1¼-inch.	1½ inch	2-inch.	3-inch.	4-inch.	6-inch.	Total.	Reamed for Larger Attachments.	Redriven.	Discontinued.	Transfer.	Not Drawn.	Drawn and Redriven.	Total.	Discontinued and Abandoned.	Delinquent.	Leak.	Total.	Drawn and Redriven.
First	789	43	19	10	4	2	3	3	2	1	876	------	226	24	------	------	62	312	38	99	265	402	
Second	173	40	34	33	8	3	14	----	----	----	305	39	42	92	------	177	------	350	61	76	162	299	
Third	1,690	18	13	24	8	5	19	2	6	11	1,796	------	8	43	4	3	------	58	80	114	311	505	289
Fourth	1,364	31	11	20	8	3	9	1	----	5	1,452	36	120	12	------	------	72	240	48	30	143	221	33
Fifth	130	46	5	3	----	1	3	----	----	----	188	2	13	3	3	12	15	48	------	7	2	9	4
Sixth	1,299	127	21	14	6	3	7	----	1	----	1,478	28	57	52	3	15	22	177	------	3	77	80	
Seventh	1,841	133	15	25	7	8	9	1	2	3	2,044	37	18	12	9	------	132	208	8	90	85	183	24
Total	7,286	438	118	129	41	25	64	7	11	20	8,139	142	484	238	19	207	303	1,393	235	419	1,045	1,699	350

Repairs to Mains, Valves and Fire Hydrants, also Valves and Fire Hydrants Removed during 1909.

	Repairs to Mains.	Valves			Fire Hydrants.		
		Repaired.	Renewed.	Removed	Repaired.	Renewed.	Removed
First	81	869	14	3	2,008	0	7
Second	80	100	7	7	698	146	12
Third	70	261	17	3	108	138	9
Fourth	205	569	4	19	349	91	13
Fifth	96	75	0	6	26	20	2
Sixth	83	25	6	6	17	47	4
Seventh	85	597	63	22	269	125	8
Totals	700	2,496	111	66	3,475	567	55

Total Number of Valves and Check Valves, Arranged by Districts.

Pattern.	Size.	Outlets.	Districts. 1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	Total.
	3	2-way.	1	185	4	24	2	19	13	248
	4	2-way.	111	258	69	160	52	90	87	827
	6	2-way.	4003	2633	5053	3388	810	2912	3897	22,696
	8	2-way.	186	129	233	129	12	91	396	1,176
	10	2-way.	260	461	364	246	37	225	264	1,857
	12	2-way.	148	228	356	173	51	267	225	1,448
Single Gate	16	2-way.	38	50	71	21	5	41	38	264
Bureau of Water	18	2-way.	------	------	7	18	------	1	------	26
	20	2-way.	25	41	20	37	14	17	33	187
	30	2-way.	8	10	32	27	19	3	3	102
	36	2-way.	3	2	8	12	11	------	8	44
	48	2-way.	------	------	3	9	------	------	------	12
	Total		4,783	3,997	6,220	4,244	1,013	3,666	4,964	28,887
	20	2-way.	------	1	5	8	4	4	5	27
	30	2-way.	2	2	7	7	9	2	4	33
Butterfly	36	2-way.	------	------	5	17	2	------	------	24
Bureau of Water	48	2-way.	------	2	7	31	22	------	1	63
	Total		2	5	24	63	37	6	10	147
	6	4-way.	3	3	------	12	------	------	12	30
	8	4-way.	------	------	------	5	------	------	------	5
Barton	6	5-way.	12	21	------	------	------	------	------	33
	6	6-way.	------	1	------	------	------	------	1	2
	Total		15	25	------	17	------	------	13	70

Total Number of Valves and Check Valves, Arranged by Districts—Continued.

Pattern.	Size.	Outlets.	Districts, 1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	Total.
Viney.	6	2-way.	3	------	5	3	------	------	------	11
	6	3-way.	44	51	19	223	4	9	3	353
	8	3-way.	------	------	------	------	------	------	5	5
	10	3-way.	------	------	------	3	------	------	------	3
	12	3-way.	------	1	------	3	------	------	1	5
	6	4-way.	22	26	18	95	4	8	7	180
	8	4-way.	1	------	1	------	------	------	4	6
	10	4-way.	------	------	------	13	------	------	------	13
	12	4-way.	------	------	------	------	------	2	------	2
	6	5-way.	24	5	1	26	------	------	2	58
		Total----	94	83	44	366	8	19	22	636
Smith Patent.	3	2-way.	3	50	4	12	------	------	11	80
	4	2-way.	5	52	3	12	------	------	5	77
	6	2-way.	4	95	33	46	13	22	26	239
	8	2-way.	1	1	13	2	1	------	------	18
	10	2-way.	------	7	12	2	2	10	7	40
	12	2-way.	1	11	10	------	------	------	4	26
	16	2-way.	4	2	4	------	------	5	------	15
	20	2-way.	------	1	2	------	------	------	6	9
		Total----	18	219	81	74	16	37	59	504
Ludlow.	3	2-way.	------	------	13	1	------	2	22	38
	4	2-way.	------	------	------	1	------	------	------	1
	6	2-way.	------	------	------	------	5	------	16	21
		Total----	------	------	13	2	5	2	38	60

Total Number of Valves and Check Valves, Arranged by Districts—Continued.

Pattern.	Size.	Outlets.	Districts. 1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	Total.
Eddy.	6	2-way.	------	11	1	10	33	10	15	80
	8	2-way.	------	------	1	------	1	5	------	7
	10	2-way.	------	8	------	1	8	12	21	50
	12	2-way.	------	5	1	------	2	2	4	14
	16	2-way.	------	2	1	------	2	15	15	35
	20	2-way.	1	5	------	1	2	17	9	35
	24	2-way.	------	------	------	------	4	5	------	9
	30	2-way.	------	3	5	1	14	4	3	30
	36	2-way.	------	3	8	2	4	------	8	25
	48	2-way.	------	------	18	------	------	------	------	18
		Total	1	37	35	15	70	70	75	303
Eddy Rotary.	20	2-way.	------	------	2	------	------	------	------	2
	30	2-way.	------	------	------	2	------	1	------	3
		Total	------	------	2	2	------	1	------	5
Rensaeler.	8	2-way.	------	------	4	16	------	13	------	33
	12	2-way.	------	------	------	3	------	------	1	4
	16	2-way.	------	------	2	4	------	------	------	6
	20	2-way.	------	------	------	2	------	2	------	4
	24	2-way.	------	------	------	------	------	2	------	2
	30	2-way.	------	------	------	1	------	------	------	1
		Total	------	------	6	26	------	17	1	50
Rensaeler Rotary.	30	2-way.	------	------	1	------	------	------	------	1

Total Number of Valves and Check Valves, Arranged by Districts—Continued.

	Pattern.	Size.	Outlets.	DISTRICTS. 1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	Total.
High Pressure Valves.	Pratt and Cady	16	2-way.	1	------	------	------	------	------	------	1
		20	2-way.	1	1	1	------	------	------	------	3
		30	2-way.	------	1	1	------	------	------	------	2
		36	2-way.	1	------	6	1	------	------	------	8
		Total		3	2	8	1	------	------	------	14
	Van Winkle.	3	2-way.	------	2	------	------	------	------	------	2
	Water Equipment Company.	20	2-way.	1	------	------	------	------	------	------	1
	(Electric) Kennedy.		2-way.	------	------	1	------	------	------	------	1
	Williamsport	8	2-way.	------	190	------	------	------	------	------	190
		12	2-way.	------	54	------	------	------	------	------	54
		16	2-way.	------	19	------	------	------	------	------	19
		Total		------	263	------	------	------	------	------	263
	Chapman.	8	2-way.	------	12	------	------	------	------	------	12
		12	2-way.	------	3	------	------	------	------	------	3
		16	2-way.	------	3	------	------	------	------	------	3
		Total		------	18	------	------	------	------	------	18
	Smith.	8	2-way.	------	154	------	------	------	------	------	154
		12	2-way.	------	9	------	------	------	------	------	9
		16	2-way.	------	1	------	------	------	------	------	1
		Total		------	164	------	------	------	------	------	164
	Ludlow.	20	2-way.	------	4	------	------	------	------	------	4
	Total Number of Valves..			4,917	4,819	6,435	4,810	1,149	3,818	5,182	31,130
	Check Valves. Bureau of Water.	12		------	1	------	------	------	------	------	1
		20		------	------	------	------	1	------	3	4
		30		------	------	1	------	5	------	6	9
		36		------	------	1	------	4	------	2	7
		48		------	------	4	4	6	------	------	14
		Total		------	1	6	4	16	------	8	35

TABLE A.

Service Attachments Laid to the Curb by the Bureau of Water, on Streets to be Paved or Repaved.

DISTRICTS.	NUMBER OF CONNECTIONS.	Total	LENGTH IN FEET.	Total.
	Size, ½-inch.		Size, ⅝-inch.	
First	37	37	444	444
Second				
Third	214	214	3,126	3,126
Fourth	136	136	1,997	1,997
Fifth	190	190	3,009	3,009
Sixth	67	67	1,060	1,060
Seventh	285	285	5,348	5,348
Total	929	929	14,984	14,984

Account of Iron Stop Boxes, New Stops and Check Valves.

DISTRICTS.	Iron Stop Boxes.	STOPS. BUREAU OF WATER Department	Butterfly.	Ludlow.	Smith.	Eddy.	Kennedy.	Check Valves.	Totals.
First		64			1				65
Second	1	12			174				186
Third	5	197			4	1	1		203
Fourth	3	112	1		2	6			121
Fifth		30			1				31
Sixth	3	135			10	1			146
Seventh	81	165		8	3			1	177
Totals	93	715	1	8	195	8	1	1	929

Number of Complaints and Examinations during 1908 and 1909.

