DEPARTMENT

FOR

SUPPLYING THE CITY WITH WATER.

ANNUAL REPORT

OF THE

Chief Engineer of the Water Department

OF THE

CITY OF PHILADELPHIA,

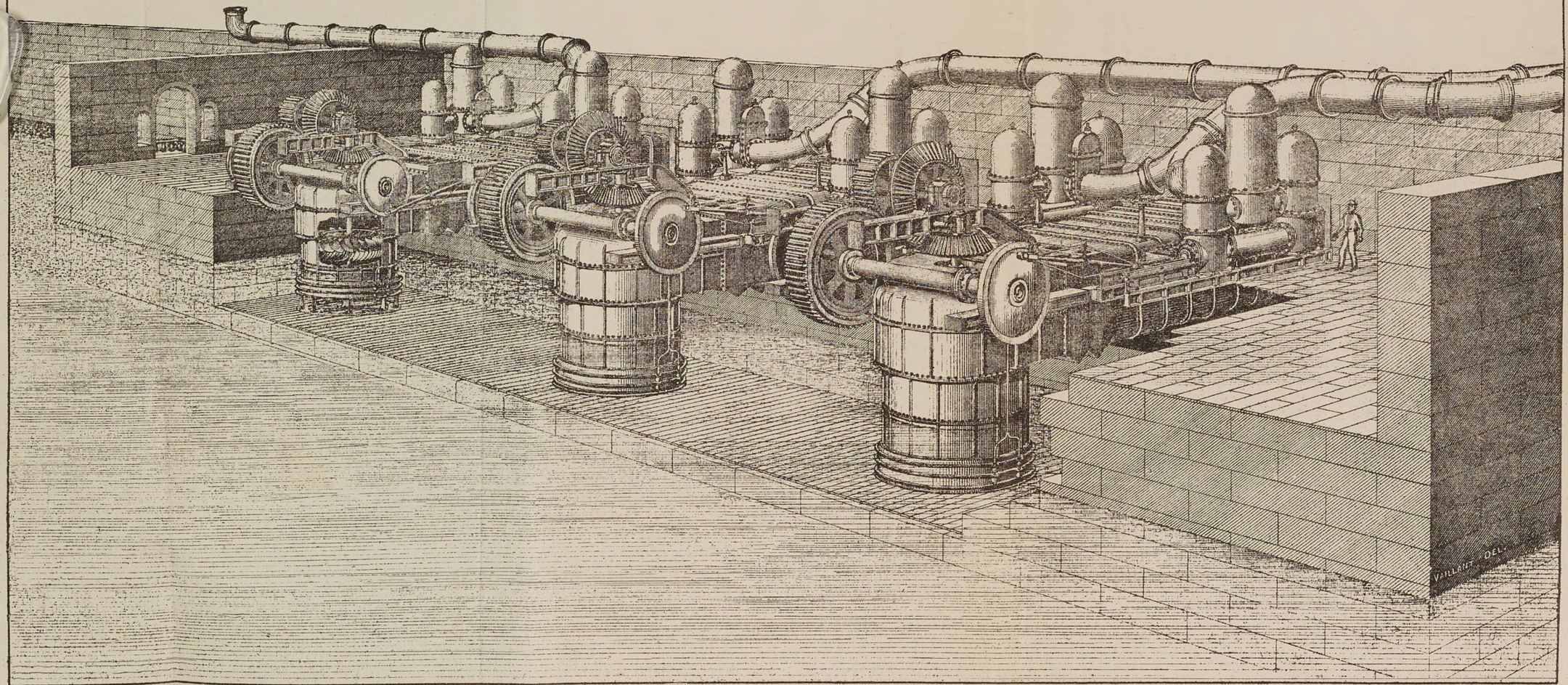
For the Year 1874.

Presented to Councils April 8th,

1875.

PHILADELPHIA:
E. C. MARKLEY & SON, PRINTERS, 422 LIBRARY STREET.
1875.

PUMPING MACHINERY OF THE FAIRMOUNT WATER WORKS



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COMMITTEE ON WATER WORKS, 1874.

E. A. SHALLCROSS, *Chairman.*

WILLIAM BALDWIN,	GEORGE DORLAN,	JOHN C. MCCALL,
JOHN C. BICKEL,	THOMAS H. GILL,	DR. A. H. MCADAM,
WILLIAM BRADLY,	GEORGE E. HALL,	JOHN MCCONNELL,
WILLIAM BUMM,	WILLIAM B. HANNA,	W. ELLWOOD ROWAN,
DR. W. W. BURNELL,	ALEXANDER L. HODGDON,	HENRY SMITHERS,
R. H. CLIFFORD,	CHARLES THOMSON JONES,	SAMUEL SHOWAKER,
JOHN CLOUDS,	RUDOLPH KLAUDER,	WILLIAM WRIGHT,

DANIEL CURRIE, J. J. MARTIN.

R. W. DOWNING, *Ex officio.* A. WILSON HENSZEY, *Ex officio.*

—o—

OFFICERS.

Chief Engineer.—WILLIAM H. MCFADDEN.

Assistant Engineers,

JOHN L. OGDEN. ELIAS J. SHAW. ABRAM D. EMERY.

General Superintendent of Works,

WILLIAM DIXEY.

Chief Engineer's Clerk,
E. P. MICHENER.

Chief Engineer's Assistant Clerk,
MILTON S. SLEEPER.

Draughtsman.—H. L. BUTLER.

Purveyors,

1st District.—Edward B. Cobb, 807 Reed Street.
2d " —Samuel M. Fox, 918 Cherry Street.
3d " —Henry S. Myers, 1420 Frankford Road.
4th District.—Thomas Gilligan, 810 Corinthian Avenue.
Germantown.—D. B. Morrell, Main and Tulphocken Sts.
Manayunk.—Henry Dawson, Lyceum Building, Roxborough

Messenger.—Thomas J. Lister.

Superintendent of City Shop.—David R. Griffith.

Engineers at Works,

Fairmount.—William Wright, A. J. Farrell.
Schuylkill.—Joshua Bartley, David Pyke.
Delaware.—Benjamin F. Norman, Joseph Thompson.
Belmont.—Abraham Stott, Christian Betzold.
Roxborough.—Johnson Hughes, William H. Saunders.
Chestnut Hill.—William Gaffey.

—o—

REGISTRAR'S DEPARTMENT.

Registrar.—JAMES WORK.

Chief Clerk,
CHARLES D. THOMAS.

Receiving Clerk,
JAMES H. WATSON.

Permit Clerks,
WILLIAM J. HALLIDAY, ISAAC CREAMER.

General Clerks,
GEORGE S. MACAULEY, ROBERT P. KING, GEORGE BECK,
CHARLES ZELL, ISAAC R. MULOCK, CHAS. E. VOORHEES.

Inspectors,

John F. Schiedt,	William Buggy,	Wm. S. Kochersperger.
J. L. Warner,	E. D. K. Thomas,	Joseph H. Edwards,
F. M. Pfouts,	Wm. H. Hergesheimer,	Joseph B. Totten,
W. Stephenson,	Jacob H. Boon,	John H. Neveil,
William L. Stiles,		James M. Rowe.

REPORT.

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

GENTLEMEN:—For the second time you conferred upon me the honor whereby it becomes my duty, in accordance with law, to submit the annual report of the operations of the Water Department for the year 1874.

Its issue has been delayed by the confusion incident to removing to new quarters at Spring Garden Hall, Thirteenth and Spring Garden Streets, where the business of the office will be hereafter transacted.

When I entered upon my duties two years ago, it was a matter of surprise to find so few records of any value. Such as time and opportunity permitted have been prepared, and are herewith embodied so as to prevent, by removal or destruction, intentional impediments being thrown in the way of any future head of the department. Others will be prepared from time to time until a full and complete record is secured.

They will be found convenient for reference and useful as a basis of facts, for deductions whose application will simplify and enlarge the distribution, concentrate the pumping stations, and so co-ordinate the works as to render them more efficient and economic, easier of management and subject to greater control. They will also give a more general and intelligent understanding, and afford a more thorough knowledge of the department, which is not in as efficient a condition as the public have been led to believe; neither has the mode of supply been determined nor the means thereto as adequate as could be wished. By communicating to the public, through their representatives, the impressions

made upon my own mind from a knowledge of the facts, I will have done my part and feel absolved from all responsibility.

In brief, the entire theoretic pumping capacity of the department is one hundred and four million gallons per day, forty-four millions by water power and sixty millions by steam.

As to the quantity that can be relied upon, the estimates vary from sixty to seventy-five per cent.; the latter would give seventy-eight million gallons per day, but the loss of twenty-eight million gallons actually experienced last summer at Fairmount reduced the capacity for supply to fifty millions, when the demand was fifty-four millions.

Who can estimate the loss to the manufacturing interests of the city by an inadequate or limited supply of water for a month, a week, or even a day? Such was experienced in 1869, and barely escaped its repetition in 1874, by the promptness of his Honor the the Mayor, with the efficient aid of his police force, in checking waste wherever found, in compliance with the proclamation of the department September 7th, 1874.

Who can tell the misery incident to impure water, such as was threatened last summer at Kensington, where putrescent fermentation set in, owing to sewage and the lack of freshets to scour the channels of the streams. In a communication published by Dr. Stephen Smith, Health Commissioner of New York City, he says: "The causation of typhoid fever, though long enveloped in obscurity, is now well known; it is one of the so-called filth diseases of modern sanitary writers; its most ordinary exciting cause is the air, or drinking water befouled with excremental matter."

This statement, in connection with the Kensington Works, renders it important, deserving your attention and the application of a remedy as soon as possible.

What would compensate in case of a conflagration, in conjunction with an inadequate supply, which was my greatest source of anxiety during the drought, while powerless with the machinery for want of water as a motor.

Prevention is better than cure. To this end experts were asked

for in June, 1873. The presentation of the actual condition of the department, its systematic reorganization, suggestions of reform, abandonment or modification of certain work, with a better mode of supply, would have well repaid the investigation and commanded the co-operation of the people. I had not the temerity to speak thus in my last report, preferring a further experience and knowledge of facts, hoping they would modify views so bold. Time has strengthened first impressions, and no effort has been spared to grasp the true situation.

The manifold duties devolving upon the head of a department in its management, forbid the time and opportunity to project such radical extensions, or suggest other modes or systems, and had not my assistants faithfully carried out instructions, and heartily co-operated in all examinations looking to an improved condition of the water works, I should not have been able to make a report so replete with facts.

It was deemed prudent to have plans made of the properties belonging to the department, of the reservoirs with their inlet and outlet pipes, and of the pumping stations with their mains.

Tables have been compiled and calculations made showing the flow of the river Schuylkill, amount of water flowing over the dam, and the rain-fall of a series of years. Embodied are analyses of the water by Dr. C. M. Cresson.

You will find included statements of the machinery, the total theoretic and actual pumping capacity, the operations of the Cherry Street shop and the Registrar's Department, the condition of the buildings, grounds, and reservoirs, and the distribution, which has been increased more than one-seventh during the last two years.

Your especial attention is again called to the immediate demands in view of the Centennial Exposition, estimates for which have been embraced in the Improvement Loan submitted for your consideration, and prompt action is demanded, considering the amount of work to be done in so short a period.

REORGANIZATION.

The department was reorganized January 1, 1874, by placing the distribution in charge of Mr. John L. Ogden, who had served many years in the capacity of draughtsman, and whose familiarity with the works well fitted him for the position assigned, with instructions to prepare plans of property, works, and reservoirs. Also to bring up the plans of the pipe distribution, which were behind many years, due to the inadequate aid in the draughting department.

Elias J. Shaw was placed in charge of the storage reservoir, in connection with the works at Roxborough, Germantown, and Chestnut Hill, previously under his care, and Abram D. Emery was assigned the works at Belmont, Spring Garden, Delaware, and the new works at Frankford, with instructions to put the machinery in order in anticipation of the drought, which was greatest in September.

Wm. Dixey was placed in the position of General Superintendent of the Works, whose promptness in the execution of orders obviated any inconvenience to or suit with the Navigation Company.

MODES OF SUPPLY.

The first mode by gravity is the simplest and best if attainable at a reasonable cost. The only suggestions in this direction within my knowledge are the Water Gap, New Hope, on the Delaware, and the Perkiomen. The cost of the first eliminates it from consideration. The second is met by the folly of going so great a distance to pump when as good water can be obtained nearer at much less expense, thereby avoiding a return aqueduct. The third may not have received the consideration which it deserved, nor have I the data to determine its value for the purpose suggested by one of my predecessors, H. P. M. Birkinbine.

The second mode, by water power, while cheaper than by steam, involves a system of compensating reservoirs and dams, with control of the river, the ownership of which has been rendered doubtful by recent legal decisions.

Quoting the Chief Engineer of Canals, James F. Smith, in the last report of the Philadelphia and Reading Railroad Company, page 87: "The area (or water shed) of the valley (of the Schuylkill River) embraces about 1,800 square miles, which at forty-two inches of rain fall annually and a utilization of eighteen inches, which is not excessive, will afford 75,271,680,000 cubic feet, equal to 563,032,166,400 gallons per year, passing into tide water at Fairmount."

This would afford a daily flow to tide water of 1,542,533,881 gallons, equal to ten inches on the dam, and assuming fifteen gallons to pump one into the reservoir, we would have available a little over one hundred million gallons per diem, which could only be increased by rendering the machinery more efficient.

The above information is communicated, in connection with the statement from the same Report, page 23, "and for an interesting report upon the important question of the water supply of the city of Philadelphia, in connection with the works of the Schuylkill Navigation, from which it will be easily inferred, not only that the valley of the Schuylkill is able to furnish an abundant supply of water, but that by means of the works of the Navigation Company that supply can be protected and assured at a cheaper cost to the city than by any other plan heretofore suggested."

The correctness of the above data may be assumed from which can be given what may be expected. The theoretic amount that could be utilized would not exceed one hundred and seventy-five million gallons daily. The imperfection of machinery as compared with the theoretic amount of work which should be obtained would make about one hundred millions, assuming the coefficient at sixty-five per cent., which is a fair estimate and about what is obtained at Fairmount.

Thus we are reduced to the third and last mode of supply, namely, by steam power, which becomes a necessity for the time being even should either of the other modes be considered worthy your investigation and examination.

The mode of supply agreed upon, the next point to determine is the location for pumping station.

Flat Rock Pool furnishes the purest water, next is the pool at Fairmount, the furthest removed from Manayunk, the source of fouling. The location of the Spring Garden Works is superior to Belmont, and should be selected as the point wherein to erect larger pumping engines, and thereby obtain the means to provide for any contingency.