Months.	Hydrants.		Service Pipes.		Wash Paves		Spigots.		Water Closets.		Horse Troughs.		No. Leaks.		Totals.	
	1908	1909	1908	1909	1908	1909	1908	1909	1908	1909	1908	1909	1908	1909	1908	1909
January	173	159	135	145	4	2	36	52	54	49	2	1	12	5	416	417
February	197	170	286	200	19	5	43	74	91	116	5	2	11	7	652	574
March	129	128	189	172	4	4	28	38	78	79			4	3	432	424
April	113	138	130	140	3	4	26	40	52	61	2		9	14	335	397
May	198	179	227	220	3	8	45	70	132	101	3	2	9	10	617	590
June	220	220	191	181	7	6	71	71	73	106	3	3	8	4	573	591
July	224	217	155	175	8	7	75	95	118	103	2	6	10	4	592	607
August	215	208	185	212	7	4	138	78	123	120	2	6	7	7	678	635
September	180	213	123	166	8	10	69	96	53	77	1	11	6	12	450	585
October	198	232	176	197	5	7	97	88	101	103		6	10	1	590	634
November	309	251	227	210	9	5	77	79	135	123	1	4	12	8	770	680
December	259	275	206	200	10	5	46	50	115	130	4	5	6	10	646	675
Total	2,415	2,390	2,230	2,222	87	67	751	831	1,138	1,168	26	46	104	85	6,751	6,809

Schedule of Pipe and Material Inspected During 1909.

Bureau of Water.

Manufacturer.	Size in Inches. Pipe.	Special Castings.	Inspected.	Rejected.	Accepted.
Standard Foundry, Bristol, Pa	6 in.		1,619	104	1,515
Standard Foundry, Bristol, Pa	8 in.		1,006	234	772
Standard Foundry, Bristol, Pa	10 in.		540	72	468
Standard Foundry, Bristol, Pa	12 in.		736	34	702
Standard Foundry, Bristol, Pa	16 in.		483	17	466
Donaldson Iron Co., Emaus, Pa	10 in.		873	58	815
Donaldson Iron Co., Emaus, Pa		Small	1,730	210	1,520
Donaldson Iron Co., Emaus, Pa		Large	40	2	38
J. R. Dimmick & Co., Flemington, N. J.		Large	21	9	12
J. R. Dimmick & Co., Philadelphia, Pa.		Large	20	8	12
J. R. Dimmick & Co., Fullerton, Pa.		Breeches	2		2
J. R. Dimmick & Co., Fullerton, Pa.		Breeches, B. & S.	3	2	1
Walter Wood, Florence, N. J.	6 in.		8,301	4,912	3,389
Walter Wood, Florence, N. J.	8 in.		931	565	366
Walter Wood, Florence, N. J.	12 in.		738	236	502
J. Alfred Clark, Philadelphia, Pa.		Meter framers and C.	25		25
J. Alfred Clark, Philadelphia, Pa.		Framers and C.	854	54	800
J. Alfred Clark, Philadelphia, Pa.		Grate bars	589	56	533
J. Alfred Clark, Philadelphia, Pa.		Gratings	551	70	481
Total			19,062	6,643	12,419

Schedule of Pipe and Material Inspected During 1909—Continued.

Contract No. 154.

Manufacturer.	Size in Inches. Pipe.	Special Castings.	Inspected.	Rejected.	Accepted.
Millard Construction Co., Burlington, N. J.	3 in.		25	13	12
Millard Construction Co., Burlington, N. J.	4 in.		16	6	10
Millard Construction Co., Burlington, N. J.	6 in.		6	1	5
Millard Construction Co., Burlington, N. J.	8 in.		72	5	67
Millard Construction Co., Burlington, N. J.	10 in.		93	23	70
Millard Construction Co., Burlington, N. J.	12 in.		68	11	57
Millard Construction Co., Burlington, N. J.	20 in.		288	18	270
Millard Construction Co., Burlington, N. J.	48 in.		49	4	45
Millard Construction Co., Phillipsburg, N. J.	*6 in.		7		7
Millard Construction Co., Phillipsburg, N. J.	*8 in.		50	4	46
Millard Construction Co., Phillipsburg, N. J.	*12 in.		175	23	152
Millard Construction Co., Phillipsburg, N. J.	*16 in.		8		8
Millard Construction Co., Phillipsburg, N. J.	*30 in.		53	10	43
Millard Construction Co., Phillipsburg, N. J.	*48 in.		1		1
Millard Construction Co., Weatherby, Pa.		Flanged	499	187	312
Millard Construction Co., Weatherby, Pa.		B. and S.	204	61	143
Millard Construction Co., Mt. Carmel, Pa.		B. and S.	83	11	72
Millard Construction Co., Mt. Carmel, Pa.		Flanged	32	7	25
Total.			**1,729**	**384**	**1,345**

*Flanged.

Schedule of Pipe and Material Inspected During 1909—Continued.

	Manufacturer.	Size in Inches. Pipe.	Special Castings.	Inspected.	Rejected.	Accepted.
Contractors.	Donaldson Iron Co., Emaus, Pa	6 in.		4,054	766	3,288
	Donaldson Iron Co., Emaus, Pa	8 in.		246	106	140
	Donaldson Iron Co., Emaus, Pa	12 in.		93	17	76
	Donaldson Iron Co., Emaus, Pa		Small	130	16	114
	Walter Wood, Florence, N. J	6 in.		5,096	2,542	2,554
	Walter Wood, Florence, N. J		Small	108	20	88
	Walter Wood, Camden, N. J		Small	23	5	18
	Walter Wood, Camden, N. J		Large	8	1	7
	Walter Wood, Camden, N. J	8 in.		54	29	25
	Walter Wood, Camden, N. J	10 in.		3		3
	Walter Wood, Camden, N. J	30 in.		6		6
	Total			9,821	3,502	6,319
Cont. No. 140	Michael O'Rourke, Addyston, Ohio		Flanged	269	19	250
	Total			269	19	250

Attachments Made and Delivered to the Districts during 1909.

Districts.	Number of Attachments Made and Delivered.	Feet of Lead Pipe		Total.
		½-inch.	¾-inch.	
First				
Second	7	70		70
Third	379	5,974		5,974
Fourth	74	898		898
Fifth	180	3,005		3,005
Sixth	118	1,900	236	2,136
Seventh	316	6,117		6,117
Total	1,074	17,964	236	18,200

DISTRIBUTION EXPENSES DURING THE YEAR 1909.

Including Expenses of Main Office, Purveyors' Districts and Meter Shops.

Material and Labor.	First District.	Second District.	Third District.	Fourth District.	Fifth District.	Sixth District.	Seventh District.	Distribution.	Meter Shops.	Main Office.	Totals.
Lead	$1,139 23	$770 03	$2,283 13	$988 74	$1,137 12	$2,282 08	$2,555 16				$11,155 49
Gasket	50 51	26 17	108 73	31 97	118 75	85 89	31 40				453 42
Coke	16 20	81 00	125 00	105 00	34 38	78 13	27 00				466 71
Wood						84 00					84 00
Straight pipe								$60,881 48			60,881 48
Small Specials								5,860 07			5,860 07
Large Specials								1,761 18			1,761 18
Breeches pipe and ¼ turns								1,826 07			1,826 07
Frames and covers	191 35	334 41	738 91	770 11	110 29	398 31	469 50		367 26		3,380 14
Hauling								7,669 10			7,669 10
Transportation and hotel							5 50	3,087 29			3,092 79
Supplies, tools, small stores, etc	1,085 67	1,592 00	3,188 90	2,268 60	675 29	2,936 63	764 28	3,087 70	1,241 36	$105 55	16,945 98
Plumbing and plumbing supplies	9 75					51 78		4,282 26	178 38		4,522 17
Meters, etc									766 29		766 29
Brick, stone, lime and cement	57 01	161 02	189 60	414 13	67 00	185 50	410 25				1,484 51
Lumber	7,407 66	351 02	801 52	2,480 42	812 13	3,199 24	472 94	386 81	319 71		16,291 45
Hay, feed, etc	980 20	921 12	1,559 49	1,309 01	366 89	438 46	1,034 19				6,609 66
Stable supplies	25 04	242 86	954 88	437 18	13 01	268 71	217 20				2,158 88
Stable repairs	441 40	260 76	424 53	433 65	121 00	124 55	134 25				1,939 54
Stable medicines	17 50	9 75	23 98	32 00	19 88	27 08	7 50				137 69

Distribution Expenses during the Year 1909—Continued.

Material and Labor.	First District.	Second District.	Third District.	Fourth District.	Fifth District.	Sixth District.	Seventh District.	Distribution.	Meter Shops.	Main Office.	Totals.
Stable, shoeing	$250 29	$301 00	$424 70	$193 70	$88 00	$178 65	$106 85				$1,543 19
Supplies, stationery	16 19	32 53	17 24	50 31		45 64	18 54	$885 02	$80 29	$97 13	$1,242 89
Wages—Per diem	34,492 92	28,041 53	90,580 89	31,898 61	25,727 02	45,408 66	40,925 33				297,074 99
Wages—Salary	5,261 93	5,233 71	6,677 76	9,861 42	3,154 58	4,854 69	5,364 00				40,408 09
Total cost of labor and material on account of distribution	$51,502 85	$38,359 21	$108,099 26	$51,274 28	$32,445 34	$60,648 00	$52,543 89	$89,726 98	$2,953 29	$202 68	$487,755 78
Buildings, grounds and reservoirs	293 57		14,034 68	1,881 50	3,086 58	5,256 75	17,834 03				42,387 11
High pressure fire service	144 00	1,228 30	1,546 88								2,919 18
Repair shop	427 25										427 25
Spring Garden testing station—Bureau of Surveys				705 25							705 25
Abolishment of grade crossing P. G. & N. Elevated		295 69		4,532 78							4,828 47
Watchman—Director's office							3 27				3 27
Total labor and material	$52,367 67	$39,883 20	$123,680 82	$58,393 81	$35,531 92	$65,904 75	$70,381 19	$89,726 98	$2,953 29	$202 68	$539,026 31

Philadelphia, January 17, 1910.

MR. FRED. C. DUNLAP,
Chief, Bureau of Water.

DEAR SIR:—I herewith submit Annual Report of the operations of this Department for year ending December 31, 1909.

The receipts from all sources for the year 1909 are as follows:

I. Collected by Water Rent Tax Office, Receiver of Taxes	$4,403,185 67
II. Collected for fees for searches, Miscellaneous Tax Office, Receiver of Taxes	2,523 50
III. Collected by City Solicitor for Water Bureau	34,865 02
IV. Collected by Department of Supplies for Water Bureau	4,215 49
V. Collected by Highway Bureau for ferrules	8,174 00
Total	$4,452,963 68

The revenue received by the Water Rent Tax Office for 1909, as compared with the receipts of 1908, shows an increase of $210,562.25.

The return made by the Law Department, to be credited to this Bureau, shows a decrease of $2,983.30, as compared with 1908.

The fees received for searches in the Miscellaneous Department for the year 1909 show a decrease of $50.25, as compared with 1908.

The amount received by the Department of Supplies from the sale of material shows an increase of $1,368.06, as compared with 1908.

An item not carried heretofore, representing payment to Highway Bureau for ferrules given by this Department, amounts to $8,174, and should be credited to the

revenue of this Department for the year ending December 31, 1909.

The total increase in revenue as compared with 1908 amounts to $217,070.76.

I submit herewith detailed statements of receipts for years 1908 and 1909.

I forward herewith report of the operations of the Meter Department for the year ending December 31, 1909.

Tables showing the number of attachments made by Purveyors in accordance with permits issued by this Department, shut offs made by permits, work done by the District Purveyors without permits, including ferrules withdrawn for delinquent water rent, discontinued, leaking and abandoned ferrules, detailed accounts of permits issued for various purposes, together with the total number of premises and fixtures supplied by City water, are attached hereto.

In closing, I desire to give full credit for the excellent returns made for the year 1909 to the Inspectors and Clerks employed in this Department. With a corps of twenty-one inspectors, the total number of inspections made for the year 1909 was 46,331, as compared with 24,934 for 1908.

Respectfully submitted,

JAMES F. McCRUDDEN,
Assistant in Charge.

Receipts of Bureau of Water Rents—1909.

	Water Rents by Schedule on Existing Connections.		Penalties		On New Connections.	By Meter, Current and Delinquent.	Charges for Ferrules on New Connections.	Fees for Searches.	Pipe Frontage Paid to Receiver of Taxes.	Miscellaneous.	Liens.	Interest.	Collected by City Solicitor.	Totals.
	Current.	Delinquent.	Current.	Delinquent.										
January		$10,971 15		$1,607 59	$5,220 49	$40,826 63	$998 00	$173 50	$8,972 28	$21 88	$19 00	$40 14	$2,150 95	$71,001 61
February	$166,317 25	3,991 19		606 05	7,938 32	47,446 82	238 00	169 00	11,695 41	207 88	14 00	25 61	1,207 20	239,859 73
March	306,950 59	1,999 77		296 18	17,760 90	14,821 44	1,534 00	227 00	13,145 65	191 40	17 00	28 78	4,812 92	361,785 63
April	303,476 84	2,293 05		353 38	18,188 70	23,821 43	3,349 00	237 25	11,303 16	147 74	36 00	94 08	2,045 24	365,345 87
May	2,455,329 39	3,518 57		521 61	16,550 83	40,620 99	2,871 00	246 25	11,557 48	13 34	55 00	248 04	4,389 88	2,535,922 38
June	83,129 04	4,158 50	$3,016 92	631 37	11,825 37	33,605 77	2,208 00	225 25	10,430 74	1,116 03	24 00	267 81	3,917 94	154,556 74
July	41,093 93	2,603 50	2,138 20	338 02	10,891 18	25,911 80	2,985 00	218 00	7,234 30	391 36	25 00	40 58	3,504 45	97,384 32
August	127,389 00	3,843 00	6,241 02	581 18	12,256 01	48,675 69	862 00	176 50	4,958 50	320 46	16 00	45 17	1,888 22	207,232 75
September	26,830 39	1,520 00	2,303 09	197 40	8,735 39	19,639 87	1,793 00	183 00	7,183 21	162 04	7 00	17 48	1,381 52	70,753 39
October	85,599 63	790 23	12,791 75	82 04	6,301 56	3,769 13	2,899 00	235 00	8,464 71	173 47	18 00	38 97	2,643 88	123,807 37
November	34,179 73	1,545 00	5,041 96	233 23	9,687 58	54,567 92	1,842 00	201 25	6,067 55	4,187 50	16 00	53 09	3,937 50	121,560 31
December	23,131 22	840 00	3,482 31	125 58	12,458 76	42,329 30	2,539 00	231 50	3,033 55	128 68	24 00	54 87	2,985 32	91,364 09
1909	3,653,427 01	$37,876 96	$36,015 25	$5,573 63	137,815 09	396,016 79	24,118 00	$2,523 50	104,046 54	$7,061 78	$271 00	$963 62	$34,865 02	$4,440,574 19
1908	3,524,699 38	36,036 92	34,099 93	5,267 05	82,941 28	348,479 64	12,615 00	2,573 75	127,955 41	18,801 89	190 00	633 92	37,848 32	4,233,045 49
Increase	$128,727 63	$1,840 04	$1,015 32	$306 58	$54,873 81	$47,537 15	11,503 00				$81 00	$329 70		$207,528 70
Decrease								$50 25	$23,908 87	$11,743 11			$2,983 30	

The following is a detailed report upon the receipts of the Bureau of Water, as collected by the Water Rent Tax Office, Receiver of Taxes, up to and including December 31, 1909 (with report of corresponding period of 1908):

	1908.	1909.	*Decrease.
Rents	$3,524,699 38	$3,653,394 01	$128,694 63
Penalties	34,999 93	36,015 25	1,015 32
Delinquents	36,036 92	37,876 96	1,840 04
Penalties	5,267 05	5,573 63	306 58
Liens	190 00	271 00	81 00
Interest	633 92	963 62	329 70
Permits	95,556 28	161,933 09	66,376 81
Meters	348,479 64	396,016 79	47,537 15
Pipe	127,955 41	104,046 54	*23,908 87
Special	18,804 89	7,061 78	*11,743 11
Total	$4,192,623 42	$4,403,185 67	$210,562 25

The permit item of the above tabulation represents bills issued direct from this office and is divided into the following items:

	No.	1908.	No.	1909.	Increase.
For additional fixtures	5,239	$9,688 66	5,665	$12,285 51	$2,596 85
For building purposes	307	3,890 23	1,242	15,665 56	11,775 33
For additional water rent	321	16,313 47	2,139	44,650 82	28,337 35
For ferrules	355	12,615 00	604	24,116 00	11,501 00
For specials	65	849 50	71	654 25	*195 25
For new houses	9,010	52,199 42	16,297	64,560 95	12,361 53
For ferrules drawn	133		174		
Total number of permits	15,430	$95,556 28	26,182	$161,933 09	$66,376 81

*Decrease.

Unpaid permits to December 31st, 1909		$7,513 70
Additional	$3,620 95	
New houses	1,700 25	
Building permits	233 50	
Department ferrules	1,792 00	
Fractional rents	167 00	
		$7,513 70

Attachments, Etc., Made by the Purveyors in Accordance With Permits Issued by the Bureau of Water.

New Attachments.

Districts.	½-inch.	⅝-inch.	¾-inch.	1-inch.	1¼-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	6-inch.	Total.
First	789	3	19	10	4	2	3	3	2	1	876
Second	273	40	34	33	8	3	14	----	----	----	305
Third	1,690	18	13	24	8	5	19	2	6	11	1,796
Fourth	1,364	31	11	20	8	3	9	1	----	5	1,452
Fifth	130	46	5	3	----	1	3	----	----	----	188
Sixth	1,299	127	21	14	6	3	7	----	1	----	1,478
Seventh	1,841	133	15	25	7	8	9	1	2	3	2,044
Total	7,286	438	118	129	41	25	64	7	11	20	8,159

Shut-Offs by Permits.

Districts.	Reamed for Large Attachment.	Redriven.	Discontinued.	Transfer	Repairs. Not Drawn.	Repairs. Drawn and Redriven.	Total.
First	--------	226	24	--------	--------	62	312
Second	39	42	92	--------	177	--------	350
Third	--------	8	43	4	3	--------	58
Fourth	36	120	12	--------	--------	72	240
Fifth	2	13	3	3	12	15	48
Sixth	28	57	52	3	15	22	177
Seventh	37	18	12	9	--------	132	208
Total	142	484	238	19	207	303	1,393

Work Done Without Permit.

Drawn:

Districts.	Discontinued and Abandoned.	Delinquent.	Leak.	Transfer.	Total.	Drawn and Redriven.
First	38	99	265		402	
Second	61	76	162		299	
Third	80	114	311		505	289
Fourth	48	30	143		221	33
Fifth		7	2		9	4
Sixth		3	77		80	
Seventh	8	90	85		183	24
Total	235	419	1,045		1,699	350

Number of Dwellings and Principal Appliances for Use of City Water.

	1908.	1909.	Increase.	Decrease.
Dwellings with water	292,565	302,922	10,357	
Dwellings without water	11,931	11,859		72
Water closets	380,628	399,875	19,247	
Baths	335,256	346,823	11,567	
Wash paves	99,195	99,347	152	
Basins and sinks	155,843	167,116	11,273	
Urinals	6,617	6,717	100	

APPENDIX D

REPORT

OF THE

OPERATIONS AT THE CONSTRUCTION AND REPAIR SHOP, BUREAU OF WATER, DURING THE YEAR 1909

Philadelphia, January 22, 1910.

MR. FRED C. DUNLAP,
Chief, Bureau of Water.

DEAR SIR:—I herewith submit the Annual Report of the operations at the Bureau of Water Construction and Repair Shop, Twelfth and Reed streets, for the year ending December 31, 1909.

Very respectfully,

JAMES H. DEAN,
Superintendent of Shop.

Report of Construction and Repair Shop, Bureau of Water, for the Year Ending December 31, 1909.