FAIRMOUNT WORKS.

The machinery at these works is in good condition; some necessary repairs are being made. The Worthington Engine worked satisfactorily during the summer. I would recommend the laying of a forty-eight-inch main from these works to connect with the proposed forty-eight-inch main from the Spring Garden Works, to the Storage Reservoir, for supplying it with water in the winter months by water power, and thereby relieve the steam machinery. Three new turbines of a capacity of thirty millions could be erected on the Mound Dam, and connected by another forty-eight-inch main to the main of the proposed engine, in place of Engine No. 4, at the Spring Garden Works, which would give a pumpage of sixty million gallons daily, by either steam or water power, into the Storage Reservoir, there allowed to subside, and thence drawn off to the distributing reservoirs, for subsequent distribution over the city.

MILL HOUSE.

The flagging was removed from roof of Mill House and vulcanite pavement substituted, the walls and ceilings were calsomined, and all the pumps with the mains across the forebay were painted. Wainscoting and washboards were placed around Wheel No. 1. Removed No. 6 Breast Wheel, preparatory to replacing a new turbine. In Bevel Wheels Nos. 4 and 5, the cogs were relined, and in No. 8 renewed.

MOUND DAM.

The walks from the Mill House along the river wall, and on the Mound Dam, have been raised and paved with flagging.

Steps have been built to level of pier at eastern end of dam, and a substantial iron railing erected on top and along the river wall.

MANSION HOUSE.

The Mansion House has been painted inside and out; the piazza extended to the river front; the old wall supported on a log, much decayed, was cracked and had to be rebuilt from a solid foundation twelve feet below low tide. Water closets have been erected off the main hall for the use of ladies, and those for gentlemen's use will be constructed under the piazza.

GROUNDS.

The Green Street drive was repaired and regravelled, some of the flagging removed from roof of Mill House was substituted for the old and dangerous board walk, and it is proposed to continue the same to the main drive; the old settees were repaired and painted; one hundred new ones made and distributed throughout the grounds; the iron railings on the inclined walks leading to top of reservoir were painted; those at Callowhill Street entrance were set back fifty feet by request of Chief Engineer and Surveyor Smedley, to give room for construction of the new bridge.

FAIRMOUNT RESERVOIRS.

On the 15th of April, in consequence of a slide on the south side of Fairmount Reservoir, within forty-five feet of the basin, caused by excavations for the approach to the new bridge, it was deemed prudent to draw off the water, when it was decided to clean the basins. The mud was about eighteen inches deep, and nearly 6,000 cubic yards were removed. The stops were found so much out of repair as to render them unfit for use; they were renewed and put in good order, and a correct plan made of the basins, stops, mains, &c.

Duty of the Engines Tabulated.

LOCATION OF ENGINES.	Duty in pounds raised one foot high per one hundred pounds coal.	Gallons raised into the reservoir per pound of coal.	Number of hours run.	Gallons pumped per hour.	Gallons pumped per day.	Gallons pumped per year.	Gallons raised one foot high per pound coal.	Description.
1874.								
Belmont, No. 1	34,127,244	195.95	2,990	203,503.4	4,884,081	638,475,186	40,920	Worthington.
Belmont, No. 2	33,944,823	202 65	1,267	204,966.9	4,919,205	259,693,089	40,701	do.
Belmont, No 3	41,691,689	248.67	6,680	311,357.3	7,472,575	2,079,866,695	49,990	do.
1873.								
Schuylkill, No. 6	43,488,038	448 3	1,808	327,587 0	7,862,0°8	592,277,296	52,143	Compound beam.
1874.								
Schuylkill, No. 6	51,511,492	531.0	2,236	378,919.0	9,694,056	847,262,884	61,764	do.
Schuylkill, No. 5	34,794,554	360.6	2,103	263,393.0	6,321,360	553,909,170	41,720	Side lever Cornish.
Schuylkill, No 4	27,705,396	287.0	591	206,772.0	4,962,528	122,202,252	33,219	Old Cornish.
Roxborough, No. 1	38,745,694	138 4	1,541	94,314.2	2,239,540	145,338,247	46,457	Cornish.
Roxborough, No. 2	32,904,313	117.5	3,473	174,658 6	4,191,806	606,589,588	39,453	Worthington.
Kensington, No. 1	Duty not calculated on account of irregular running.							Beam engine.
Kensington, No. 2								High pressure horizontal.
Kensington, No. 3								Worthington.

SPRING GARDEN WORKS.

Engine No. 6.

The double-cylinder (compound) engine, known as No. 6, needed remodelling. It never worked satisfactorily. The piston valve controlling the steam cylinders was an utter failure, causing great waste of steam; the bed-plate was badly cracked directly under the main pedestal. The pumps were in good condition. The shock upon the engine was very great, even when working at a greatly reduced speed of nine or ten revolutions. After much delay the repairs were got under way. The contract was awarded to Jacob Naylor, of the People's Works, the department to furnish the plans and be responsible for the successful working of the same, he to guarantee materials and workmanship. This engine was started on the twenty-sixth day of June, and has been running successfully ever since. On occasions it pumped over ten million gallons per day, and never since the alterations less than nine millions. This was all delivered direct into Corinthian Avenue Reservoir, where the water was needed the most, thence a portion was drawn into the reservoir at Fairmount.

The alterations consisted in removing the defective piston valve and substituting a plain slide valve with steam chest and pipes to connect the same to the cylinders. New rings were fitted to the pistons, a crank axle was substituted for the single crank, and a heavy main pedestal placed over the cracked bed, which was securely fastened to a heavy stiffening piece underneath; this has given perfect satisfaction, and saved making a new bed plate. An air feeder was fitted to the pump, by which the air chamber is kept full at all times without stopping the engine to charge it as heretofore. This engine is in better condition for a long and safe run than any in the department.

Boilers, No. 6 *Engine.*

These were in a very unsafe condition. The connections between the boilers and the main drum were continually giving

out. They were removed and new ones riveted on. The heads of the drums were securely stayed to prevent the straining of the connections. Nothing was spared to make them safe. The drums and steam pipes were covered with asbestos to prevent radiation.

Engine No. 5.

This is a side-lever Cornish. Several times during the year it broke down; fortunately the breaks were slight and easily repaired, causing little detention. The great difficulty with this engine is in the foundation, part of which is old and part new, causing unequal settling, and throwing it out of line. The bed-plate will have to be raised and leveled. This necessitates lifting a greater portion of the heavy parts of the engine, which is a tedious and difficult operation. The valve gear also needs repairing, and iron girders substituted for the wooden ones.

The boilers of No. 5 engine are receiving the usual yearly repairs.

Engine No. 4.

Engine No. 4 is an old style Cornish, which is run at intervals when No. 5 is disabled. The latter is of sufficient capacity to supply Schuylkill basin.

Boilers, No. 4 Engine.

These are in the same condition as were those of No. 6 last year; to make them safe, they should be repaired in the same manner.

Engine No. 3.

This engine has not been run since my connection with the department, and will be removed to make room for the new twenty million engine now being designed to pump into the East Park Reservoir, the drawings for which are in an advanced state; and copies of the principal parts will soon be ready, when proposals will be invited for building the same. No provision has yet been made, though the money necessary has been asked

for in the Improvement Loan, for foundations, inlet chambers, boilers, boiler-house, and stack, or for the necessary alterations to the house, to accommodate this engine. These are imperatively demanded, and should be immediately provided for, or it will be too late to complete the same in time to fill the reservoir when finished.

A portion of the engine-house and No. 4 Engine has been repainted, the engineers' houses have been painted, frame bath-rooms added, and new ranges placed in the kitchens.

FORTY-EIGHT-INCH MAIN.

It is intended to substitute a forty-eight-inch pumping main in place of the proposed inadequate thirty-six-inch. The present price of pipes enables this change to be made without exceeding the appropriation. The new route selected is straight, avoiding three right-angled curves, is shorter, and, being within the limits of the Park, the contour of the ground can be followed, and thereby avoid deep cutting, which would have been necessary had the line of Thirty-third Street been adhered to, as originally intended. At the terminus of the forty-eight-inch main, at the Spring Garden engine-house, a large wrought-iron air vessel will be erected, and the thirty-six-inch outlet from No. 6 will be attached to it, enabling both engines to pump through the forty-eight-inch main, dispensing with a separate thirty-six-inch main from branch at Thirty-third and Master Streets, as projected to accommodate No. 6.

I would recommend the substitution of a twenty or thirty million engine in place of the old No. 4, with another forty-eight-inch main to the storage. This would give a daily pumpage of sixty million gallons into the reservoir, and would be ample, with proper distributing pipes, to supply the city for the next fifteen years.

SPRING GARDEN FOREBAY.

A portion of the south wall has fallen in and is being repaired. The entire structure is in a weak condition, and has always been pervious to the drainage from the unfinished culvert, whereby the water is contaminated, and has often been a source

of complaint. This can be remedied by the completion of the culvert to the river, and protecting the forebay from its impurities, or better by lining the bottom and sides.

SPRING GARDEN OR SCHUYLKILL RESERVOIR.

This reservoir is in good condition. A slight leak was discovered and repaired. During the drought it was filled to its maximum height, 17 feet 4 inches, and was perfectly tight. The fence around same was repaired.

CORINTHIAN AVENUE RESERVOIR.

There is a leak in this basin on Twenty-second Street which has existed for a number of years, and, though not serious, should receive attention. When the storage reservoir is in operation, the former can be dispensed with until repaired. The fence was repainted. During the drought a connection was made with the main from Belmont, connecting at north side of South College Avenue, south on Twenty-second Street to Poplar, and east to a thirty-inch dead end. By this means water was, and can be, drawn into this basin; at the same time a connection was made across Market Street bridge to keep up the supply of the old city proper, and though this was only a four-inch pipe, the altitude from Belmont increased the pressure at Cherry Street shop from 12 to 16 pounds, which will be continued through the winter in order that the increased velocity may aid in preventing the freezing of the plugs.

DELAWARE WORKS.

The Worthington Engine was in use the entire season, but is now undergoing necessary repairs. The high pressure engine is run at intervals. The old beam engine was used during the drought. The boilers are in good condition. The wharf, during the summer, gave way, endangering the suction mains. It was repaired, and is now in good order. It is proposed to fill the dock and thereby increase the space in the rear of the works.

KENSINGTON RESERVOIR.

Two sections of this reservoir were cleaned out during the month of August in consequence of the putrid condition of the water. Several slight breaks occurred on the pumping mains, and such was the demand for water, and the supply was so short, that they had to be repaired while the works were in operation.

BELMONT WORKS.

At these works we were relieved of much anxiety and alarm by effectually securing the pumping mains. This was done by removing the cross connection between Nos. 1 and 2, and placing the check valve of No. 1 close to the wall. Since June 22, when the alterations were completed, all trouble has ceased and much expense thereby saved. Formerly an eight-inch pipe conveyed all the steam made by the boilers and supplied an eight-inch branch to each of the three engines. From unequal expansion and contraction this pipe was continually giving trouble; apart from the annoyance, it was dangerous, as one defective joint would disable the whole works. At present there are three separate steam pipes, with expansion joints to each engine, whereby the strain is relieved. Any engine can now be completely overhauled without stopping either of the others. A larger donkey has been added, so that in no case need the boilers be short of water. The scaling of these gives considerable trouble, forming one-eighth of an inch in four weeks, and often blistering the plates. They are receiving the usual yearly repairs.

ENGINES.

No. 1 needs complete overhauling; all the joints must be made anew; the steam valves and cylinder surfaces are much worn and will have to be faced. Nos. 2 and 3 are in good condition, but their pumping into a common main is objectionable, causing them to work very unevenly. A reservoir gauge was placed in these works and gives satisfaction. The engine house was repainted, the roof and floor repaired, a hand-rail placed on plat-

form around engines, and walnut casing on steam pipes in engine room. Water was conducted from a neighboring spring to engine house, for the convenience of workmen and pedestrians in the Park. Dwellings should be provided for the engineers, so as to have them convenient in case of accident.

BELMONT RESERVOIR.

This reservoir is in a leaky condition; the leak seems to be close to the bottom, although not serious, yet deserves attention. This year it was filled to its maximum height for the first time. A railing is needed around, and an iron grating over, the inlet chambers.

ROXBOROUGH WORKS.

The cornish and auxiliary engines are in good working order, considerable repairs are being made on the Worthington duplex, and the boilers are receiving their annual overhauling.

The extension to the boiler-house was completed early in the spring, the old engine-house has been repainted, and the two houses being erected for the engineers of the works are nearly finished.

A stone wharf capped with twelve-inch by twelve-inch yellow pine, backed with stone and cinders, has been built along the river front for a distance of eight hundred feet, raising the grounds four feet above the river and protecting them from freshets. A new coal shed will be built, the inlet repaired, the grounds improved and inclosed during the present season.

ROXBOROUGH RESERVOIR.

The Mill River disaster rendered the people sensative, and put the department on the alert. A spring was developed by the heavy rain fall of last April, which the neighbors feared was a leak. The drought of the summer dried up the spring, showing clearly it was not due to leakage from the basin. A retaining wall will be built around the reservoir to strengthen the banks as soon as the weather permits.

WISSAHICKON AQUEDUCT.

The 20-inch main on the western approach was lined up and recaulked in consequence of the settling of the wall, which was built dry, of small stone, in a temporary manner. It should be substantially rebuilt to avoid continual repairs.

MOUNT AIRY RESERVOIR.

This reservoir was purchased from the Germantown Water Company, and has always been a source of much trouble and expense, owing to its construction. The embankments are not of sufficient strength, and should be increased or strengthened by a retaining wall.

Some years ago, the large section was repaired with a concrete bottom, but its continued leakage induced a connection being made in May last, so that the district could be supplied from the Roxborough Reservoir direct, when it was repaired with a nine-inch clay bottom, paved with hard brick, and grouted in hydraulic cement, a portion of division wall in small section taken down, puddled and rebuilt; the sixteen-inch reducer was removed from twenty-inch outlet, preparatory to laying the main on west side of Germantown.

CHESTNUT HILL WORKS.

	Gallons furnished for the year.	Daily pumpage—maximum.
1874 - -	36,400,000	211,200
1873 - -	22,000,000	153,480
Increase, -	14,400,000	57,720

The engine and pumps at the Chestnut Hill Works have been repaired and are in good working order, but the boilers being in use over thirty years, by various parties, have been patched, repaired, and turned over, until they were condemned by the boiler inspectors at the close of the year. New ones should be immediately substituted.

The chimney stack has been repaired and raised thirty-two feet. The engine and boiler house, tower and spring, need considerable repairs, and the grounds should be improved and enclosed.