MERCHANDISE AND WAGES.		DR.
Inventory, January 1, 1909		$29,184 76
Iron castings	$18,670 42	
Wrought iron	1,417 83	
Brass castings	5,910 16	
Brass fittings	4 00	
Lead coating	481 40	
Bolts, nuts and washers	881 93	
Hardware	703 08	
Coal	1,558 04	
Coke	48 60	
Gum goods and belting	782 50	
Leather	883 29	
Pig lead	576 60	
Lumber	972 90	
Oils and tallows	306 68	
Paints and oils	50 04	
Steel	895 76	
Baskets, brushes, brooms, etc	43 03	
House cleaning supplies	40 03	
Forage	143 78	
Harness and stable supplies	89 80	
Stationery, blank books and office supplies	19 23	
Printed blanks and books	20 47	
Miscellaneous	1,156 52	
Wages	40,290 90	75,946 99
Total		$105,131 75

LABOR AND MERCHANDISE.		CR.
First District	$4,995 17	
Second District	3,862 18	
Third District	11,870 61	
Fourth District	5,691 40	
Fifth District	1,407 53	
Sixth District	7,108 51	
Seventh District	9,703 85	
		$44,639 25

Belmont machinery	$4,982 90	
Belmont boilers	636 45	
Belmont filters	1,167 35	
		$6,786 70
Frankford machinery	$1,512 64	
Frankford boilers	1,978 04	
		3,490 68
Fairmount machinery	14 06	
		14 06
Queen Lane machinery	$3,667 65	
Queen Lane boilers	146 09	
		3,813 74
Roxborough machinery	$6,530 53	
Roxborough boilers	1,251 18	
Roxborongh filters	354 42	
		8,136 13
Spring Garden machinery	$351 28	
Spring Garden boilers	194 44	
		545 72
Torresdale machinery	$473 41	
Torresdale boilers	219 63	
Torresdale filters	466 98	
		1,160 02
Mt. Airy machinery	$115 70	
		115 70
General buildings and grounds	$1,155 31	
		1,155 31
General distribution	$969 66	
		969 66
High pressure fire service	$391 87	
		391 87
Main office	$580 05	
		580 05
Survey Bureau	$1,231 36	
		1,231 36
U. G. I. Co	$1 80	
		1 80
Fixed patterns	$980 02	
		980 02
Holmesburg Water Co	$443 23	
		443 23
Construction and repair shop	$2,810 58	
		2,810 58
Total		$77,265 88
Inventory January 1, 1910		32,290 84
Total Cr		$109,556 72
Total Dr		105,131 75
Balance		$4,424 97

Inventory January 1, 191		Cr.
4 4-in. stop valves at $16	$64 00	
36 6-in. stop valves at $18.50	666 00	
10 8-in. stop valves at $28.50	285 00	
12 10-in. stop valves at $37.50	450 00	
13 12-in. stop valves at $48	624 00	
2 16-in. stop valves at $80	160 00	
2 20-in. stop valves at $120	240 00	
3 30-in. stop valves at $260	780 00	
		$3,269 00
Finished iron castings for stop valves	$644 74	
Finished brass castings for stop valves	840 74	
		1,485 48
11,443 lbs. iron castings for stop valves	$400 50	
		400 50
5 No. 1 fire hydrants at $34	$170 00	
1 No. 2 fire hydrant at $42.50	42 50	
		212 50
Finished iron castings for fire hydrants	$228 60	
Finished brass castings for fire hydrants	436 10	
		664 70
28,422 lbs. iron castings for fire hydrants	$852 66	
604 lbs. brass castings for fire hydrants	108 72	
		961 38
Partly finished frost and valve rods and cap bands	$517 35	
Finished eye bolts, chains and S hooks	35 75	
		553 10
30 4-in. leather valves, complete, at $2	$60 00	
10 6-in. leather valves at $4.50	45 00	
417 4-in. rubber valves at 60c	250 20	
6 6-in. rubber valves at $1.25	7 50	
		362 70
165 lbs. large and small gumjoint rings at 30c	$49 50	
180 lbs. leather for valves, cut and uncut	108 00	
		157 50
1,133 ferrule plugs, various sizes	$418 30	
28 fire hydrant risers, various sizes	78 75	
300 feet coil chain	9 00	
6 gross flat-head brass screws	18 00	
		524 05
Tools, etc., to distribute to districts	637 90	
		637 90
1 partly finished 48-in. rotary valve	$536 00	
24 steel plunger rods, finished and unfinished	1,138 00	
30 quadrants	300 00	
1 crosshead guide	42 50	

1	plunger, No. 5 Spring Garden	$310 50	
68	heads for fire hoes	119 00	
385	steel sketch plates	96 25	
	Finished parts for turntables	193 50	
12	wedge block bolts	15 00	
3	spur gears for sponge washers	15 75	
	Coal car wheels and axles	170 25	
10	furnaces, complete	210 00	
8	furnace grates	56 00	
28	lead pots, various sizes	90 50	
			$3,293 25
433	department stop screws, various sizes	$1,464 00	
355	assorted stop screws, various sizes	2,472 75	
63	socket screws, various sizes	132 25	
			4,069 00
36	pairs of brasses for air pumps	$187 00	
79	keys for air pumps	177 75	
57	gibs for air pumps	128 25	
30	straps for air pumps	270 00	
			763 00
317	Iron bead and bell bands, various sizes	$1,565 50	
194	tail ends, various sizes	106 75	
191	eye bolts for stops	50 95	
50	bolts for bands	37 50	
50	wrought iron monkey legs	187 50	
71	saddles for drilling machines	14 20	
4	street keys	30 00	
2	scrapers	4 00	
9	brass reducers	22 50	
			2,018 90
15,499	bolts, square heads and nuts, various sizes	$615 47	
645	bolts, Hex nuts, various sizes	88 31	
2,875	T head gland bolts, various sizes	460 49	
2,512	set screws, various sizes	169 80	
565	lbs. square nuts, various sizes	56 50	
2,174	lbs. Hex nuts, various sizes	260 88	
1,883	lbs. washers, various sizes	188 30	
			$1,839 75
700	wooden plugs, various sizes	$350 00	
1,017	lbs. brass spring wire	305 10	
25	lbs. copper wire	7 50	
1,782	lbs. rolled brass	445 50	
50	lbs. sheet brass	12 50	
3,192	lbs. pig lead	223 44	
			1,344 04

515 lbs.	gasket	$36 05	
230 lbs.	waste	16 10	
½ bbl.	tallow	18 00	
¼ bbl.	sal soda	1 50	
			$71 65
42,481 lbs.	miscellaneous and pump machinery castings	$1,486 84	
29,710 lbs.	loam castings	1,485 50	
380 lbs.	steel castings	22 80	
2,336 lbs.	red brass castings	432 16	
9,666 lbs.	Ajax metal castings	2,319 84	
			5,747 14
825 lbs.	non-shrinkable metal	206 25	
130 lbs.	Unital steel	65 00	
530 lbs.	Swedish steel	95 40	
1,805 lbs.	English tool steel	324 90	
546 lbs.	Muschette steel	191 10	
4,308 lbs.	American cast steel	344 64	
1,389 lbs.	shear steel	97 23	
1,874 lbs.	Hex steel	112 44	
1,214 lbs.	spring steel	72 84	
517 lbs.	Norway iron	20 68	
38,293 lbs.	refined iron, various sizes	1,148 79	
13,036 lbs.	steel, various sizes	391 08	
			3,070 35
	Lumber	$542 35	
	Hardware	68 85	
	Paints, oils and tallows	91 45	
	Forage	16 00	
	Coal and coke	126 30	
			844 95
	Total		$32,290 84

Furnished to Districts during 1909.

Districts.	No. 1 Fire Hydrants	No. 2 Fire Hydrants	Wedge Stop Valves							Plugs			Stop Screws.
			4-inch.	6-inch.	8-inch.	10-inch	12-inch	16-inch	20-inch	30-inch	Wood.	Brass.	Iron Bands.	
First	29	12	3	45	14	8	2	----	----	----	15	531	1	44
Second	67	2	----	4	----	3	1	----	----	1	12	572	-----	22
Third	105	8	5	139	9	29	9	6	1	2	141	480	75	51
Fourth	26	5	----	115	4	----	11	----	----	----	66	531	11	89
Fifth	14	----	----	21	----	2	----	----	----	----	12	-------	-----	17
Sixth	79	3	----	113	1	17	6	2	1	1	92	254	21	65
Seventh	70	19	2	181	20	10	2	2	----	1	42	330	25	27
Totals	394	49	10	618	48	69	31	10	2	5	380	2,698	133	225

Principal Articles Manufactured During 1909.

651	6-inch stop valves at $18.50	$12,043 50
54	8-inch stop valves at $28.50	1,539 00
76	10-inch stop valves at $37.50	2,850 00
22	12-inch stop valves at $48	1,056 00
6	16-inch stop valves at $80	480 00
2	20-inch stop valves at $120	240 00
7	30-inch stop valves at $260	1,820 00
346	No. 1 fire hydrants, leather valves, at $34	11,764 00
60	No. 1 fire hydrants, rubber valves, at $34	2,040 00
50	No. 2 fire hydrants, leather valves, at $42.50	2,125 00
2,392	ferrule plugs, various sizes, at 25 cents	598 00
430	wooden plugs, various sizes, at 50 cents	215 00
	Total	$36,770 50

APPENDIX E

REPORT
OF THE
CHIEF DRAUGHTSMAN
ON THE
HYDROGRAPHIC WORK
FOR THE YEAR 1909

Philadelphia, January 2, 1910.

MR. FRED C. DUNLAP,
Chief, Bureau of aWter.

DEAR SIR:—The following report on Hydrographic Work under my charge and on data collected during the year 1909 is respectfully submitted.

Attention is called to the following errors which occur in the published data of the Hydrographic Work in the report of the Bureau of Water for the year 1907.

On page 197 the flow-off in inches of rainfall for the Perkiomen, 1907, should read 28.034 instead of 27.79.

On the same page read: "There was high water flowing over the flash boards at Fairmount Dam during the months of January and March; very little water flowed over the flash boards during the months of April, May, June, July, August and September to the 12th of the month, when the rains of the 10th and 11th caused a rise and flow of water over the flashboards for three days.

In Table VI the area of the Schuylkill watershed should read 1915 instead of 191.5.

In Table VII Minimum Flow of the Schuylkill should read 672,820,000 instead of 67,282,000.

In Table IX the quantities for October and December, 1907, for the Perkiomen are transposed in the second to the seventh column. The quantity for November is correct. These figures are correctly placed in the report for 1908, where the months of Ocober, November and December are repeated, the Hydrographic year, as suggested in the beginning of this observation, ending September 30.

Table IX also shows the minimum average flow of the Schuylkill to be 679,320,000 gallons per day for the month of September; this is correct for the whole month.

Table VII shows the minimum flow for one day to be 672,820,000; this is correct for one day in the month during which no water flowed over the flash boards.

Rainfall observations at twenty-one stations, from which the Bureau obtained these data, have been carried on, completing twenty-seven years of continuous records. Nine of these stations are maintained by the Bureau, and furnished with instruments, stationery and postage. The observers are paid a small monthly salary for the services rendered.

Three of the stations are furnished with self-registering rain gauges, and at four stations automatic stream gauges are in operation, recording continuously the height of water flowing in the streams. From the curves traced by these instruments the daily, monthly and yearly flow is computed.

The total observed precipitation for the year 1909 was below the normal of the years in which these observations have been made.

The greatest monthly rainfall on the area comprising the water sheds of the Schuylkill, Perkiomen, Neshaminy

and Tohickon streams during the year 1909 was 5.53 inches, being the average of nineteen stations for the month of February.

The average rainfall for the months of January, February, March, April and May to the middle of June shows a deficiency in the normal amount of rainfall for these months over nearly all of the Middle and New England States. Beginning with the middle of June a very severe drought extended over a large portion of the Middle and New England States, but not with the same severity in the New England States.

The average total rainfall from the Bureau records for the months of July, August, September, October and November for the past eleven years, covering an area considerably greater than the watershed of the Schuylkill river, is 20.81 inches. The total rainfall for the same records for the same months of 1909 was only 10.22 inches, or less than one-half the average total for the preceding eleven years. The deficiency in the rainfall of the preceding months and the great deficiency in following months, when there is the greatest evaporation, combined with the very unequal distribution of the small amount of rainfall that was recorded, produced a condition in the ground that has rarely been equalled, and certainly not within the time these data were collected on the area covering the watersheds of the streams under observation.

Stream flow observations with the automatic stream gauges have been continued on the Perkiomen, Neshaminy, Tohickon and Schuylkill, making twenty-six years of continuous records relative to stream flow on the three first-named streams and eleven years on the Schuylkill river. Observations on the Wissahickon were subject to so much interruption that a continuous record for over one year was impossible, and the work on this stream was discontinued in 1906.

The effect of the unusual drought of the past five months is shown in the diminished flow of the rivers and streams in Eastern Pennsylvania, exceeding by far any previous record in the observations of the past twenty-six years.

The average daily flow of the Perkiomen for the past twenty-six years is 166,170,000 gallons.

The average daily flow for the five months of July, August, September, October and November is 110,000,000 gallons, and the average daily flow for the same months of 1909 is only 19,800,000, or about one-tenth of the average yearly flow and one-fifth of the average flow for the months of least flow.

The average daily yield per square mile of the Perkiomen watershed for the past twenty-six years is 1,093,000 gallons.

The average daily yield per square mile of watershed for the months of low flow is 660,000 gallons, and the average for the same months in 1909 is only 130,000 gallons

The average daily flow of the Neshaminy for the past twenty-six years is 151,806,000 gallons.

The average daily flow for the five months of July, August, September, October and November is 82,000,000 gallons, and the average daily flow for the same months in 1909 is only 10,100,000 gallons, or about one-fifteenth the average yearly flow and about one-eighth the average daily flow for the months of least flow.

The average daily yield per square mile of the Neshaminy watershed for the past twenty-six years is 1,091,000 gallons, and the average daily yield per sqare mile of watershed for the month of least flow is 590,000 gallons, and the average for the same months of 1909 is 72,000 gallons.

The average daily flow of the Tohickon for the past twenty-six years is 127,580,000 gallons. The average

daily flow for the five months of July, August, September, October and November is 64,000,000 gallons, and the average daily flow for the same months of low flow in 1909 is only 3,700,000 gallons, or about one-fortieth of the average annual daily flow.

The average daily yield per square mile of the Tohickon watershed is 1,250,000 gallons, and the average daily yield per square mile of watershed for the five months of least flow for twenty-six years is 627,000 gallons, and the average daily flow for the same months in 1909 is only 30,600 gallons

The average daily flow of the Schuylkill river for the past eleven years in which observations on the flow of this stream have been made is 1,869,100,000 gallons, and the average daily flow for the months of July, August, September, October and November is 995,000,000 gallons for eleven years, and the average daily flow for the same five months in 1909 is only 136,000,000 gallons, or about one-fourteenth of the average annual flow and about one-seventh of the average daily flow during the five months of least flow.

The average daily yield per square mile of watershed of the Schuylkill river is 976,000 gallons, and the average daily yield for the months of least flow is 520,000 gallons, and for the same months of low flow in 1909 71,000 gallons.

A popular assertion is often made that a yield of 1,000,000 gallons per square mile of watershed can be depended upon from rivers and streams in the eastern part of the United States. This does not seem at all probable from the observations and computations made on these streams, and especially so on streams with as large a watershed as the Schuylkill river, even if an almost unlimited storage is provided.

The observations show that the average annual daily

flow of the streams remains nearly the same from year to year, the year 1909 showing the greatest departure from the average annual flow.

The distribution of the flow is becoming more irregular, uncontrollable freshets, followed by periods of extremely low flow, are more prominently observed, and the engineering problem of controlling and utilizing the flow is becoming more difficult.

This can be illustrated by making a computation of the total horsepower of the Schuylkill river at Fairmount Dam. The observed average daily flow is found to be 175,000 cubic feet per minute, and the average fall can be assessed at twelve (12) feet. This will produce about 4,000 horsepower, and with wheels utilizing eighty-five (85) per cent. would give 3,400 horsepower if the whole flow could be controlled, but as not more than two-thirds of this can be controlled by storage, the net horsepower at Fairmount Dam would be 2,270 horsepower with storage sufficient to control the flow.

Comparing this computation with the result obtained from the extremely low flow of 1909, during five months of which the average daily flow was only 12,400 cubic feet per minute, which would develop 281 horsepower, and with the wheels developing 85 per cent., the horsepower would only be 238 horsepower, a difference of something over 2,000 horsepower between the average daily flow and what may be expected from a long-continued drought as was experienced in 1909.

The automatice gauge at Fairmount records the height of water in Fairmount dam from zero, City Datum, in feet and decimals of a foot, and records the height of water, in inches, on the dam above the old comb of the dam, which is given in the records of this Bureau as 4.76 C. D.

The zero of this gauge, as shown in the report for

1905, was compared with the City Datum bench marks, established by the Bureau of Surveys on both sides of the river, and was found to practically correspond with both. All observations on the flow of the stream are made from the records of this gauge.

Daily computations of the amount of water flowing over the flash boards were made from the records of the automatic gauge, the known pumpage from the river, the quantity used for power, through the wheels, the leakage and lockage (both estimated), which give an approximation of the monthly flow of the Schuylkill river at Fairmount dam.

A comparison of the inches of rainfall flowing off in the Schuylkil river, with the run off, in inches, on the Perkiomen and Neshaminy creeks, is shown in the following table:

Inches of Rainfall Flowing Off January to December.	Perkiomen.	Neshaminy.	Schuylkill.
1898	21.50	22.22	24.39
1899	24.66	21.03	22.29
1900	15.21	17.27	18.23
1901	17.55	22.80	17.80
1902	29.01	30.74	29.02
1903	27.23	26.32	27.79
1904	23.07	23.37	18.84
1905	23.62	17.98	18.95
1906	21.67	24.41	17.31
1907	28.03	30.25	21.72
1908	18.71	20.31	17.10
1909	15.72	15.74	10.32

At present there is no method available by which the low water flow for periods of less than one month can be determined.

The daily average flow of the Schuylkill river, as given in Table IX, is computed from the total monthly flow, and is often, for several days at a time, much less than shown in the table.

Your attention is especially directed to the value of the Hydrographic Work: First, in the length of time during which it has been continued, the year 1909 completing twenty-seven years of records of rainfall and twenty-six years of stream-flow observations. Second, the very favorable conditions under which the observations have been continued for so long a period without any changes in the stream conditions at the places selected for the location of the stream gauges which would affect the original computed stream-flow curves. Third, in the fact that the watersheds adjoin each other, thus making it possible that the records of stream flows can be combined to cover one large area on which the observations have been made consecutively, as on small areas the rainfall is much more evenly distributed. The run-off from the smaller area is also in all probability more nearly correct, and shows clearly the amount of water taken from the rainfall by evaporation and vegetation on the surface of the ground at different seasons of the year.

The following named tables, compiled as in previous years, accompany this report:

I.	Monthly precipitation on sundry water sheds.	
II., III., IV.	Rainstorms exceeding ¼ inch per hour.	Philadelphia. Forks of Neshaminy Spring Mount.
V., VI., VII.	Inches of rainfall flowing in.....	Perkiomen. Neshaminy. Tohickon. Schuylkill.
	Average annual yield of streams.....	
	Comparative stream flow.....	
IX.	Monthly and daily yield of.....	Perkiomen. Neshaminy. Tohickon. Schuylkill.

The Bureau is indebted to the following named persons, who have kindly furnished rainfall records:

Mr. John C. Beans, Moorestown, N. J.

Mr. Benjamin H. Shoemaker, Pennsylvania Hospital.

In order to secure uniformity in rainfall observations, the following notice was sent to the observers employed by the Bureau of Water at the beginning of the year 1890:

"To facilitate the work of the Hydrographic Corps and maintain a uniform system of observations with the United States Weather Bureau, it is requested that you hereafter take rainfall observations at least once every day, as near 8.00 P. M. as possible, recording the amount under that date as the rainfall of the preceding twenty-four hours."

Yours respectfully,

JOHN E. CODMAN,
In charge Hydrographic Work

TABLE I.—MONTHLY PRECIPITATION ON SUNDRY WATER SHEDS, COMPARDED WITH U. S. WEATHER BUREAU OBSERVATIONS AT PHILADELPHIA.