The mains on Union and Prospect Avenues have been connected, thus closing several dead ends, and securing a circulation which has greatly improved the quality of the water. New stops have been inserted and others renewed, whereby repairs can be made without depriving the entire district of water, as formerly. Complaints of sand in the water were remedied by placing a stop on suction pipe, and inserting a T piece to prevent pumping from the bottom of the well.

I renew my recommendation to purchase the lot on the county line containing a spring.

NEW WORKS AT FRANKFORD.

The surveys for these works are completed and work can be commenced in the spring. Owing to the difficulty in negotiating for the land for both reservoir and pumping station, security will be entered for the payment of the damages, and possession taken of the ground selected, unless you determine to abandon the project as recommended in connection with the erection of a stand-pipe at the East Park Reservoir.

DISTRIBUTION.

The necessity of another thirty-inch main connecting the Corinthian Avenue with the Spring Garden Reservoir was severely felt. By it all the steam-pumps could be made available, and the former reservoir maintained at its maximum height.

Perhaps in no other way is the rapid growth of the city made so apparent as in the miles of service pipe annually demanded by extending improvements.

During the years 1873 and 1874 nearly eighty-three miles were laid, adding almost one-fourth of (363,) the total for the last twenty years, and more than one-seventh of the entire distribution, which was 545 miles two years ago.

In 1874, 225,271 feet or forty-two and one-half miles of service pipe were laid, leaving, yet to be laid according to ordinances of Councils, 174,743 feet, or over thirty-three miles.

The twenty-inch supply main was continued along Washington

Avenue to Twenty-second Street, down Twenty-second and out Federal to Grays' Ferry Road, a distance of 3,303 feet. A twelve-inch feeder was also laid on Moyamensing Avenue, from Washington Avenue to Christian Street, which improved the supply in that section.

The use of four-inch service pipes has been discontinued. Four-fifths of the amount laid during the year was six inches in diameter.

Nearly forty miles of small pipe was added to the distribution, much of it in districts already receiving but a scanty supply.

The necessity of more large feeding mains is severely felt. It is impossible to furnish an adequate supply, especially during the summer, through long lines of small pipe, four and six inches in diameter, as is the case in the northern parts of the City.

Three hundred and forty-two fire-plugs were placed in position, making a total of 5,119. The repairs have been somewhat increased.

One hundred and seventy-four valves were discovered down. They were in old sections of the City, and resulted, in a majority of cases, from the corrosion of the thread of the screw.

The circulation of the water was in consequence greatly obstructed, and in some instances almost entirely cut off. They were immediately repaired. It is proposed to guard against such accidents in future by the use of phosphor bronze in place of wrought iron for the screws.

CHERRY STREET SHOP.

The profits of this shop for the past year have been nearly $42,000, as shown by accompanying statement. The stops, valves, plugs, and most of the repairs for the works and purveyor's districts are done by the employees more efficiently and economically than could be otherwise secured.

I would again recommend the erection of a large and suitable shop with accommodations for improved machinery, and storeroom facilities to enable the purchasing of supplies in quantities at reduced rates, avoiding the present daily issue of orders to

meet the demands. The junction of Girard Avenue and Reading Railroad would afford a convenient location for access to the various works. The Cherry Street property would still be used by the Purveyor of the Second District.

The Water and Highway Departments now pay $500 per annum for the convenience of the First District at 807 Reed Street. I would recommend the occupation of the rear portion of the old parade ground, after selling off the fronts on Twelfth and Wharton Streets; this would be sufficient to meet the requirements of both departments.

THE TELEGRAPH.

The department telegraph, connecting the various works and purveyor's offices with the main office, has been a great acquisition, securing greater facility in the transaction of business, and enabling the adoption of a system of checks and reforms in the control and management that otherwise would be futile. The condition of the engines, pumps, and reservoirs, with the requirements and number of employees at work, are daily reported to this office and registered. Complaints of leaks, breaks, and stoppages are immediately transmitted to the purveyors for attention.

THE RIVER.

The storm water of the river cannot at present be utilized nor the best results obtained from the wheels at Fairmount for the want of storage capacity. The average flow of the river would give about ten inches on the dam, the mean flow about five inches.

The maximum rain-fall of any one month during 1874 was 7.5 inches in April. The minimum was 1.59 inches in March. The total was 40.911 inches, which is seven per cent. below the mean (44.05) of forty-three years; 17.375 inches less than the previous year 1873, and nearly eight inches or 16⅔ per cent. less than in 1869, when the city experienced a drought

"which in duration and severity had no precedent since the erection of the dam nearly fifty years."

Considerable anxiety was felt during August and the beginning of September, lest a similar scarcity should be experienced.

On the 7th of September street sprinkling was stopped, and the people asked to exercise the greatest economy in the useof water, which was cheerfully responded to. Every exertion was made to keep up the supply, and we believe no one, except those on the extremely high ground, experienced any inconvenience.

The rain-fall of April and the springs supplied sufficient water until the twenty-sixth day of June, when the Schuylkill Navigation Company notified the city of its responsibility in case water was pumped below the comb of the dam. Fortunately, the alterations to the Simpson Engine at the Spring Garden Works had just been completed, and on that very day was successfully started with increased duty and capacity beyond the most sanguine expectations, saving a water famine that its failure would have made inevitable.

From April 26th to November 23d, there was almost a continual drought, such as has never been experienced in this city; from the former date the water on the dam was constantly receding until the rain of July 4th which served two days; that of July 7th which served ten days; that of August 9th which served nine days; that of September 19th which served six days; that of October 9th which served nine days; that of November 23d, gave assurance that the end of the drought was reached.

About June 1st orders were given to Superintendent William Dixey under no circumstances whatever to pump below the comb of the dam, assured if the supply could not be maintained without this recourse it could not with the loss of power, and in order to economise power wheels were discontinued, so as to allow the water to accumulate in the pool, and the stock of water in the basins relied upon. This answered the purpose of keeping the water above the comb of the dam.

Thanks are due to the co-operation of the Schuylkill Navigation Company, and the suggestion of flash boards by their Chief

Engineer, James F. Smith, Esq. These were put up July 1 in so effectual a manner that scarce a drop of water passed over them during the balance of the year.

Pure water demands motion, aeration, and sun light; the formation of ice impedes the former, and occludes the action of the air and sun, whereby the water becomes unpleasant both to taste and smell. This could be remedied by the Park Commission permitting the ice to be cut, which would help to prevent the formation of ice gorges.

BOOK FOR COMPLAINTS.

It is useless for citizens to complain of abuses so long as they manifest an indifference to or are active in them and fail to co-operate for their correction. To this end a book is open and a record made of every reasonable ground of complaint. The co-operation of citizens is earnestly solicited. A form, embracing all the outlets and their rates, should be sent to each consumer of water, and a correct return under penalty required. This would greatly facilitate and afford a proper check upon the officers.

STORAGE OR SUBSIDING RESERVOIR.

The work on this reservoir was resumed early in the spring and continued until the contract was awarded to Edward S. McGlue.

The six circulating chambers are nearly completed. The mason work on the outlet chambers is finished ready for the coping, which is on the ground. During the year 3,500 perches of stone and 650,000 bricks were laid.

The early resumption and completion of this work is dependent upon the appropriation still pending. Had it not been delayed the earth work could have been completed last fall, and had the benefit of settling during the winter preparatory to lining in the spring; the small chamber should be lined at once to be available for the Centennial year.

It was a great oversight and mistake to locate the storage at its present altitude of 135 feet, from which it is impossible to

supply any portion of the city above a hundred feet altitude, or any that is not at present supplied by the first system, embracing Spring Garden, Corinthian Avenue, Delaware, and Fairmount basins.

The selection of this location is the more remarkable since a suitable altitude thirty to forty feet higher was available at Thirtieth and Cambria Streets, with an increase of only 6,000 feet in the pumping main. This site, with an elevation of 160 to 170 feet, would have controlled all east of the river not supplied by Roxborough, and avoided the necessity of the expensive and uncertain submerged main, or the contemplated duplication at Belmont, whose present facilities are ample to meet the demands of the Centennial and the entire district west of the river for the next ten years, if relieved of the requirements from the east side.

At Thirtieth and Morris Streets, a distance of 17,000 feet from the Spring Garden pumping station, is an available site on a level with Belmont basin, which will eventually have to be selected for a reservoir, to meet the wants of the high ground not provided for at present by the low altitude of the storage.

It was my intent and purpose to have suggested these, with other views, to the experts asked for in June, 1873, had I been favored with their appointment; Councils not approving, the Committee on Water, at their meeting, November 3, 1874, asked for my views upon this subject, and in response thereto I submit the following as a recapitulation of the same.

PLAN OF IMPROVEMENTS RECOMMENDED.

To extricate the department from the oversight of the past; to meet the pressing necessities of the early future, and the imperative demands of the Centennial; to be prepared to supply Kensington in case of a recurrence of putrescent fermentation; to provide an ample and abundant supply to Frankford; to concentrate the pumping stations, and render the works more economic in management, and subject to greater control; and

to terminate the heretofore costly patching policy,—I would recommend:

First.—The erection of two turbines at Fairmount, in place of the old breast wheels Nos. 2 and 6.

Second.—The laying of a forty-eight-inch main from Fairmount, to connect with pumping main, from the new twenty million engine at Spring Garden, which is intended to supply the subsiding reservoir.

Third.—The erection of another large engine of twenty or thirty million capacity in place of No. 4 at Spring Garden, and its connection by a forty-eight-inch main, with the subsiding reservoir.

Fourth.—The continuation of said forty-eight-inch main to Fairmount, and the erection of three new turbines on the site of the Mound Dam.

Fifth.—The erection of a stand pipe of such an altitude as to control Belmont basin, and to supply the future basin proposed, on ground on same level as Belmont, which the improvements of a few years will render imperative in the north-west portion of the city, south and east of the Roxborough and Germantown plateaux.

Sixth.—The distribution from the subsiding reservoir by large mains:—

1st. To the Kensington basin.

2d. A continuation of same to Frankford.

3d. A connection with Spring Garden and Corinthian avenue basins.

I cannot too earnestly direct your attention to the advantages and importance of so feasible a plan to meet the emergency within the required time. Its economy and practicability recommend it, and should command your candid and careful consideration, and if approved, means at once provided for its consummation.

To these suggestions criticism is invited, that nothing may be overlooked that would add to the welfare of the city, than which nothing can be more important than an abundant supply of pure water, and a proper distribution of the same.

This plan appropriates Belmont to the west side of the river, will supply that section for ten years, meet the demands of the Centennial Exposition, and obviates the expense of a new thirty-six-inch pumping main imperatively demanded. Were the present one a distributing main only, the muddy water would not pass, as now, directly from the river to the consumers on the east side, causing well grounded complaints for want of passing through the basin depriving it of proper purification.

With enlarged machinery at Spring Garden, would be prepared for a recurrence of the drought or almost any contingency.

The stand pipe would meet the lack of elevation in the Eats Park Reservoir, supply the section of high ground not yet provided for, and control the Belmont Basin and one which future improvements will soon demand. This unifies and makes a general system and puts an end to the patching plan.

The connection of Fairmount with the subsiding reservoir, will enable the utilization of storm water which passes to waste.

Mains from the subsiding reservoir communicating with the Spring Garden, Corinthian Avenue, and Kensington Basins, will afford such a circulation and movement of the water as to render it as pure as though it were filtered, and would be enabled to suspend the Kensington Works when putrescence recurred again.

The main continued to Frankford, would obviate the purchase of the pumping station and reservoir site, and the expense and trouble incident to the management of a separate and isolated works.

This plan will also form a basis for a simple and inexpensive mode of correcting the inadequate distribution, especially in the eastern portion of the old city proper, where the demands have outgrown the small mains laid many years ago.

I am convinced that no better mode can be suggested to render our present system commensurate with the growth and prosperity of the city, whose immense and rapid improvements few can appreciate, save those only who are in constant contact with the demands made upon the Gas, Highway, and Water Departments.

Yours, very truly,

WM. H. McFADDEN,

Chief Engineer Water Department.

RESULTS

OF THE

EXAMINATION OF WATER

FROM THE RIVER SCHUYLKILL.

LABORATORY, 417 WALNUT STREET,
PHILADELPHIA, MARCH 3, 1875.

DR. W. H. MCFADDEN,
Chief Engineer Water Department.

DEAR SIR: In answer to your inquiry, I must say that I am not prepared to furnish an exhaustive report upon the sources of water supply to our city; but having made very many analyses, with especial reference to the presence of sewage, and to the prevention of the ill effects of it, I gladly furnish you with selections from them, and herewith present the results of examinations of waters from various locations on the Schuylkill, and from streams emptying into it. (See Tables A, B, C, D, E, F, annexed.)

The mode of examination adopted is one which has received the approbation of the highest authorities at home and abroad as being the best suited for the analysis of potable water. For drinking and household purposes it has already been decided that the *nature* and not the *quantity* of the ordinary mineral constituents is of the greatest moment, so long as the amount of inorganic impurity does not exceed 30 to 35 grains in one gallon, and of which not more than 2 or 3 grains are salts of lime or magnesia.

With respect to the organic constituents, such an amount

is not allowable, and as the hygienic effects of different sorts of organic matter have been the subject of discussion for several years past, I shall quote freely in relation to them from the standard authorities. (1)

"The amount of organic matter, and closely connected with it, the amount of ammonia, is a matter of prime consequence."

"The extreme minuteness of the quantity which makes the difference between a good and a bad kind of water renders this branch of the inquiry difficult, and excludes the employment of all the ordinary methods of chemical analysis. The detection and measurement of the organic matters in water belong to the domain of micro-chemical investigation."

A comparison of the amounts of the "organic matter," as obtained by the old method of ignition, with those got as "sewage" by the new methods (representing the deleterious matters contained in water), shows that no reliance whatever is to be placed in the amount of "organic matter" by ignition as a means of determining the purity of waters.

A reference to table D, which exhibits the amounts of *organic matter by ignition*, more fully illustrates this point.

From this table it appears that the extreme variations in the amount of *organic matter* in these samples amount to but 16.2 per cent., whilst that of the *sewage* varies to the amount of 220 per cent., and the water containing the greatest amount of "organic matter" really has in it but "*traces*" of sewage.

The relative wholesomeness of water is undoubtedly dependent upon the relative amount of certain kinds of organic substances which may be present.