	PHILADELPHIA SERIES.					SCHUYLKILL SERIES.					PERKIOMEN SERIES.		DELAWARE SERIES.			TOHICKON SERIES.			NESHAMINY SERIES		
	U. S. Weather Bureau.	Water Bureau Auto.	Water Bureau Ground Gauge.	Pennsylvania Hospital.	Shawmont.	Lebanon.	Reading.	Pottsville.	Browers.	Hamburg.	Seisholtzville.	Spring Mount.	Easton.	Moorestown.	West Chester.	Ottsville.	Smith's Corner.	Point Pleasant.	Lansdale.	Forks of Neshaminy.	Doylestown.
Elevations are in Feet Above Sea Level.	207	66	49	25	368	480	207	150	86	365	870	300	340	65	455	390	480	119	350	143	405
1909.	Precipitation in Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January	2.52	2.68	2.81	2.63	2.72	2.85	2.99	3.10	2.17	1.88	3.20	3.28	3.37	2.91	3.21	3.37	2.63	3.16	2.94	2.71	4.03
February	4.62	4.84	5.19	5.64	5.34	5.41	5.53	5.13	4.42	9.86	6.10	4.32	6.01	4.96	5.04	5.51	5.17	4.99	4.70	5.00	4.81
March	2.92	3.10	3.08	4.02	3.60	3.32	3.66	3.20	3.59	3.56	4.26	3.23	3.02	3.33	4.20	3.29	3.11	3.37	3.32	3.14	4.52
April	4.49	4.06	4.42	4.29	3.96	3.86	4.18	5.33	4.47	6.90	4.96	4.54	6.01	5.45	3.16	5.27	5.52	5.52	5.08	5.51	6.01
May	2.67	2.57	3.06	3.03	3.42	2.96	3.62	3.28	2.70	5.52	2.95	3.54	2.82	2.25	2.63	2.96	3.47	2.90	3.40	3.34	3.91
June	2.26	2.40	2.42	2.49	3.52	3.27	3.23	3.87	3.93	5.62	2.46	2.95	3.77	2.34	3.49	3.70	3.48	3.04	3.39	4.02	3.62
July	2.19	2.46	2.59	2.32	1.68	0.87	1.22	2.43	1.85	1.53	1.57	1.97	3.02	1.72	0.96	2.63	1.97	2.15	2.39	2.48	1.89
August	1.95	2.65	2.67	2.33	2.80	0.33	0.33	0.34	1.40	1.61	1.10	0.46	1.51	2.28	1.80	1.72	3.21	3.41	2.03	3.73	2.56
September	3.55	3.08	3.12	4.00	3.72	1.50	3.08	2.88	1.98	3.43	2.27	1.85	3.07	2.80	3.02	1.87	2.21	2.56	2.68	2.87	3.06
October	0.83	0.83	0.85	1.10	0.99	2.48	2.59	3.48	1.40	4.60	1.31	1.18	1.04	1.06	1.11	1.26	1.13	1.05	0.85	1.04	1.28
November	3.50	2.72	2.72	3.02	2.38	1.05	1.58	1.36	1.78	1.03	1.40	1.51	-------	3.44	2.50	3.97	3.50	3.29	2.48	3.24	3.33
December	5.86	5.07	5.24	*3.79	4.37	3.75	5.32	4.32	4.59	3.19	5.66	5.85	-------	5.02	4.51	3.96	4.21	5.08	4.26	5.06	4.52
Total	37.36	37.46	38.17	38.66	38.50	31.65	37.33	38.72	34.19	48.73	37.24	34.68	-------	37.56	35.63	39.51	39.61	40.52	37.58	42.14	47.50
Percentage	100	100	102	105	103	84	100	104	92	131	100	93	-------	100	94	106	106	111	100	103	117
27 years yearly average (Inches)	40.76	-------	43.89	44.91	43.02	43.27	43.05	49.03	44.73	48.72	48.88	44.93	-------	47.02	50.94	47.26	50.43	48.83	44.79	46.68	47.50
27 years yearly average (Percentages)	100	-------	107	112	105	106	105	120	109	119	119	110	-------	115	124	116	123	119	110	114	116
Average deficiency or increase	—3.40	-------	—5.72	—6.25	—4.50	—11.62	—5.72	—10.31	—10.50	-------	—11.64	—10.75	-------	—9.46	—15.31	—7.75	—10.82	—8.31	—7.21	—4.44	—3.96
Percentage deficiency or increase	8	-------	13	15	10	27	13	20	22	-------	24	24	-------	20	30	16	20	17	14	11	8

*Snow fall of December 25 and 26 not recorded.

TABLE II.

Rain Storms Exceeding in Rate 0.25 Inches per Hour, as Recorded by the Automatic Rain Gauge at Philadelphia, for the Year 1909.

DATE OF OBSERVATION	AUTOMATIC RAIN GAUGE					REMARKS
	TOTAL FALL.		MAXIMUM FALL.			
	Amount in Inches.	Duration Hours, Minutes.	Amount in Inches.	Duration in Minutes.	Rate per Hour During Maximum Fall.	
February 24, rain storm	2.13	32—00	.73	60	.73	
April 13 and 15, rain storm	1.67	34—20	.25	40	.38	
June 27, shower	0.25	1—45	.23	20	.69	
July 16, shower	.85	1—00	.55	15	2.20	
July 22 and 23, rain storm	1.64	37—40	.48	12	2.40	
August 16, rain storm	2.41	20—40	.75	25	1.80	
December 13 and 14, rain storm	2.75	15—35	.30	20	.90	

TABLE III.

Rain Storms Exceeding in Rate 0.25 Inches per Hour, as Recorded by the Automatic Rain Gauge at Forks of Neshaminy, for the Year 1909.

DATE OF OBSERVATION.	AUTOMATIC RAIN GAUGE.					REMARKS.
	TOTAL FALL		MAXIMUM FALL.			
	Amount in Inches.	Duration Hours, Minutes.	Amount in Inches.	Duration in Minutes.	Rate per Hour During Maximum Fall.	
February 24, rain storm	2.50	32—00	.25	60	.25	
April 13 and 15, rain storm	2.13	37—40	.45	40	.66	
April 29, rain storm	1.18	7—10	.35	30	.70	
May 27, shower	.48	1—15	.35	15	1.40	
June 2, shower	.55	0—20	.55	20	1.65	
June 5, shower	.42	12—00	.25	25	.60	
June 14, shower	.96	1—25	.86	15	3.44	
June 27, shower	.37	0—20	.35	10	2.10	
July 22 and 23, rain storm	1.01	35—00	.70	25	1.68	
July 27, shower	.40	0—50	.35	15	1.40	
August 16, rain storm	2.96	41—30	2.11	180	.70	
December 13 and 14, rain storm	2.85	13—35	1.50	60	1.50	

TABLE IV.

Rain Storms Exceeding in Rate 0.25 Inches per Hour, as Recorded by the Automatic Rain Gauge at Spring Mount, for the Year 1909.

DATE OF OBSERVATION.	AUTOMATIC RAIN GAUGE.					REMARKS
	TOTAL FALL		MAXIMUM FALL			
	Amount in Inches.	Duration Hours. Minutes.	Amount in Inches.	Duration in Minutes.	Rate per Hour During Maximum Fall.	
January 5, rain storm	1.70	21—45	.40	15	1.60	
February 24, rain storm	2.12	30—20	.25	60	.25	
April 13 and 15, rain storm	1.56	34—55	.15	25	.36	
April 29, rain storm	.94	6—10	.25	60	.25	
May 27, shower	.45	50	.34	15	1.36	
June 14, shower	.30	1—30	.20	20	.60	
June 17, shower	1.03	4—30	.23	6	2.30	
June 15, shower	.51	1—00	.42	20	1.26	
July 22 and 23, rain storm	1.22	37—15	.25	60	.60	
December 13 and 14, rain storm	3.54	13— 5	1.50	80	1.12	

TABLE V.

Inches of Rainfall Flowing in the Perkiomen, Neshaminy and Tohickon Creeks.

Watersheds.	Area in Miles.	Percentage of Total Area				Average for 26 Years 1883—1909.												
		Woodland.	Cultivated.	Flats.	Roads.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Perkiomen at Frederick, 26 years	152.0	25	71	2	2	2.87	3.51	3.86	2.15	1.37	0.93	1.07	0.97	0.98	1.08	1.50	2.24	22.53
Neshaminy below Forks, 26 years	139.3	6	92	¼	1¾	3.11	3.82	3.81	2.11	1.55	0.87	0.96	1.03	0.86	1.07	1.38	2.34	22.91
Tohickon, 26 years	102.2	24	72	2	2	3.88	4.22	4.83	2.43	1.74	0.80	1.01	1.10	1.23	1.07	1.75	2.76	26.82
Perkiomen, at Frederick — Maximum, 26 years						5.40	9.73	6.68	3.52	6.68	2.65	4.80	2.48	3.68	2.82	6.67	6.45	
Perkiomen, at Frederick — Minimum, 26 years						0.50	0.85	2.38	0.97	0.46	0.23	0.17	0.18	0.16	0.20	0.24	0.61	
Neshaminy, below Forks — Maximum, 26 years						6.77	10.71	7.11	4.20	7.41	2.93	5.47	3.37	3.81	4.55	6.31	5.55	
Neshaminy, below Forks — Minimum, 26 years						1.60	0.90	1.84	1.03	0.35	0.08	0.04	0.14	0.03	0.06	0.11	0.41	
Tohickon — Maximum, 26 years						7.34	10.41	8.58	4.76	8.56	3.43	6.41	3.75	5.49	4.27	7.07	7.58	
Tohickon — Minimum, 26 years						0.54	0.62	2.98	0.73	0.10	0.07	0.08	0.04	0.03	0.04	0.12	0.56	

TABLE VI.

Average Annual Yields of Sundry Watersheds to October 1, 1909.

Watersheds.	Period covered in years.	Area in Miles.	Average rainfall in inches.	Average rainfall flowing off in inches.	Per cent flowing off.	Average daily yield in gallons.	Average yield in cubic feet per second per square mile of drainage area.	Average yield in cubic feet per second per square mile of drainage area for each inch of rainfall.
Perkiomen at Frederick	26	152.0	46.663	22.961	49.206	166,170,000	1.6914	0.0362
Neshaminy below Forks	26	139.3	47.822	22.889	47.862	151,806,000	1.6861	0.0353
Tohickon	26	102.2	48.330	26.866	55.590	130,724,000	1.9791	0.0410
Schuylkill	11	1915.0	47.152	20.500	43.470	1,869,100,000	1.5101	0.0320
Sudbury, Mass.	34	75.2	45.70	22.167	48.504.	1,053,000	1.625	0.0355
Croton, N. Y.								

TABLE VII.

Comparative Daily Stream Flow, 1908 and 1909.

Watersheds.	Area of watersheds.	MAXIMUM. GALLONS.		Date.	MINIMUM. GALLONS.		Date.
		Per Day.	Per Sq. Mile.		Per Day.	Per Sq. Mile.	
Perkiomen	152.0	2,160,000,000	14,200,000	February 24.	6,450,000	42,500	Sept. 9.
Neshaminy	139.3	2,420,000,000	17,400,000	February 24.	5,150,000	35,800	Sept. 8.
Tohickon	102.2	1,960,000,000	19,200,000	February 24.	1,160,000	11,800	Sept. 4.
Schuylkill	1915.0	10,820,000,000	5,750,000	February 24.	115,000,000	59,000	Sept. —

TABLE IX.—PRECIPITATION AND STREAM FLOW ON PERKIOMEN, NESHAMINY AND TOHICKEN WATERSHEDS, AND SCHUYLKILL RIVER AT FAIRMOUNT.

DATE. 1908.	PERKIOMEN AT FREDERICK. AREA OF WATER SHED, 152 SQUARE MILES.							NESHAMINY BELOW FORKS. AREA OF WATER SHED, 139.3 SQUARE MILES.							TOHICKON. AREA OF WATER SHED, 102.2 SQUARE MILES.							SCHUYLKILL AT FAIRMOUNT. AREA OF WATER SHED, 1,915 SQUARE MILES.						
	Rainfall in Inches.	Inches of Rainfall Flowing Off.	Percentage Flowing Off.	Monthly Yield of Stream.	Average Daily Yield of Stream.		Average Yield in Cubic Feet per Second per Square Mile.	Rainfall in Inches.	Inches of Rainfall Flowing Off.	Percentage Flowing Off.	Monthly Yield of Stream.	Average Daily Yield of Stream.		Average Yield in Cubic Feet per Second per Square Mile.	Rainfall in Inches.	Inches of Rainfall Flowing Off.	Percentage Flowing Off.	Monehly Yield of Stream.	Average Daily Yield of Stream.		Average Yield in Cubic Feet per Second per Square Mile.	Rainfall in Inches.	Inches of Rainfall Flowing Off.	Percentage Flowing Off.	Monthlx Yield of Stream.	Average Daily Yield of Stream.		Average Yield in Cubic Feet per Second per Square Mile.
				Cubic Feet.	Cubic Feet.	Gallons.					Cubic Feet.	Cubic Feet.	Gallons.					Cubic Feet.	Cubic Feet.	Gallons.					Cubic Feet.	Cubic Feet.	Gallons.	
October	2.830	0.434	16	153,403,000	4,948,500	37,017,300	0.3768	4.106	0.972	23	314,643,000	10,149,800	75,929,000	0.8483	3.583	0.369	10	87,653,000	2,827,500	21,151,200	0.3202	3.030	0.375	12	1,668,640,000	53,828,000	402,660,000	0.3253
November	0.800	0.311	39	109,860,000	3,670,000	27,394,000	0.2788	0.923	0.517	56	167,233,000	5,574,200	41,698,000	0.4632	0.833	0.160	19	38,059,000	1,268,600	9,490,100	0.1437	0.850	0.270	32	1,203,020,000	40,100,000	299,950,000	0.2423
December	2.470	0.622	25	219,724,000	7,087,800	53,021,000	0.5397	3.113	1.400	45	452,961,000	14,611,600	109,303,000	1.2141	2.636	0.566	21	134,421,000	4,336,200	32,437,000	0.4911	2.980	0.495	17	2,202,470,000	71,047,400	531,470,000	0.4294
1909.																												
January	3.220	1.887	58	666,100,000	21,449,200	160,760,000	1.6364	3.226	2.375	73	768,450,000	24,789,000	185,432,000	2.0596	3.053	2.762	90	655,672,000	21,150,700	158,310,000	2.3953	3.050	1.139	32	5,069,520,000	163,532,000	1,223,320,000	0.9884
February	5.215	3.856	74	1,361,680,000	48,631,500	363,789,000	3.7031	4.836	4.291	88	1,388,420,000	49,586,500	370,923,000	4.1201	5.223	5.599	107	1,329,380,000	47,477,700	355,158,000	5.3767	5.570	2.752	50	12,241,700,000	437,203,000	3,270,500,000	2.6425
March	3.745	2.635	70	930,675,000	30,022,000	224,578,000	2.2860	3.680	2.634	71	852,293,000	27,493,300	205,665,000	2.2843	3.256	2.581	76	612,852,000	19,769,400	147,886,000	2.2387	3.550	1.674	47	7,446,560,000	240,212,000	1,796,920,000	1.4518
April	4.750	2.438	51	860,993,000	28,699,000	214,690,000	2.1853	5.533	2.671	48	864,380,000	28,813,000	215,534,000	2.3940	5.436	3.023	55	717,650,000	23,932,000	178,944,000	2.7091	5.150	1.627	31	7,234,400,000	241,145,000	1,803,900,000	1.4575
May	3.245	1.672	51	590,310,000	19,042,700	142,446,000	1.4500	3.550	1.440	41	465,964,000	15,031,000	112,440,000	1.2489	3.140	1.103	35	261,818,000	8,445,000	63,178,500	0.9565	3.290	1.395	42	6,205,200,000	200,170,000	1,497,350,000	1.2098
June	2.705	0.587	21	207,360,000	6,912,000	51,705,000	0.5263	3.673	0.617	17	199,593,000	6,653,800	49,766,000	0.5527	3.407	0.567	17	134,698,000	4,489,000	33,587,000	0.5085	3.620	0.360	10	1,599,350,000	53,331,200	398,800,000	0.3222
July	1.770	0.278	15	95,532,000	3,153,500	23,590,000	0.2347	2.253	0.153	6	49,516,000	1,597,300	11,949,000	0.1327	2.250	0.079	3	18,861,000	608,400	4,551,300	0.0689	1.920	0.112	6	532,350,000	17,171,300	128,460,000	0.1037
August	0.780	0.176	22	62,398,000	2,012,800	15,057,000	0.1533	2.273	0.163	6	52,773,000	1,702,400	12,735,000	0.1414	2.780	0.045	1.7	10,715,000	345,600	2,585,300	0.0391	1.560	0.107	7	476,450,000	15,369,400	115,000,000	0.0929
September	2.060	0.171	8	50,506,000	2,016,800	15,087,000	0.1536	2.870	0.089	3	28,823,000	960,800	7,187,000	0.0798	2.213	0.031	1.4	7,587,000	246,200	1,842,000	0.0279	2.715	0.126	6	560,400,000	18,680,000	139,420,000	0.1129
Totals	33.591	15.061	45	5,318,541,000	14,571,400	109,001,000	1.1096	40.533	17.320	43	5,605,949,000	15,356,000	114,372,000	1.2759	37.810	16.885	44	4,009,166,000	10,984,000	82,166,000	1.2499	37.285	10.432	28	46,440,020,000	127,233,000	951,770,000	0.7691
October	1.245	0.198	15	69,950,000	2,261,600	16,880,000	0.1718	1.056	0.082	7	26,672,000	860,400	6,436,000	0.0715	1.146	0.042	4	9,867,000	318,300	2,381,000	0.0361	1.937	0.139	6	617,940,000	19,933,300	149,120,000	0.1205
November	1.455	0.259	18	91,523,000	3,051,000	28,731,000	0.2323	3.016	0.152	5	49,110,000	1,637,000	12,246,000	0.1360	3.586	0.122	3.4	29,048,000	968,260	7,243,100	0.1097	2.055	0.133	6	593,395,000	19,780,000	147,964,000	0.1195
December	5.755	1.581	27	558,200,000	18,006,300	134,690,000	1.3711	4.613	1.072	25	346,990,000	11,193,300	83,731,000	0.9309	4.416	1.723	39	409,040,000	13,195,000	98,705,000	1.4943	4.510	0.749	16	3,333,400,000	107,530,000	804,370,000	0.6499
Totals for 1909	35.945	15.718	43	5,555,227,000	15,207,000	113,760,000	1.1579	41.079	15.738	38	5,092,984,000	13,954,000	104,380,000	1.1594	39.906	17.767	44	4,196,988,000	11,499,000	86,018,000	1.3002	38.872	10.315	27	45,910,625,000	125,780,000	940,910,000	0.6568

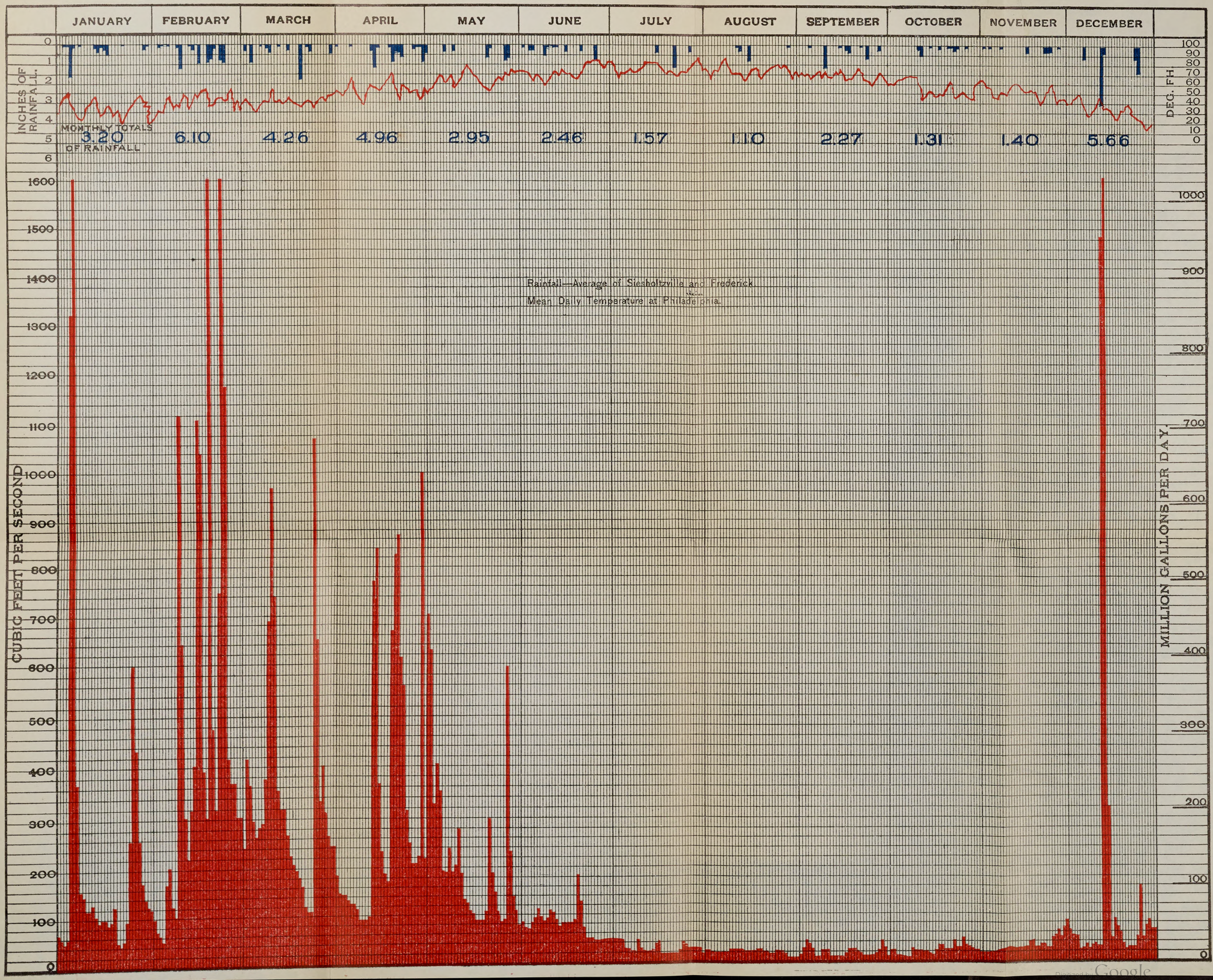
TABLE OF COMPUTED DAILY FLOW OF THE SCHUYLLKILL RIVER AT FAIRMOUNT DAM.