The kinds of organic substances that are deleterious are those which contain nitrogen, and are therefore liable to putrefaction. All such bodies can by proper treatment be con-

(1) Journal Chemical Society; Wanklyn & Chapman, Water Analysis; H. Watt's Dictionary of Chemistry; the works of Bloxam, Tyndale, Fownes, Schorlemmer, Chandler, Krepp; Reports of the Commission appointed to inquire into the best mode of distributing the sewage of towns, etc., by Parliament, London.

verted into ammonia, and upon this property is based the most approved method of determining the healthfulness of drinking water.

"By estimating the amount of ammonia obtainable from water, noting the circumstances under which it is obtained, we have a measure of the nitrogenous organic matter present in water.

"In the whole range of chemical analysis there is no determination which surpasses that of ammonia in point of delicacy. It is questionable, indeed, whether any other approaches it. The Nessler test is capable of indicating one part of ammonia in 200,000,000 parts of water, and even this statement, surprising though it may seem, is an understatement of the delicacy of the test. Such being the character of the measurement of ammonia, the great advantage of causing determinations of organic matter to depend on measurements of ammonia will be manifest. By making these measurements of ammonia stand for measurements of organic matter in water, we apply micro-chemistry."

Modern chemistry has also given us very delicate re-agents for the determination of sulphuric acid, of which the presence in very minute quantities may materially affect the wholesomeness of our water supply (2).

(2) I find upon my laboratory record the following memorandum by Mr. Howard W. Mitchell, who has made a great number of determinations of free acid in water:

"Hæmatoxyline in neutral solution, though belonging to the class of general rather than special re agents, seems as deservedly to possess a claim in the domain of micro-chemistry, as either the Nessler test for ammonia, or the sulpho-cyanide test for ferric iron. Its efficacy as a re-agent in the estimation of free acid in waters does not appear to have met with that general recognition which is certainly its due. The perfect simplicity of its application, and within certain definite limits, the unvarying character of its color changes, render hæmatoxyline solution especially efficient for this purpose. In the examination of natural waters with this re-agent by the use of a standard ammonia solution, it has been found quite possible to detect the presence of .016 grs. of free sulphuric acid in the gallon, or, in other words, to detect one part in about three and a half-million parts of water. This, however, requires some nicety of discrimination. A very

The presence of salts of lime and magnesia concerns chiefly the relative economy of waters; that is, their power to destroy soap, a necessary detergent in household use.

The destruction of soap is due to the formation of insoluble salts, and not until the salts of lime and magnesia present in the water have exhausted their chemical powers upon the soap will there be a formation of lather.

Soft waters destroy at most but five or six grains of soap to the gallon of water used; but hard waters are in use which will destroy over forty grains of soap to the gallon of water, so that the additional cost of soap required for household use becomes a considerable item.

In addition to their soap destroying power, there should be considered the effects of the salts of lime and magnesia in water used in steam boilers. This item is of considerable consequence in a city of manufactures, such as is Philadelphia.

Since January, 1872, my examinations of Schuylkill, Delaware, and other sources of city supply have been made upon the improved methods referred to, and have been directed as follows:

FIRST, To the ESSENTIALS of a city supply—

a—Healthfulness;

b—Economy;

c—Quantity;

d—Suitability for manufacturing purposes.

SECOND, To the sources of DEPRECIATION—

a—Natural sewage;

b—Sewage incident to cultivation of the land;

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marked transformation is shown in the addition or subtraction of .06 grains of free acid, when one gallon of water is the quantity operated upon. From the first result it is readily seen that, when working with .01 gallon, to determine .00016 grs. of sulphuric anhydride is quite within experimental limits. The second result indicates that in ordinary manipulation, within the detection of one part in the million, no restriction to determination need be made. The presence of sulphurous acid or other deoxidizing agents seem to impair, though not entirely to destroy, the delicacy of this remarkable color reaction."—H. W. M.

c—Sewage from factories;

d—Sewage from slaughter houses, cesspools, cemeteries; and

e—Presence of hurtful metallic solutions.

THIRD. To the PRECAUTIONS that are best suited to preserve the water supply from contamination, and the REMEDIES most appropriate to restore its purity when lost, either by ordinary causes or by those that may produce epidemic disease—

a—Exclusion of improper sewage.

b—Natural treatment for the purification of bad waters.

c—Filtration.

d—Chemical agents to be used in case of emergency.

It is not necessary to discuss here in detail the course of experiments or results obtained; but I will in a general way give the conclusions to which I have arrived.

The river Schuylkill drains a vast agricultural territory, and receives the drainage from two large and growing cities ([3]) beside many smaller towns, several of which are centres of manufacturing industries.

Within a few years numerous iron banks have been opened upon its tributaries, and iron furnaces built upon its margin.

The quality of the water varies materially with the location from which it is taken, the season of the year, and is gradually

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([3]) Cities and towns draining into the river Schuylkill above Fairmount dam:

Population from Census, 1870.

Reading	33,930
Pottsville	12,384
Norristown	10,753
Tamaqua	5,960
Schuylkill Haven	2,940
Pottstown	4,125
Phœnixville	4,886
Manayunk	7,000

Auburn, Port Clinton, Hamburg, Shoemakersville, Leesport, Birdsboro, Douglassville, Schwenksville, Bridgeport, in all representing an aggregate population of over 90,000.

being deteriorated by the influx of foreign matter, both organic and inorganic, from the refuse of the manufacturing establishments which it drains.

As a natural source for city supply, the river Schuylkill is unequalled. It furnishes a soft water containing but little mineral matter, running in a shallow stream over a rough rocky bed, with numerous rapids and cascades, which give it every opportunity for aeration and the destruction of organic matter. The limited amount of salts of lime and magnesia renders it a suitable and an economical water, not only for household use but also for most manufacturing purposes. The frequent examinations made by the city authorities and the corporations using the water, show that the volume is such that with the precautions and the devices that have been suggested "the average flow of the river would then give sufficient water power to raise into distributing reservoirs at Philadelphia over three and one-half billion gallons per month, or 100,000,000 per day, throughout the driest portion of the year." (4)

Depreciation of the water supply by sewage, incident to natural causes, is at its maximum in the autumn, when the leaves and seeds have fallen from the trees, and when the ground is closed by frost, so that the winter showers and water from melting snow does not soak into the ground but flow over the surface into the creeks and rivers.

From a similar reason the sewage from the manuring of farms is greatest in spring, at the breaking up of frost, and entirely ceases when the surface of the ground is broken up by the plough. Fortunately, at such season there are usually freshets, which rapidly and effectually cleanse the river from impurity, and a sufficient margin of the river is enclosed within the limits of the Park to prevent the entrance of such drainage unless at points at such a distance (several miles) from where our chief supply of water is taken as to secure sufficient exposure to natural influences and counteract any ill effects.

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(4) Report of a special committee of the Commissioners of Fairmount Park, upon the preservation of the purity of the water supply.—1867.

Natural sewage rarely exceeds 1 to 1½ pounds to the 1,000,000 U. S. G.

The sewage run into the river from the manufactories located within ten miles of Fairmount dam consists chiefly of the following materials:

Refuse from bleaching and printing.
" " scouring and dyeing.
" " paper works (alkaline).
" " gas works, tar, ammoniacal liquor, and wash from foul lime.

The nearest mill is about 3½ miles, and a majority of them are over 5½ miles, from the Fairmount dam.

That portion of the sewage which consists of decomposing vegetable substances does not produce the hurtful effects of that from decaying animal matters, and if cesspool and surface drainage could be excluded, the whole of the refuse matter from the factories (except that of wool washing and scouring) at present put into the river by these factories, could readily be rendered innocuous by proper exposure to air and light.

That not only the whole of this sewage, but also a great portion of that received from the borough of Norristown, is reduced by oxygenation during its course down the river is evident from an inspection of Table A.

Analyses Nos. 1266 and 1269 (lines 17 and 20) were made of samples taken the same day, one from the inlet to the Roxborough Water Works, containing sewage (from Norristown), to the amount of 42½ lbs. to the 1,000,000 U. S. gallons, and the other from the pool of Fairmount dam, at the inlet to the Belmont Works, containing 19.4 lbs. of sewage; so that 23 lbs. of sewage had been oxydized, in addition to that received by the river from the factories and from Wissahickon Creek and elsewhere.

That portion of the sewage which is most dangerous, and which would in the presence of an epidemic produce fatal results, is derived from the cess-pools and the drainage of slaughter-houses. Singularly, the river is tolerably free from such sewage until it enters the pool of Fairmount dam.

Into this pool from both sides of the river is poured an enormous quantity of animal refuse from slaughter-houses, in which I am informed not less than 25 per cent. of the whole number of animals needed for our market are killed.

The accumulation of this drainage when the water ceases to flow over the dam at Fairmount is evidenced by the amount of sewage found July 24, 1874, in Analyses Nos. 1152, 1153, 1154 (Table A, lines 16, 19, 24), at the inlets to the pump works at Belmont, Fairmount, and Spring Garden, to the enormous amounts of 98.06, 97.14, 121.37 lbs. to the 1,000,000 U. S. G., respectively. It is to be noted that the creek emptying into this river below the inlet to the Spring Garden Water Works was, September 5, 1873, conveying water containing 227.68 lbs. to the 1,000,000 U. S. G. (Table A, Analysis No. 658, line 8), whilst Mantua Creek, on the western bank, was conveying the drainage from slaughter-houses killing a much larger number of animals than that upon the eastern shore. The amount of sewage found in Fairmount forebay, February 9, 1872, was 6.65 lbs. per 1,000,000 U. S. G.. and gradually increased until about November, when a large increment was added, and it has been steadily increasing since that time, until the water is occasionally charged with an amount of sewage exceeding that carried by the river Thames, at London (England), and is totally ufit for use. Unless some precautions are soon taken to prevent the influx of this great amount of sewage of animal matter into our source of supply, we may certainly expect to have our city visited by some epidemic scourge.

The remedies to be applied are, first :

The exclusion of improper sewage.

Channels should be provided *at once* for the conveyance of all sewage on both banks of the river that now enters it below Columbia Bridge.

Provision should be made to exclude (at an early day), all sewage that enters the river at and below Manayunk.

In this sewage should be included, if possible, the waters

of the Wissahickon Creek, which now drains a large portion of a thickly inhabited district.

Water plants, such as float upon the water with their roots in the liquid and leaves in the air, should be cultivated in the stream.

The drainage from the gas works especially should be diverted.

If practicable, it should be so arranged that the water which is pumped into the reservoirs shall flow into each reservoir over an artificial bed, forming as extended a cascade as possible, thus obtaining as much as can be the benefit of exposure to air and light, and so reduce to a minimum the amount of oxidizable matter.

Filtration would remove much of the floating matter, and greatly improve the quality of the water; but if proper precautions are used, it may be rendered unnecessary.

If at any time the condition of the water supply should become seriously polluted, chemical agents may be employed, which will at least render it harmless.

The following extracts from "The Sewage Question," by Krepp, show the mode of the propagation of epidemics, and from a study of the conditions therein stated, we are able to learn the means of prevention and of cure should epidemics unfortunately make their appearance.

"Dr. Klob, of Vienna, has recently, by means of a microscope, of 808 to 1000 power, discovered in the evacuations of cholera patients millions and millions of microscopic fungi very similar in form to common mushrooms.

That these fungi form the basis and medium of propagation of that terrible disease there can hardly be any more doubt, as all kinds of fungi most rapidly propagate under favorable circumstances."

"The most eminent physicians of the southern part of the United States now acknowledge that yellow fever is much promoted, if not actually generated, by the decomposition of large masses of human fæces left exposed to the open air, though they very much disagree respecting the manner in which this terrible distemper is propagated. According to

Captain Liernur, who was for a number of years a resident of the Southern States, and from whose notes, as stated in the preface, we are working—according to his decided opinion the infection by yellow fever is simply caused by the germs of infusoria or fungi, developed by a combination of fæcal matters with vegetable substances, putrefying together under the influences of a torrid clime.

"Both yellow fever and cholera germs, whether of the vegetable or animal, fungus or infusoria class, abound of course in the evacuations of the stomach and bowels of the patients, a single drop of which, however diluted, contains millions of these poisonous atoms, which are ever taken up into the air by the evaporation of the infectious fluid, and afterward return in the rain.

"The scientific investigations of the celebrated Professor Pettenkofer, of Munich, have thrown additional light upon this subject, and disclosed important facts, which may be summed up as follows:

"1. Cholera is neither altogether a contagion nor entirely a miasma, but a most dangerous bastard, combining all the virulence of both.

"2. The origin of cholera lies in a specific ferment or germ, contained in the excrements of cholera-stricken persons, or even of otherwise healthy people, coming from an infected locality.

"3. Cholera, if once introduced, in the shape of this germ, develops itself in an epidemic only in such localities where the water, circulating in a loose porous soil, is impregnated with fæcal matter, through percolation out of cesspools, sewers, and gutters.

"4. Such polluted sub-soil water becomes the more dangerous when, by atmospheric influences, it alternately rises and falls, leaving in the latter case the upper strata impregnated with putrid organic matter to dry up, and thereby exhale volumes of most poisonous gases, which enter the human system through our lungs.

"5. Cholera is, therefore, propagated not only by the atmosphere, when charged with fæcal gases, but also by wells, when contaminated by excremental percolation; the latter being by far the more dangerous mode, as the cholera ferment or poison is much more concentrated and powerful in the water we drink than in the air we inhale.

"6. Excrements, even of cholera-stricken persons, never spread their infectious ferment whilst they are fresh, but only after the second day, when alkaline fermentation sets in, which therefore must be prevented by admixture of proper disinfectants in sufficient quantity."

"In the year 1849 nearly all the water used in London for drinking and culinary purposes was notoriously contaminated by cesspools and water-closets, in many instances even by direct percolation of the evacuations of cholera patients. Fortunately, the quality of London water has since improved. Hence the mortality by cholera in the years 1849, 1864, and 1866, has decreased as follows: 62—43—18 of every 1000 inhabitants."

"When river water holds in suspense effete organic substances of the animal or vegetable kingdom, a process of combustion rapidly goes on by the oxygen contained in the water itself; and when all the oygen which for that purpose can be spared is consumed, the remaining organic ingredients pass into a state of putrefaction."

From the above statements it appears that a condition of alkalinity is necessary for the propagation of typhoid and choleraic disorders, and all of the modern authorities assert the danger of drinking alkaline waters containing much sewage.

The best corrective is suphuric acid. By the use of a proper amount of this acid putrefaction is prevented, and the dangerous characteristics of the water disappear.

Its properties and therapeutical effects are thus expressed in the U. S. Dispensary, 1865, Wood & Bache:

"Diluted sulphuric acid is a tonic, refrigerant, and astringent.

"It is given in typhoid fevers, and often with advantage. The dose is from ten to thirty drops, three times a day.

"In 1851 attention was called by Mr. Buxton, of London, to the remarkable efficacy of diluted sulphuric acid in severe forms of diarrhœa, especially choleraic diarrhœa.

"In October, 1853, Dr. H. W. Fuller, of St. George's Hospital, published a paper in the *London Medical Times and Gazette*, in which he strongly recommends it in choleraic diarrhœa, from his own experience and that of his friends in more than ninety cases without a single failure."

During the summer of 1849 the workmen employed at the Philadelphia gas works were directed, before drinking the river water, to add to each pint one or two drops of sulphuric acid, which was furnished to them for the purpose. So far as my knowledge goes, and I was constantly at the gas works during that summer, not a single case of cholera occurred among them, although the employment, location, and habits of the men predisposed them, and favored an attack of the epidemic, of which they were in the midst.

In addition to the natural advantages possessed by the river Schuylkill for the purification of the water, it happens that it receives from many sources quite large amounts of free sulphuric acid. (See Table C.) This acid is derived chiefly from the decomposition of the pyrites of the coal waste at the mines near its source and from the refuse of the iron furnaces erected along the course of the river.

From an inspection of the table, which contains the results of observations upon samples taken from the river on one day and on one ebb tide, below the Fairmount dam, it will be seen that the amount of acid, free and combined, varies very much, although the points from which the samples were taken are but a few miles apart.

These changes are the result of the action and reaction between the acid and the organic matter, resulting in the oxidation of one and the conversion of the other into a gaseous form, in which shape it escapes into the air.

The additions of acid below the City of Reading come

chiefly from the oxidation of the sulphur in the slag heaps from the furnaces; a portion is, however, derived from ore heaps exposed to atmospheric influences upon the banks of streams emptying into the river, and from chemical works similarly located. (5)

At the foot of the table I have placed the results of an examination of water from a well at the "George's" Mansion, near George's Hill, in Fairmount Park. This water, which contains 0.98 of a grain of Sulphuric Acid of commercial strength in each gallon, is in constant use for drinking purposes, and is considered to be an especially excellent and healthful water.

To neutralize the free ammonia in the Schuylkill water on February 25th, 1875, would for every gallon have required of commercial Sulphuric Acid only 0.05363 of a grain, or one grain of acid in about 19 gallons of water, and it is only proposed to neutralize and not to add an excess of acid.

As the amount of free ammonia rarely exceeds that stated, the proportion of acid needed is very minute and affords a ready and safe remedy in case of necessity.

The pollution of the Schuylkill River has been increased to such an extent as occasionally to class the water as "unwholesome;" prompt measures should therefore be taken to relieve it of sewage containing fæcal and decaying animal matter. The greatest proportion of these are now received from the streams draining into the pool of Fairmount Dam. Preparations have been made to conduct that on the west side of the river below the dam by means of a sewer, and provision should at once be made for the sewage on the eastern shore.

When the flow of this sewage shall have been diverted into some new channel, then the sedimentary matter deposited in the river near the places of its entrance should be at once

(5) The sewage of the City of Reading not only neutralizes the free acid found in the river at Schuylkill Bridge, but renders its waters alkaline. This alkalinity is in turn corrected by the free acid draining into the river from the slag heaps of the iron furnaces located just below the city at Upper Neversink.

removed, and before the summer heat can set up putrefactive fermentation.

In conclusion, I will briefly enumerate what I deem to be the proper steps to be taken to restore and maintain the purity of our water supply:

1. The diversion of *all sewage* now flowing into the pool of Fairmount Dam below the Falls Bridge into some other channel.

2. The diversion of all sewage containing *fœcal and animal matter* now flowing into the river below Flat Rock dam into some other channel.

3. The filtration of the sewage from all mills, so as to exclude solid matter, animal or vegetable.

4. The exclusion of ammonia waste and surface wash coming from the Gas Works, cemeteries, etc.

5. The cultivation of fish and of suitable plant life in and upon the waters of the river.

6. The erection of suitable cascades over the reservoirs, so as to secure the benefits of æration to as great an extent as possible.

7. The employment of proper prophylactic and curative agents as occasion may require.

Respectfully yours,

CHARLES M. CRESSON, M. D.

NOTE.—The tables annexed are expressed in pounds to the 1,000,000 U. S. gallons.

To convert pounds in the million U. S. gallon into *grains to the gallon*, it is only necessary to set the decimal point three figures to the left and multiply by 7, thus:—92.85 lbs. to the 1,000,000 U. S. G.=0.09285 x 7= 0.64995 grains to U. S. G.

To convert pounds in the 1,000,000 U. S. G., into *parts in the* 1,000,000, divide the pounds to the 1,000,000 U. S. G. by 8.33, thus:—92.85 lbs. to U. S. G.=11.14 parts in the 1,000,000.

United States gallon=231 cubic inches=8.332698 lbs.

Results of the Examination of Water from the River Schuylkill.

TABLE A.

CHARLES M. CRESSON, M.D., 417 Walnut Street, Philadelphia.

FROM WHENCE OBTAINED.	Anal. No.	DATE.	Total solid matter.	AMMONIA.			Sewage.	Sulphuric acid.	Chlorine.	REMARKS.
				Free.	Albumenoid.	From Nitr'tes				
			POUNDS IN 1,000,000 U. S. GALLONS.							
1. Fairmount Forebay	329	Feb. 9, 1872	899.10	0.89	0.66	10.27	6.65	169.53	37.18	
2 Belmont Inlet.	330	" 9, "	928.80	0.17	2.13		21.28	202.28	34.62	
3. Schuylkill River, below Manayunk, G. W.	336	" 9, "	993 60	7.32	0.67		6.65	198 53	39.95	No water over dam for eight days previous, and very little for fifteen days previous.
4. " " " Wissahickon Creek	335	" 9, "	594 00	Traces only.	1 99		19.96	63 67	39.95	
5. " " " Dobson's Mill	333	" 9, "	982.80	0.17	0.70		6 98	191.13	31.97	
6. " " " Simpson's Mill	334	" 9, "	934 20	Traces only.				195 07	37.28	
7. Creek below Spring Garden Water Works Inlet.	361	Apr. 26, "		1 66	9.98	3.33	99.79			Sewage from slaughter houses, &c., on east side of river.
8. " " " "	658	Sept. 5, 1873		2 73	22 77		227.68	38.57	65.71	
9. Schuylkill River, below Manayunk, G. W.	600	July 24, "		4.57	6 86		68.57	140 00	45.71	
10. " " " Wissahickon Creek	599	" 31, "		17.14	4.57		45 71	None.	40.00	
11. " " " Simpson's Mill	364	Apr. 20, 1872		3.66	3.33	4.82	33 26			
12. " " " " "	656	Aug. 29, 1873		0.46	2.28		22.77	133.57	28.57	
13. Belmont Inlet	331	Mar. 9, 1872	901.80	0.17	1.33		13.30	226 19	38.72	
14. " "	634	July 31, 1873		15.17	3.21		32.14	82.86	40.00	
15. " "	657	Sept. 5, "		0.30	1.82		18.21	127.14	50.00	
16. " "	1152	July 24, 1874		2.43	9.81	19.43	98.06	70.00	34 29	No water over dam for four days previous
17. " "	1266	Nov. 7, "		None.	1 94	12.14	19.42	205.71	25.71	
18. Spring Garden Water Works Inlet	655	Aug 27, 1873		7.86	1.79		17.85	122 85	40 00	
19. " " " "	1154	July 24, 1874		2.42	12 13	14.57	121.37	71.43	31.43	No water over dam for four days previous.
20. Roxborough " "	1269	Nov. 7, "		4.12	4.25	18.21	42.50	197.14	21.42	
21. Fairmount Forebay	329	Feb. 9, 1872	899 10	0.99	0 66	10.27	6.65	169.53	37.18	No water over dam for eight days previous.
22. " "	512	Jan. 6, 1873	1067.10	1 67	2 51		25.17	91.11	110 00	Slight freshet. High water for two days previous.
23. " "	1025	" 22, 1874	817.31	0.76	2.13	4.68	21.25	210.00	114.28	
24. " "	1153	July 24, "		1.94	9.72	19.43	97.14	71.43	30.00	No water over dam for four days. Low water for ten days previous.
25. " "	1414	Jan. 19, 1875	998.57	1.21	3.06	24.28	30.60	168.57	71.42	No water over dam for six days previous.
26. Croton—New York City Supply	337	Mar. 7, 1872	507.60	0.99	0.99	1.25	9.97	34.92	21.36	
27. Loch Katrine—Glasgow			235.73	0 03	0.67	2.58	6.66	46.64	39.15	
28. Bala Lake			233.40	0 08	2.08		20.82	29.15	60 80	
29. Thames—London Supply			2,577.30	0.24	1.33	28.82	13.32	261.56	118.28	From Watt's Dictionary, and Wanklyn, Chapman, and Smith's Manual.
30. " London Bridge			3,401.97		4.91		49.14	268 22	529.78	
31. River Lea, London			2,798.88	0.24	0.74	30.07	7.41	369.01	127.45	

Results of the Examination of Water—Continued.

TABLE B.—*Fairmount Forebay.*

	DATE.	Anal. No.	AMMONIA. Free.	Albumenoid.	From Nitr'tes.	Sulphuric Acid.	Chlorine.	Sewage.
			POUNDS IN 1,000,000 U. S. GALLONS.					
1.	February 9, 1872.....	329	0.99	0 66	10.27	169.53	37.18	6.65
2.	April 26, "	364	None.	0.95	.....	.....	.....	9.55
3.	May 11, "	364 *c*	"	0.95	.....	.....	.....	9.55
4.	June 8, "	364 *d*	"	0.83	.....	.....	.....	8.32
5.	July 6, "	364 *e*	Traces.	0.66	2.69	.....	.....	6.65
6.	September 7, "	364 *f*	0 99	0 99	2 69	.....	.....	9.97
7.	November 2, "	364 *g*	None.	2 69	1.25	.....	.....	26.99
8.	January 6, 1873.....	512	1.67	2.51	.....	91.11	110.00	25.17
9.	March 29, "	548	0 70	1 80	5.80	94 20	125.70	18.80
10.	January 22, 1874.....	1025	0.75	2.13	4.68	210.00	114.28	21.25
11.	July 24, "	1153	1.94	9.72	19.43	71.43	30.00	97.14
12.	November 7, "	1268	Traces.	3.15	18.21	162 85	30 00	31.57
13.	January 19, 1875.....	1414	1.21	3.06	24.28	168 57	71.42	30 60
14.	February 25, "	1431	2.67	5.15	24.28	134.28	27.14	51.57
15.	Well water.....	1428	None.	2.62	48 57	155.71	275.71	26.22

Results of the Examination of Water—Continued.

TABLE C.—*Sulphuric Acid and Chlorine.*

Anal. No.	LOCATION.	SULPHURIC ACID. Free.	Combined.	Total.	Chlorine.
		Pounds in 1,000,000 U. S. Gals.			
1.	1302 Canal Level above Schuylkill Haven.....	38.03	476 25	514.28	20.00
2.	1300 Lippincott Dock, Schuylkill Haven.....	12 89	379.97	392 85	21.42
3.	1301 Port Clinton, Canal Dock.....	7.87	1,363 56	1,371.43	18.57
4.	1424 Schuylkill River, at Port Clinton.....	4.80	378.06	382.85	21.42
5.	1245 " " at Schuylkill Bridge, Reading.....	54.28	245.72	300 00	12.14
6.	1237 " " at Neversink, Upper Station.....	24.00	461.71	485.71	14.23
7.	1235 " " at Monocacy.....	28.57	337.14	365.71	18.57
8.	1223 " " above French Creek.....	not det	not det	391.42	17.14
9.	1230 " " at Perkiomen Junction.....	"	"	411.42	14.28
10.	1267 " " at Spring Garden Forebay.....	None.	154.28	154.28	35.71
11.	1268 " " at Fairmount Forebay.....	"	162.85	162.85	30 00
12.	1276 " " below dam at Fairmount Bridge....	"	382.85	382.85	11.42
13.	1277 " " at Gray's Ferry Bridge.....	"	967.14	967.14	21.42
14	1278 " " at Penrose Ferry.....	"	845 71	845.71	18.57
15.	1428 Pump well at George's Mansion near Fairmount Park	114.28	41.43	155.71	275.71

Results of the Examination of Water—Continued.

TABLE D.—*Organic matter determined by ignition and sewage by the method of Wanklyn and Chapman.*

SAMPLES FROM SCHUYLKILL RIVER AT	Analysis No.	Solid Matter after Ignition.	Organic Matter by Ignition.	Sewage.
	POUNDS IN 1,000,000 U. S. GALLONS.			
1. Fairmount Forebay	339	675.00	224.10	6.65
2. Inlet to Belmont	330	712.80	216.00	21.28
3. " "	331	677.20	224.60	13.30
4. Wissahickon	335	378.00	216.00	19.95
5. Dobson's	333	761.40	221.40	6.98
6. Simpson's	334	702.00	232 20	Traces.
7. Manayunk Gas Works	336	793.80	199.80	6 65
8. Croton, New York	337	372.60	135.00	9.98

Results of the Examination of Water—Continued.

TABLE E—*Memorandum.*

In the analysis (329, Table F) of water from Forebay at Fairmount, February 9, 1872, there was found sedimentary matter (to U. S. G.)=1.92 grains.

This consisted of Silica.....43.3 per ct.
Alumina.....35. 0 "
Combined water...18 0 "
} or {
Clay.....65.0 per ct.
Alumina....13.3 "
Water.....18.0 "

A trace of lime and of oxide of iron.

The particles of this sedimentary clay are very minute, of dimensions between the 1-20,000 and 1-30,000 of an inch in diameter, and give a peculiar taste to the water.

They are too small to be removed by ordinary filters, and remain in suspension for several weeks, although the vessels containing the water are undisturbed.

This clay is derived from a thin belt crossing the River Schuylkill above the city of Reading, and is seldom brought down by the stream, except at such times as the margin of the river is covered with melting snow or ice.

Results of the Examination of Water—Continued.

TABLE F.—ANALYSES OF WATER FROM FAIRMOUNT FOREBAY.