Showing Flow Over Flashboards in Cubic Feet per Second, Height of Water Above or Below Top of Flashboards in Inches, Computed Pumpage, Leakage and Lockage, from the Pool.

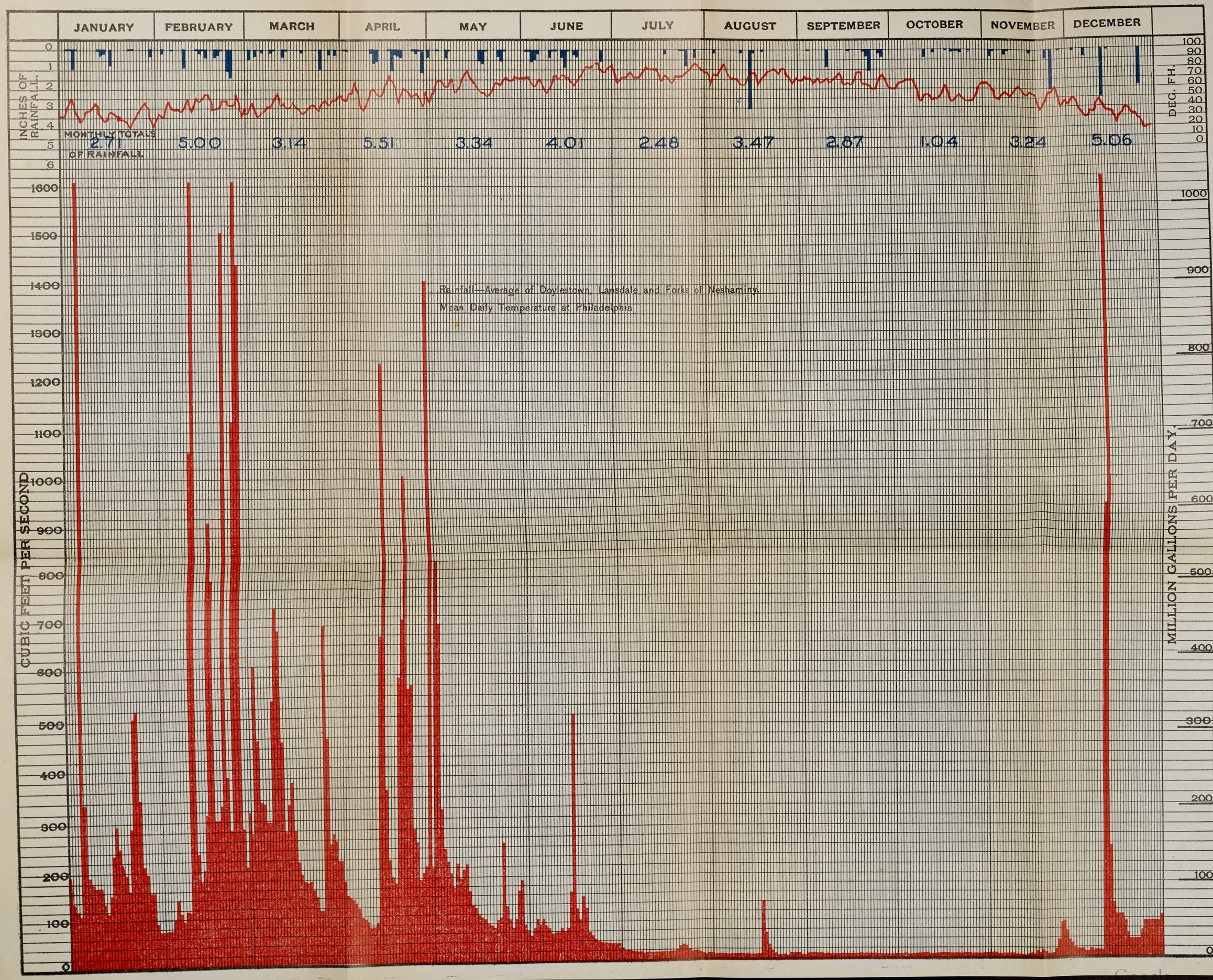
1909. DATE.	January.	Inches.	February.	Inches.	March.	Inches.	April.	Inches.	May.	Inches.	June.	Inches.	July.	Inches.	August.	Inches.	September.	Inches.	October.	Inches.	November.	Inches.	December.	Inches.
1		*10	78	*10	3,509	10¾	2,674	9½	6,584	17	366	2½		*11		*21		*37		*5		*3	32	½
2		*10	60	*10	3,743	11¼	2,323	8½	7,429	18¾	274	1¾		*12		*20		*35		*6		*2	11	¼
3		*12	58	*10	3,638	11	1,972	7¾	5,474	15¼	204	1½		*14		*19		*31		*16		*2		*2
4		*12	50	*11	2,769	9	1,972	7¾	4,165	12¾	204	1½		*17		*19		*26		*15		*3		*2
5	314	3¼	45	*11	2,414	8¼	1,796	7¼	3,523	11½	513	3¼		*17		*20		*32		*12		*2		*2
6	10,586	23½	75	*8	2,166	7½	1,716	7	2,878	10	643	3¾		*16		*22		*36		*10		*2	11	¼
7	4,188	13	522	3¼	2,020	7¼	1,460	6¼	3,347	11	492	3		*15		*28		*30		*8		*5		*2
8	1,826	7½	578	3¼	2,691	9¾	1,422	6¼	3,347	11	274	2		*10		*38		*22		*6		*3		*2
9	955	4¾	267	0	3,523	10¾	879	4½	2,160	8¼	404	2½		*24		*35		*18		*6		*3		*4
10	770	4	1,864	7½	4,165	12	816	4½	1,798	7¼	204	1½		*16		*30		*6½		*18		*3		*4
11	448	3	6,296	16½	4,586	13¼	753	4½	1,798	7¼	534	3¼		*30		*28		*9		*25		*2		*4
12	372	2½	4,041	12½	2,874	9¼	619	3½	1,972	7¾	404	2½		*24		*24		*24		*18		*2		*6
13	219	1¾	2,347	8¾	2,564	8½	619	3½	1,798	7¼	404	2½		*10		*24		*24		*13		*4	649	3½
14	137	*1½	2,154	8¼	2,564	8½	1,769	7¼	1,461	6¼	274	2		*20		*24		*15		*14		*4	15,260	30¼
15	52	*11	2,457	9	2,383	8	5,176	14¾	1,154	5¼	204	1½		*25		*30		*6	65	¾		*6	6,492	17
16	58	*11	3,923	12¼	1,980	7	4,172	12¾	1,080	5	204	1½		*16		*18		*3		*8		*3	4,873	14
17	58	*11	8,497	20½	1,798	6½	2,433	9	1,010	5	172	1¼		*17		*4	83	1		*10		*3	1,254	5¾
18	58	*11	6,674	17½	1,541	5¾	2,363	8½	816	4½	982	4¾		*30		*10		*2½		*6		*4	768	4
19	58	*11	4,779	14	1,308	5	1,980	7¾	694	4½	982	4¾		*21		*12	99	1¼		*6		*2	548	3¼
20	58	*11	8,822	21	1,154	4½	2,891	9¾	584	3½	457	3		*8		*15		*2		*6		*6	343	2½
21	58	*11	6,844	17½	1,154	4½	6,199	16½	584	3½	226	1¾		*16		*24		*3		*6		*8	343	2½
22	58	*11	4,564	13½	1,154	4½	5,382	15	1,306	6	204	1½		*22		*27		*3		*4		*6	376	2½
23	64	*11	7,000	17¾	1,154	4½	4,509	13½	1,636	7	204	1½		*8		*21		*3		*4		*3	343	2½
24	295	2¼	15,319	30½	1,082	4¼	4,344	13	1,155	5¼	145	1¼		*8		*10		*3		*6		*2	343	2½
25	1,022	5	15,500	3½	2,714	9	3,634	11¾	825	4¼	94	1		*4		*12		*6		*4		*2	290	2
26	1,565	6½	8,800	21	6,049	15¾	3,184	10½	591	3¼	51	½	196	1½		*15		*8		*3	92	1	188	1½
27	1,405	6¼	6,400	17	4,534	13	2,766	9¼	404	2¾	51	½		*5		*15		*4	28	½		*2	145	1¼
28	972	4¾	4,654	12¾	3,735	11¼	2,160	8¼	1,441	6¼	204	1½		*8		*18		*4		*4		*2	145	1¼
29	547	3¼			3,194	10	1,611	7½	1,824	7½	357	2½		*10		*33		*4		*2	260	2	145	1¼
30	353	2½			2,752	9	4,725	14	976	4¾	172	1½		*15		*33		*4	23	½	92	1	145	1¼
31	191	*1½			2,658	8¾			545	3¾				*15		*36				*4			51	¾
Total over flashboards	26,687		122,668		83,570		78,319		64,359		9,903		196				182		116		444		32,755	
Total pumpage, leakage and locka	31,988		19,018		2,617		5,412		7,460		8,608		5,965				6,304		7,036		6,424		5,836	
Grand total	58,675		141,686		86,187		83,731		71,819		18,511		6,161		5,514		6,486		7,152		6,868		38,591	

*Below top of Flashboards.

STREAM FLOW
1909
PERKIOMEN CREEK AT FREDERICK



STREAM FLOW
1909
NESHAMINY CREEK BELOW FORKS



STREAM FLOW
1909
TOHICKON CREEK