	Analyses Made by		C. M. Cresson, M. D.				
	Prof. Boyé, 1842.	S. C. Phillips. 1870.	Feb. 9, 1872.	Jan. 6, 1873.	Mar. 29, 1873.	Jan. 22, 1874.	Jan. 19, 1875.
	Pounds in 1,000,000 U. S. Gallons.						
Analyses Number			329	512	548	1025	1414
Sediment			274.28		339.00		
Solid matter upon evaporation to dryness	585.9	652.41	899.10	1067.10	606.20	817.31	998.57
Inorganic matter	580.7	615.70	675.00	891.40			722.85
Organic matter, by ignition	5.1	36.71	224.10	175.70			275.72
Silica ($Si O_3$)	56.4	42.56		357.70	73.40	15.12	92.85
Alumina ($Al_2 O_3$)						29.01	7.28
Oxide of Iron ($Fe_2 O_3$)						37.40	8.43
Silica, Alumina, and Oxide of Iron			78.30				
Alumina and Oxide of Iron	11.0	13.34		27.70	98.80		
Lime (Ca O)	175.2	141.83	86.40	61.88	142.91	56.14	135.20
Magnesia (Mg O)	31.4	38.75	21.38	97.40	43.10	52.61	76.11
Sulphuric Acid, free (SO_3)			None.	None.	None.	None.	None.
Sulphuric Acid, in combination	44.8	91.01	169.53	91.11	94.20	210.00	168.57
Chlorine, free (Cl)			None.	None.	None.	None.	None.
Chlorine, in combination	13.3	42.44	37.18	110.00	125.70	114 28	71.42
Potash (KO)		33.28	} 85.27	} Residue not determined.	} Residue not determined.	} Residue not determined.	} Residue not determined.
Soda (Na O)	62.1	67.03					
Ammonia, free (NH_3)			0.99	1.67	0.70	0.75	1.21
Ammonia, albumenoid			0.66	2.51	1.80	2.13	3 06
Nitrogen from Nitrates and Nitrites			10.27	Not determined	5.80	4.68	24.28
Sewage			6.65	25.17	18.80	21.25	30.60

NOTE.—The Sulphuric Acid in all of the Tables is expressed as Sulphuric Anhydride. The Residues entered as Soda and Potash, consist chiefly of Soda.

CHARLES M. CRESSON, M. D., 417 Walnut Street, Philadelphia.

RECEIPTS

OF THE

WATER DEPARTMENT

FOR

1874.

The gross receipts for the year have been $1,229,881 38. The sources from which this amount has been received will be exhibited by the statement of the Registrar, James Work, Esq.

Of the above sum $6,994.58, has been received at the Chief Engineer's office, and paid over to the City Treasurer.

RECEIPTS AT CHIEF ENGINEER'S OFFICE FOR 1874.

For rents,	$1,160 00
For old iron &c.,	444 35
For damaged pipe,	27 48
For scrap brass &c.,	226 94
For stone,	111 00
For old cement barrels,	14 00
Neafie & Levy, attachment,	324 50
Commissioners Fairmount Park, attachment,	302 64
North Pennsylvania Railroad, attachment,	62 50
J. L. Haines, Treas., attachment,	232 30
Thos. Atkinson, attachment,	116 33
Southern Steamship Co., attachment,	335 50
McKean, Newhall & Borie, attachment,	437 35
W. C. Allison & Sons, attachment,	135 05
Buckley & Co., attachment,	171 50
Frankford & Southwark Railroad Co., attachment,	298 06
Isaac A. Sheppard, attachment,	111 65
House of Refuge, white department, repairs,	45 25
House of Refuge, colored department, repairs,	27 32
Guardians of the Poor, repairs,	5 85
Boston Steamship Co., repairs,	3 00
Midvale Steel Works, repairs,	43 47
Commissioners Fairmount Park, repairs,	2 25
Sundry repairs, &c.,	121 49
Lawrence Water Works, Mass. stops, &c.,	1,230 00
Philadelphia & Reading Railroad Co., labor &c.,	248 56
University Hospital, connection,	11 00
R. J. Dobbins (Centennial Building), connection,	16 47
Adams Express Co., moving plug,	34 60
Commissioners Fairmount Park, stop-cocks, fire-plugs, &c., and labor in park,	694 17
	$6,994 58

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER,
REGISTRAR'S OFFICE,

Philadelphia, February 1, 1875.

DR. WM. H. MCFADDEN,
Chief Engineer.

DEAR SIR:—Herewith please find report and itemized statements of the operations of this office for the year 1874, showing a total amount of receipts of $1,222,886.80, an increase over the year 1873 of $144,592.85.

For the different sources of revenue, I would respectfully refer to the following tabular statements.

Very respectfully,

JAMES WORK,
Registrar.

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Receipts at Registrar's Office for the year 1874.

1874.	DELINQUENT RENTS.	PENALTIES.	RENTS OF 1874.	PENALTIES.	FRACTIONAL RENTS.	WATER PIPE.	TOTALS.
January	$2,563 00	$378 22	$46,406 50	.....	$1,988 50	$24,137 08	$75,473 30
February	1,954 50	230 27	51,058 50	.....	1,680 50	7,709 08	62,632 85
March	2,176 50	312 33	159,468 75	.....	5,711 15	12,163 42	179,832 15
April	4,615 75	679 24	470,392 25	.....	5,267 58	22,732 38	503,687 20
May	4,562 50	670 08	34,471 25	$1,706 82	11,877 28	11,105 11	64,393 04
June	3,047 75	443 32	50,183 25	2,491 68	6,685 70	7,725 09	70,576 79
July	2,834 00	422 50	10,157 75	1,503 75	4,575 50	11,196 49	30,689 99
August	1,833 00	269 15	17,983 75	2,669 86	3,982 50	24,648 28	51,386 54
September	2,589 25	368 34	24,274 00	3,590 49	4,336 00	17,299 45	52,457 53
October	2,346 25	345 14	22,364 75	3,164 77	3,560 00	18,611 51	50,392 42
November	1,187 50	176 61	10,846 25	1,506 16	3,909 85	20,298 92	37,925 29
December	1,354 25	187 82	12,292 50	1,800 95	6,534 00	21,270 18	43,439 70
Totals	$31,064 25	$4,483 02	$909,899 50	$18,434 48	$60,108 56	$198,896 99	$1,222,886 80

Amount of claims for water pipe returned for lien during the year.....$152,593.11
Amount of claims for water pipe collected by City Solicitor during the year.....31,130.17

Comparative statement of receipts of the years 1873 *and* 1874.

	DELINQUENT RENTS.	PENALTIES.	WATER RENTS.	PENALTIES.	FRACTIONAL RENTS.	WATER PIPE.	TOTAL.
1874	$31,064 25	$1,483 02	$909,899 50	$18,434 48	$60,108 56	$198,896 99	$1,222,886 80
1873	22,705 50	2,824 93	865,696 50	18,095 73	51,974 12	116,997 17	1,078,293 95
Increase	$8,358 75	$1,658 09	$44,203 00	$338 75	$8,134 44	$81,899 82	$144,592 85

Items of receipts under head of fractional rents.

	RENTS.	FERRULES.	REPAVING.	REPAIRS.	TOTAL.
1874	$43,229 56	$9,198 00	$6,632 00	$1,049 00	$60,108 56
1873	34,731 37	9,440 00	6,783 00	1,019 75	51,974 12
Increase	$8,498 19			$29 25	$8,134 44
Decrease		$242 00	$151 00		

List of Dwellings, Factories, Horse-power, &c., as charged on Registers of 1874.

	WARDS.																											Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 & 28	22	23	24	25	26	27	29	
Dwellings	7316	3876	2028	1881	2768	2785	3712	2809	2488	2903	2371	1922	2591	3137	6070	2045	2162	3795	10201	6514	2422	1821	763	3756	2104	7893	1686	5021	98,840
" ½ & ¾	484	1580	1396	1576	543	325	1325	175	513	1066	967	753	619	813	1381	1379	691	1092	1121	566	21	7	12	49	312	562	73	173	19,574
Baths	2032	1033	671	438	833	515	2031	2139	1243	1791	437	845	1706	1625	3652	469	333	778	3165	4615	7406	1360	201	1855	440	2613	1134	3280	48,610
Wash-paves	726	429	315	138	576	338	1059	1191	945	1168	203	493	965	1117	2609	324	257	488	1765	3461	1364	565	296	815	257	1227	767	2760	26,648
Water closets, urinals and bidetts	85	60	67	73	1436	1769	1152	2321	1616	1171	168	212	429	463	1816	106	42	33	260	1213	642	970	29	536	22	801	884	1466	19,848
Basins, sinks and wash tubs	65	56	63	72	1406	1711	1222	2423	1573	1187	158	189	384	321	1829	116	40	25	253	1475	711	938	24	419	30	193	1055	2264	20,202
Horse-power	646	684	135	211	819	1570	362	320	1023	339	505	293	258	199	2165	1310	510	667	1979	719	191	523	258	70	96	149	381	195	16,577
Horse-stalls	554	970	307	247	525	407	663	1621	1370	1733	1708	1647	615	702	1956	672	212	513	1169	1343	133	102	132	1037	156	768	542	847	22,651
Bars	110	160	119	219	298	182	94	114	155	107	283	119	93	55	214	137	169	98	280	176	59	22	17	73	82	310	62	73	3,880
Watering horses	28	10	12	10	20	2	11	.....	20	6	4	1	1	6	14	4	11	69	25	31	2	4	10	30	15	64	13	14	427
Factories	11	9	1	2	6	31	23	1	40	10	5	14	11	29	7	35	41	6	119	36	11	10	4	9	6	9	13	1	400
Foundries	6	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	5	2	1	.....	.....	2	5	.....	.....	2	1	2	1	3	.....	32
Bakeries	29	38	31	21	14	19	10	9	27	9	13	16	12	16	43	13	17	14	93	59	6	9	5	6	21	16	5	19	590
Dye-tubs	.....	7	.....	.....	9	39	1	.....	5	10	7	.....	3	.....	68	57	55	21	98	5	10	24	5	6	34	.....	.....	.....	464
Meat packers	10	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15
Breweries	1	2	.....	.....	.....	.....	.....	.....	.....	.....	1	2	3	.....	6	7	18	1	3	6	2	3	.....	2	.....	5	1	17	80
Sugar houses	.....	2	.....	1	1	2	.....	.....	.....	2	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
Hot and Green houses	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	17	6	5	4	1	.....	11	15	64
Fountains	3	1	3	1	17	15	2	27	30	20	3	8	8	15	32	5	.....	7	3	22	10	21	3	21	2	11	24	14	328
Distilleries	.....	.....	.....	1	.....	1	3	.....	.....	.....	.....	.....	.....	.....	.....	3	2	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	11
Slaughter houses	15	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	5	13	1	3	3	1	17	13	3	3	.....	17	3	.....	2	16	116
Malt houses	.....	.....	.....	.....	.....	1	.....	1	.....	1	2	.....	1	.....	1	1	.....	1	.....	3	.....	.....	.....	.....	.....	.....	.....	2	14
Brick yards	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	1	2	.....	5	8	.....	4	23
Barber shops	22	31	15	15	33	29	12	11	37	13	13	15	17	25	28	17	24	12	57	26	6	5	4	13	4	12	8	19	523
Photographs	.....	.....	1	.....	6	11	2	9	21	2	5	5	7	2	1	.....	2	.....	18	1	1	1	1	.....	.....	.....	1	1	98
Miscellaneous	7	7	10	6	3	6	5	3	5	7	6	6	8	6	11	2	4	3	6	63	5	3	2	7	3	4	20	47	265

Permits issued during the year 1874.

	WARDS.																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 & 28	22	23	24	25	26	27	29	Total.
Dwellings	441	26	3	6	7	10	21	24	9	13	6	2	11	7	76	5	12	90	695	84	521	206	150	486	419	528	140	474	4,472
½ and ¾	...	2	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	4	...	.....	...	5	4	...	2	...	.....	21
Baths	132	31	1	6	11	3	21	47	17	17	9	9	19	13	92	8	15	51	485	95	311	146	41	268	64	203	98	441	2.654
Wash paves	90	21	1	3	12	10	10	33	15	20	7	6	17	12	46	2	11	20	345	77	292	74	49	135	33	125	59	328	1,853
Water closets, urinals, and bidetts	7	8	1	...	61	72	36	118	81	38	3	23	26	16	74	2	9	4	57	54	136	97	2	100	...	54	103	151	1,333
Basins, sinks, and wash tubs	5	4	1	...	46	65	50	121	75	28	5	10	6	5	81	4	15	4	59	56	153	84	...	49	6	2	44	182	1,160
Stores and shops	5	2	2	1	3	4	1	1	9	4	1	2	1	1	1	2	2	3	12	4	3	1	1	3	3	5	1	5	83
Bars	5	2	4	10	7	7	3	...	2	4	2	3	4	1	4	1	1	1	8	2	16	2	1	5	5	16	1	9	126
Engines and boilers	2	4	2	...	3	19	1	5	3	2	...	4	...	2	3	1	2	2	16	2	4	2	3	.....	1	3	1	3	90
Horse power	12	52	15	...	37	176	10	34	80	9	...	25	...	14	52	60	23	21	117	24	80	8	74	.....	10	15	5	15	968
Stables	5	8	...	...	2	1	2	8	2	2	2	...	...	3	9	2	1	4	15	2	10	11	3	6	...	11	3	3	115
Slaughter-houses	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	.....	...	...	2	1	.....	...	.....	5
Horse troughs	2	1	3	1	1	...	...	...	...	1	...	...	...	1	1	...	...	...	5	...	1	1	1	2	4	10	...	3	38
Bakeries	...	1	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	4	...	1	...	...	.....	1	.....	...	2	11
Sprinkling streets	...	...	...	...	3	3	3	1	3	3	...	1	...	...	2	...	...	...	.....	...	...	2	...	2	...	.....	...	1	24
Watering ships	2	43	...	4	1	...	...	...	...	...	1	...	...	...	...	...	...	...	.....	...	.....	...	...	.....	...	.....	1	.....	52
Building purposes	24	...	2	...	4	3	4	12	1	1	...	...	1	1	20	1	4	3	64	13	73	25	19	60	24	30	17	31	437
Fountains	...	...	...	...	2	...	...	1	1	...	1	...	...	1	1	1	...	2	.....	...	1	1	...	8	...	3	2	.....	25
Market houses	..	...	1	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	.....	...	.....	...	...	.....	...	.....	...	.....	3
Factories and dye houses	...	1	...	...	1	...	1	1	1	...	1	1	...	...	2	1	1	...	6	2	5	1	2	.....	1	2	...	1	31
Photograph galleries	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	.....	...	1	...	...	.....	...	.....	...	.....	2
Laundries	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	1	.....	...	...	.....	...	.....	...	.....	1
Breweries and malt houses	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	.....	...	2	...	...	.....	...	.....	...	.....	4
Churches	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	3	1	1	...	...	1	...	.....	1	.....	8
Hot-houses	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	2	1	1	1	.....	1	1	13
Meat packers	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	.....	...	...	.....	...	.....	...	.....	1
Restaurants	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	.....	...	...	.....	...	.....	...	.....	1
Brick-yards	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	1	...	...	.....	...	1	...	.....	2
Totals	731	207	37	31	201	374	164	406	300	142	39	86	86	81	467	90	96	205	1896	417	1618	663	352	1132	573	1010	477	1650	13,533

Amount of Duplicates for the years 1874 *and* 1875.

Wards.	1874.	1875.
First,	$45,912 50	$49,528 00
Second,	33,661 25	36,940 50
Third,	19,892 50	21,926 25
Fourth,	19,200 25	19,303 00
Fifth,	35,257 25	35,706 25
Sixth,	36,345 50	37,230 00
Seventh,	40,122 25	39,928 25
Eighth,	38,841 75	39,621 75
Ninth,	34,410 25	35,087 75
Tenth,	35,100 75	35,409 75
Eleventh,	18,138 75	19,373 00
Twelfth,	20,738 00	20,161 00
Thirteenth,	29,325 75	29,304 00
Fourteenth,	33,468 25	33,746 25
Fifteenth,	71,750 00	73,259 25
Sixteenth,	23,825 75	26,003 25
Seventeenth,	22,685 75	23,119 75
Eighteenth,	33,033 25	33,772 50
Nineteenth,	94,912 50	101,797 25
Twentieth,	69,148 00	70,209 75
Twenty-first, Twenty-eighth,	21,486 75	6,818 50
Twenty-second,	20,506 00	22,421 00
Twenty-third,	6,660 00	7,778 00
Twenty-fourth,	28,451 50	32,502 00
Twenty-fifth,	14,662 00	17,428 00
Twenty-sixth,	64,460 25	69,084 25
Twenty-seventh,	19,306 75	21,095 25
Twenty-eighth,	. . . . .	21,014 75
Twenty-ninth,	48,212 50	53,641 00
Totals,	$979,516 00	$1,033,210 25

Amount collected by City Solicitor from Liens.

YEARS.	Feet of pipe laid.	Frontage collected by Registrar.	Returned for Liens.	Collected by City Solicitor.
1863	$56,961	$30,715 02	$14,350 70	$16,544 21
1864	35,867	22,278 57	13,630 59	13,535 22
1865	46,994	34,141 07	11,970 42	7,564 68
1866	66,324	32,031 11	4,160 13	12,190 21
1867	84,171	76,938 39	22,830 11	7,892 28
1868	79,348	64,959 03	21,701 68	18,549 86
1869	118,044	61,065 06	24,866 43	16,389 90
1870	139,233	117,319 12	61,640 99	11,959 82
1871	158,972	96,110 98	62,341 24	14,764 47
1872	146,221	131,822 96	77,467 36	21,108 90
1873	210,736	116,997 17	75,882 09	26,601 71
1874	225,271	198,896 99	152,593 11	31,130 17
Total	$1,368,142	$983,275 47	$543,434 85	$198,231 43

Receipts and Expenditures since Consolidation.

YEARS.	Received by Registrar for water rents and percentage.	Received by Chief Engineer for rents, old iron, scraps, and private fire-plug attachments.	Total receipts from all sources.	Yearly increase.	Total expenditures.
1855,	$381,410 17	$626 55	$382,036 72	.....	$250,895 37
1856,	351,936 49	960 11	352,896 60	Decrease.	160,368 02
1857,	425,661 94	302 20	425,964 14	$73,067 54	200,605 82
1858,	457,518 48	129 75	457,648 23	31,684 09	187,978 09
1859,	548,128 19	3,051 89	551,180 08	93,531 85	411,737 09
1860,	557,121 76	1,409 77	558,531 53	7,351 45	252,506 23
1861,	533,094 76	885 30	533,980 06	Decrease.	238,989 54
1862,	544,767 25	1,025 82	545,793 07	11,813 01	177,271 69
1863,	568,740 60	937 69	569,678 29	23,885 22	213,750 20
1864,	609,257 28	855 29	610,112 57	40,434 28	253,968 75
1865,	629,887 47	6,500 95	636,388 42	26,275 85	422,337 58
1866,	666,294 95	3,927 18	670,222 13	33,833 71	616,712 92
1867,	761,559 45	5,891 44	767,450 89	96,228 76	575,844 49
1868,	772,605 76	4,404 83	777,009 59	9,558 70	802,217 45
1869,	808,508 23	4,962 60	813,470 83	36,461 24	909,768 28
1870,	928,035 95	7,335 01	935,370 96	121,900 13	1,144,073 51
1871,	956,050 04	7,184 04	963,234 08	27,863 12	1,069,193 43
1872,	1,043,613 11	10,668 40	1,054,281 51	91,047 43	1,063,576 28
1873,	1,078,293 95	4,691 06	1,082,985 01	28,703 50	1,564,418 48
1874,	1,222,886 80	6,994 58	1,229,881 38	146,896 37	1,225,102 08

EXPENDITURES

OF THE

Water Department

FOR

1874.

EXPENDITURES OF THE DEPARTMENT FOR THE YEAR 1874.

Salaries of Chief Engineer, Registrar, Clerks, &c.,		$54,950 00
Office expenses,		8,199 34
Salaries of engineers, firemen, &c., at works,		49,025 00
Supplies to works, viz.:		
Coal and wood,		58,926 49
Tallow, oil, and gas,		6,247 65
Small stores, packing, &c.,		2,999 35
Repairs to works, viz.:		
Fairmount,	$3,495 76	
Schuylkill,	4,997 64	
Delaware,	3,499 76	
Belmont,	3,491 56	
Roxborough,	2,499 75	
		17,984 47
For keeping pipes, plugs, stops and fixtures in good order:		
Wages, First District,	$3,938 41	
" Second "	8,374 92	
" Third, "	10,438 30	
" Fourth, "	14,032 84	
" Germantown,	2,548 47	
" Manayunk,	1,600 19	
Repaving around fire-plugs,	1,699 25	
Plumbing,	158 39	
Shop,	783 75	
Oil,	41 40	
Packing,	59 00	
Hardware,	29 38	
Anti-friction metal,	42 00	
Salt hay,	7 26	
Boxing pipe,	47 50	
Plug valve,	1 60	
Tubing,	6 67	
Hauling,	189 00	
		43,998 33
Amount carried forward,		$242,330 63

Amount brought forward, - - -		$242,330 63
For keeping grounds, buildings, and reservoirs in good order:		
Wages, - - - - -	$58,814 35	
Lumber, - - - - -	5,317 42	
Hardware, - - - -	1,135 88	
Glass, paints, &c., - - -	1,264 93	
Tin and slate roofing, - - -	500 54	
Window frames, sash, &c., - -	563 25	
Brick, - - - - -	1,989 96	
Paving, - - - - -	3,030 00	
Gas fitting and Plumbing, - -	838 57	
Brickwork, - - - -	541 80	
Stone, - - - - -	300 00	
Lime, - - - - -	137 00	
Coal, - - - - -	216 75	
Plants, - - - - -	100 00	
Cement, - - - - -	816 35	
Repairs to railroad tracks, - -	136 02	
Sand, - - - - -	269 53	
Brass castings, &c., - - -	22 16	
Hauling, - - - - -	731 50	
Tubing, - - - - -	137 27	
Hire of scows, - - - -	386 75	
Towing, - - - - -	106 00	
Valves, - - - - -	28 73	
Iron castings, - - - -	16 60	
Hydrostatic pump, - - -	269 00	
Filling, - - - - -	445 00	
Carpet lining, - - - -	7 50	
Ranges and stoves, - - -	67 00	
Springs, - - - - -	2 00	
Repairs, - - - - -	38 35	
Thermometers, - - - -	12 00	
Regulating scales, - - -	7 50	
Salt hay, - - - - -	1 75	
Plastering, - - - -	25 00	
Repairs to Delaware wharf, - -	110 25	
Surveying instruments, - - -	25 00	
Fire bricks, - - - -	20 00	
Amounts carried forward, - -	$78,431 71	$242,330 63

Amounts brought forward, - -	$78,431 71	$242,330 63
Freight, - - - - -	39 62	
Gum packing, &c., - - -	407 64	
Painting and glazing, - - -	47 50	
Powder and fuse, - - - -	36 26	
Belting, - - - - -	55 72	
Police Uniforms, - - - -	55 00	
Rope, - - - - -	4 50	
Papering, - - - - -	41 34	
Ventilators, - - - -	120 00	
Lubricators, - - - -	90 00	
Coca matting, - - - -	16 50	
Bolts and nuts, - - - -	5 29	
Toll, - - - - -	3 70	
Carpenter work, - - - -	10 75	
Sundries, - - - -	84 44	
		79,449 97
For the purchase of iron pipes, fire-plugs, stop-cocks, lead, brass, and iron castings, &c.:		
Iron pipe, - - - -	$178,896 16	
Iron castings, - - - -	19,138 06	
Brass castings, - - - -	4,035 47	
Iron and steel, - - - -	2,411 32	
Lumber, - - - - -	5,231 39	
Hardware, - - - -	2,295 03	
Bolts and nuts, - - - -	1,780 99	
Coal, - - - - -	1,061 50	
Galvanized spindles, - - -	337 87	
Plug valves, - - - -	2,252 90	
Lead, - - - - -	1,352 14	
Expansion joint, - - - -	450 00	
Water meters, - - - -	392 75	
Powder and fuse, - - - -	351 38	
Patterns, - - - - -	122 81	
Gum valves, packing, &c., - -	705 90	
Wood, - - - - -	160 00	
Iron varnish, &c., - - -	161 10	
Oils, - - - - -	436 13	
Rent of offices, &c., - - -	410 00	
Amounts carried forward, - -	$221,982 90	$321,780 60

Amounts brought forward,	$221,982 90	$321,780 60
Coke,	143 00	
White lead, turpentine, &c.,	171 88	
Wharfage,	326 30	
Indicators and gauges,	953 15	
Tubing,	335 21	
Gasket,	1,376 37	
Shovels,	121 96	
Drawing boards,	134 95	
Mathematical instruments,	476 15	
Tool houses,	972 90	
Sundry bills,	183 72	
Wicks,	12 51	
Steel restorative,	50 00	
Maps,	53 20	
Sheet copper and brass,	27 30	
Ice,	98 35	
Repairs,	30 82	
Pug mill,	100 00	
Belting,	15 27	
Boiler iron,	56 16	
Brass oil cans,	14 25	
Taper taps,	35 50	
Badges,	18 00	
Siding charges,	44 50	
Office furniture,	83 00	
Drawing paper,	45 10	
Brass thermometer cases,	22 20	
Alcohol,	12 56	
Machine work,	88 62	
Stop-cocks, springs, &c.,	66 70	
Pulley blocks,	3 75	
Copper pipe,	12 75	
Packing,	11 45	
Tolls,	6 77	
Tin work,	4 15	
Gum gasket,	6 40	
Drill,	9 50	
Printing,	3 50	
Strainer,	3 00	
Amounts carried forward,	$228,113 80	$321,780 60

Amounts brought forward, - -	$228,113 80	$321,780 60
Sledge handles, - - - -	7 00	
Scoops, - - - - -	3 00	
Hauling, - - - - -	1 20	
		228,125 00
For labor in laying pipes, setting and fitting fire-plugs, stop-cocks, &c.:		
Wages, First District, - - -	4,557 66	
" Second District, - - -	15,107 93	
" Third District, - - -	17,600 66	
" Fourth District, - - -	20,477 15	
" Germantown District, - -	11,810 20	
" Manayunk District, - -	7,023 72	
" Shop, - - - -	20,534 06	
Hauling, - - - - -	8,653 59	
Measuring pipe, - - - -	7,990 69	
Pipe plans, - - - -	1,158 10	
Inspecting pipe, - - - -	2,011 02	
Boxing pipe, - - - -	208 00	
Inspecting boilers, - - -	391 73	
Dressing and repairing tools, - -	181 73	
Blasting rock, - - - -	423 25	
Damages, - - - - -	200 00	
Grade stakes, - - - -	618 26	
Repairs, - - - - -	192 20	
Paving, - - - - -	613 14	
Wharfage, - - - - -	26 00	
Iron work, - - - -	37 20	
Filling, - - - - -	78 25	
Brickwork, - - - -	25 00	
Tolls, - - - - -	12 19	
Sundries, - - - - -	67 43	
		119,999 16
For drilling and making new attachments:		
Wages, First District, - - -	2,059 00	
" Second District, - - -	3,481 75	
" Third District, - - -	2,392 00	
" Fourth District, - - -	2,932 62	
" Germantown District, - -	1,257 74	
" Manayunk District, - -	876 34	
		12,999 45
Amount carried forward, - - -		$682,904 21

Amount brought forward, -	$682,904 21
For carriage hire and keep of horse for Chief Engineer, - - - - - -	649 50
For the care and maintenance of Chestnut Hill Works, - - - - - -	4,953 18
For expenses of the public fountains of the Philadelphia Fountain Society, - -	1,000 00
	$689,506 89

SPECIAL APPROPRIATIONS.

(Appropriation approved November 4, 1873.)

For dredging dock at foot of Otis Street, - - -	269 75

(Appropriation approved June 24, 1873.)

To refund certain twice paid and over-paid water rent and pipe laying bills, - - - - - -	10 00

(Appropriation approved June 20, 1870.)

Assisting to keep up the supply of water, - - -	267 82

(Appropriation approved June 12, 1871.)

To refund certain twice paid and over-paid water rents and pipe laying bills, - - - - - -	45 00

(Appropriation approved October 23, 1871.)

For making surveys for an additional supply of water to Frankford, - - - - - -	73 62

(Appropriation approved September 18, 1874.)

To refund certain twice paid and over-paid water rents and pipe-laying bills, - - - - - -	352 73
Amount carried forward, - - - -	$690,525 81

EXTENSIONS OF WORKS.

AMOUNTS PAID FROM WATER LOANS.

(Appropriation approved April 3, 1868.)

Item 2.

For purchasing and laying a 20-inch main to connect the Roxborough Water Works with Germantown Works:		
Lumber, - - - - - -	$5 47	
Pay roll, - - - - - -	165 50	
		170 97

Item 4.

For purchasing and laying a 30-inch ascending and a 20-inch descending main for the Twenty-fourth Ward Water Works:		
Bolts and nuts, - - - - -	$11 25	
Valves, - - - - - -	10 65	
Sundries, - - - - - -	9 60	
		31 50

(Appropriation approved February 13, 1869.)

Item 2.

For boilers and connections at the Belmont Works:		
Valves and cocks, - - - -	$19 73	
Brass castings, - - - - -	17 08	
Sundries, - - - - - -	2 42	
		39 23

Item 10.

For incidentals, - - - - - - -	2 24

(Appropriation approved April 7, 1870.)

Item 1.

For Engines and foundations at the Schuylkill Water Works in place of old engine No. 3:		
Wages, - - - - - -	$303 50	
Wages (city shop), - - - -	242 62	
Plug valves, &c., - - - - -	622 63	
Amounts carried forward, - -	$1,168 75	$243 94

Amounts brought forward, - -	$1,168 75	$243 94
Cocks and gauges, - - -	255 45	
Machine and engine work, - -	11,370 27	
Felting, - - - - -	657 55	
Hydraulic jack, - - - -	22 10	
Lubricators, - - - -	63 00	
Tubing, - - - - -	43 11	
Sheet brass, - - - -	2 41	
Sundries, - - - - -	20 89	
		13,603 53

Item 3.

For ascending main for Belmont Works:

Wages, - - - - -	$947 16	
Tubing, - - - - -	5 28	
Cast iron bonnet, - - - -	14 88	
Sundries, - - - - -	7 55	
		974 87

Item 4.

For descending main from the Belmont Reservoir and for crossing the Schuylkill River:

Wages, - - - - -	$2,431 25	
Wages (shop), - - - -	355 49	
Sundries, - - - - -	22 91	
		2,809 65

Item 5.

For pumping main from the Delaware Works to the Reservoir:

Sundries, - - - - - - -		3 25

Item 10.

For incidentals:

Lumber, - - - - -	$129 40	
Reservoir indicator, - - -	225 00	
Labor and materials, - - -	344 75	
Door frames, &c., - - - -	216 72	
Gum packing, &c., - - -	14 50	
Sundries, - - - - -	95 11	
		1,025 48
Amount carried forward, - - - -		$18,660 72

Amount brought forward, - - - -		$18,660 72

(Appropriation approved July 7, 1870.)

Item 1.

For new engine and pump with foundations and inlet thereto, Roxborough:		
Tubing, - - - - -	$149 57	
Flanges, valves, &c., - - -	277 90	
		427 49

Item 2.

For new engine and boiler house, Roxborough:		
Wages, - - - - -	$3,938 24	
Boilers, - - - - -	3,250 00	
Roofing, - - - - -	307 87	
Iron Castings, - - - -	318 36	
Brick, - - - - -	204 62	
Hardware, - - - -	289 90	
Flue and steam pipe, - - -	801 13	
Iron castings, - - - -	286 36	
Felting boilers, - - - -	302 60	
Painting, - - - - -	160 00	
Plastering, - - - -	200 00	
Plug valves, - - - -	63 00	
Coupon tickets, - - - -	10 00	
Stone, - - - - -	34 50	
Iron beams, - - - -	60 30	
Freight, - - - - -	28 80	
Powder and fuse, - - - -	14 55	
Tubing, - - - - -	10 90	
Lime, - - - - -	57 01	
Steam trap, - - - -	25 00	
Fire brick, - - - -	58 05	
Indicator and gauge, - - -	31 50	
Sundries, - - - -	13 75	
Glass, &c., - - - - -	4 21	
Bolts and nuts, - - - -	7 12	
Dressing tools, - - - -	2 00	
		10,479 77
Amount carried forward, - - - -		$29,567 98

Amount brought forward, - - - -		$29,567 98

Item 3.

For necessary repairs to the Reservoir, Roxborough:

Wages, - - - - -	$420 99	
Lumber, - - - - -	1,173 77	
		1,594 76

Item 5.

Incidentals:

Scale, - - - - -	$210 00	
Stationery, - - - -	7 00	
Sundries, - - - - -	34 45	
		251 45

(Appropriation approved December 5, 1870.)

For a sixteen-inch main from Mount Airy Reservoir to Tulpehocken street, and a twelve-inch main from Tulpehocken street to Wistar street:

Wages, - - - - -	$238 00	
Hauling, - - - - -	150 00	
Clay, - - - - -	200 00	
		588 00

(Appropriation approved November 6, 1871.)

Item 1.

For new engine No. 3 at the Schuylkill Works:

Wages, - - - - - - - -	117 00

Item 2.

For new engine No. 3 at the Belmont Water Works:

Reservation on engine contract, - -	$4,800 00	
Machine work, - - - -	287 17	
Gauges and indicators, - - -	270 00	
Coal car, - - - - -	325 00	
Felting, - - - - -	281 23	
Strainer, - - - - -	10 75	
Sundries, - - - - -	3 50	
		5,977 65
Amount carried forward, - - - -		$38,096 84

Amount brought forward, - - -		$38,096 84
Item 3.		
For rebuilding Fairmount Dam:		
Wages, - - - - -	$10,136 93	
Wages (shop), - - - -	465 25	
Iron castings, - - - -	961 91	
Gas pipe railing, - - - -	160 00	
Hardware, - - - -	109 05	
Stone, - - - - -	788 04	
Cement, - - - - -	111 00	
Hire of Scow, - - - -	224 00	
Towing, - - - - -	21 00	
Lime, - - - - -	65 74	
Bolts and nuts, - - - -	34 17	
Paints and oils, - - - -	35 45	
Lumber, - - - - -	90 10	
Tubing, - - - - -	3 56	
Coal, - - - - -	7 00	
		13,213 20
Item 5.		
For the completion of the Belmont Reservoir:		
Wages, - - - - -	$4,250 69	
Lumber, - - - - -	66 36	
Belting, - - - - -	3 24	
		4,320 29
Item 6.		
For completion of Delaware Water Works Reservoir:		
Pay roll, - - - - -		10 50
Item 7.		
For construction of large Storage Reservoir in East Fairmount Park:		
McGlue contract, - - - -	$320,373 20	
Wages, - - - - -	92,784 95	
Lumber, - - - - -	1,168 38	
Stone, - - - - -	9,584 14	
Cement, - - - - -	5,065 97	
Iron pipes, - - - -	4,282 97	
Amounts carried forward, - -	$433,259 61	$55,640 83

Amounts brought forward, - -	$133,259 61	$55,640 83
Hardware, - - - -	434 50	
Iron castings, - - - -	597 57	
Gum packing, &c., - - -	307 37	
Surveying instruments, - - -	106 35	
Tubing, - - - - -	36 92	
Cocks and valves, - - - -	47 93	
Bolts and nuts, - - - -	52 33	
Cleaning wells, - - - -	75 00	
Park tickets, - - - -	70 00	
Tinning, - - - - -	14 10	
Brick, - - - - -	147 00	
Sundries, - - - - -	24 50	
Coal, - - - - -	7 00	
Scotch tubes, - - - -	5 85	
Repairs, - - - - -	7 30	
Lamp wicks, - - - -	6 90	
Paints, - - - - -	1 60	
		435,201 83

Item 8.

For mains to connect large Storage Reservoir, East Fairmount Park, with Engines at Schuylkill Works:	
Wages, - - - - -	1,238 56

Item 9.

Incidentals:		
Stone, - - - - -	$981 25	
Transit, level, &c., - - -	425 00	
Horse keep for Assistant Engineer, -	240 00	
Hardware, - - - -	177 44	
Drawing paper and instruments, - -	301 85	
Carriage hire, - - - -	108 00	
Sundries, - - - - -	260 63	
Stationery, - . - -	91 00	
Park tickets, - - - -	70 00	
Tolls, - - - - -	17 00	
Repairs, - - - - -	14 45	
Coal, - - - - -	29 50	
Car fares, - - - - -	28 00	
Amounts carried forward, - -	$2,744 12	$492,081 22

Amounts brought forward, - -	$2,744 12	$492,081 22
Cleaning wells, - - - -	30 00	
Printing, - - - - -	65 37	
Thermometer, - - - -	2 75	
		2,842 24

(Appropriation approved May 19, 1873.)

Item 1.

For Engine House and Stack at Harrison's Landing:

Wages, - - - - - - -	71 50

Item 4.

For Reservoir:

Wages, - - - - -	$1,741 25	
Testing instruments, - - -	93 30	
		1,834 55

Item 8.

For ten-inch and twelve-inch mains, with stop-cocks, etc., on Ridge Avenue, from Green Lane to Hermit Lane:

Wages, - - - - -	$1,294 13	
Reservation on pipe contract, - -	979 87	
Lead, - - - - -	343 34	
Paving, - - - - -	428 19	
Tool wagon, - - - -	230 00	
Inspecting mains, - - - -	92 00	
Powder and fuse, - - - -	94 78	
Sharpening tools, - - - -	29 00	
Sundries, - - - - -	2 30	
		3,493 61

Item 9.

For twenty-inch main on Twenty-second Street, from Jefferson to Ridge Avenue, and twelve-inch main on Ridge Avenue, from Twenty-second to Thirty-third Street, with stop-cocks, branches, &c.:

Wages, - - - - -	$5,235 01	
Pipe, - - - - -	2,143 22	
Amounts carried forward, - -	$7,378 23	$500,323 12

Amounts brought forward, - -	$7,378 23	$500,323 12
Hauling, - - - - - -	268 62	
Paving, - - - - - -	420 57	
		8,067 42

Item 10.

For twenty-inch main on Washington Avenue, from Twenty-first to Twenty-second Street, on Twenty-second Street, from Washington Avenue to Federal Street, and on Federal Street to Gray's Ferry Road:

Wages, - - - - - -	$4,149 22	
Pipe, - - - - - -	2,428 05	
Paving, - - - - - -	1,411 41	
Inspecting mains, - - - - -	65 85	
Repairs to culvert, - - -	49 12	
		8,103 65

Item 11.

For twenty-inch main on Broad Street, from Washington Avenue to Snyder Avenue, with stop-cocks, &c.:

Pipe, - - - - - -	$2,197 19	
Wages, - - - - - -	1,167 75	
		3,364 94

Item 12.

For sixteen-inch main on Washington Avenue, from Fifth Street to Moyamensing Avenue, and on Moyamensing Avenue, from Washington Avenue to Snyder Avenue, with stop-cocks, &c.:

Wages, - - - - - -	$5,169 63	
Pipe, - - - - - -	4,571 86	
Lead, - - - - - -	1,863 58	
Hauling, - - - - - -	727 75	
Tool wagon, - - - -	230 00	
Inspecting mains, - - - -	277 50	
Paving, - - - - - -	769 23	
Surveying instruments, - - -	61 25	
Lumber, - - - - - -	70 09	
		13,740 89
Amount carried forward, - - -		$533,600 02

Amount brought forward, - - -		$533,600 02
Item 13.		
For incidentals:		
Transit, level, &c., - - -	$390 00	
Drawing and mathematical instruments,	164 75	
Keep of horse for Assistant Engineer, -	240 00	
Iron pipe, - - - - -	22 73	
Carriage hire, - - - -	56 00	
Tracing paper, - - - -	19 35	
Car fares, tools, and sundries, - -	82 17	
Hardware, - - - -	1 25	
		976 25
Extension of Works, - - - -		$534,576 27

RECAPITULATION.

Expended from General Appropriation, - -	$689,506 89
" " Special " - -	1,018 92
" " Loans, - - - - -	534,576 27
Total expenditures for 1874, - -	$1,225,102 08

OPERATIONS

OF THE

SHOP,

918 CHERRY STREET.

Statement of the Operations of Shop from January 1, 1874, *to December* 31, 1874.

DR.

To stock on hand January 1, 1874,			$8,523 34
582,250 lbs.	cast-iron castings,		17,919 54
43,866¼ "	wrought-iron,		1,761 67
3,109¼ "	steel,		643 55
18,839¼ "	brass castings,		3,965 43
16,065 "	lead,		1,285 20
25 "	listing,		3 75
350 "	gasket,		59 50
20 "	tallow,		3 60
957	gum valves,		1,528 44
52,993	feet lumber, "assorted,"		2,633 48
123	tons coal,		861 00
901	galvanized spindles,		337 88
	Bolts, nuts, and washers,		1,875 65
	Hardware for shop, districts, and works,		1,494 65
	Wrought-iron tubing, &c.,		13 62
	Paints, oils, &c.,		564 04
	Files bought and re-cut,		419 09
	Wages paid hands,		22,381 17
	Sundries, incidentals,		129 39
			$66,403 99

CR.

By 15	stop-cocks,	3	inch, at	$25 00,	$375 00	
104	"	4	" at	25 00,	2,288 00	
560	"	6	" at	22 00,	12,320 00	
18	"	8	" at	50 00,	900 00	
12	"	10	" at	85 00,	1,020 00	
12	"	12	" at	120 00,	1,440 00	
6	"	16	" at	200 00,	1,200 00	
	Amounts carried forward,				$19,543 00	$66,403 99

Amounts brought forward,		$19,543 00	$66,403 99	
3	stop-cocks 20 inch, at	$225 00,	675 00	
1	" 23 " at	380 00,	380 00	
3	" 30 " at	520 00,	1,560 00	
2	" 36 " at	750 00,	1,500 00	
1102	" boxes, at	4 00,	4,408 00	
458	fire plugs, at	36 00,	16,488 00	
682	" cases, at	18 00	12,276 00	
635	frames and covers, at	8 00,	5,080 00	
4,400½	" ferrules, at	50,	2,200 00	
100⅝	" " at	50,	50 00	
100¾	" " at	50,	50 00	
64	1 inch frame ferrules, at	50,	32 00	
Repairs for First District,			3,229 01	
"	Second "		5,199 75	
"	Third "		3,618 45	
"	Fourth "		5,389 20	
"	Germantown District,		1,528 14	
"	Manayunk "		1,235 67	
"	Fairmount Works,		3,247 80	
"	Delaware "		686 31	
"	Schuylkill "		1,416 29	
"	Belmont "		2,177 99	
"	Roxborough "		794 82	
"	Chestnut Hill,		282 80	
"	Fairmount Dam,		461 62	
"	30-inch main, Belmont,		353 61	
"	Simpson Engine,		285 33	
"	Storage reservoir,		789 89	
"	Buildings and grounds,		1,621 97	
"	Fifth and Chestnut, office,		1,703 79	
"	Water metres,		49 46	
"	New Engine No. 3, Schuylkill W'ks,		6 69	
"	Item 10, First District,		49 07	
Amounts carried forward,			$98,269 66	$66,403 99

	Amounts brought forward,						$98,269 66	$66,403 99
Repairs for Item 2, Roxborough,							145 57	
"	Pattern account,						866 53	
"	Fixed stock,						1,011 35	
"	Item 4, Frankford,						13 30	
"	Mt. Airy Reservoir,						215 97	
"	Iron railing, Fairmount,						3 55	
Stock on hand, viz.:								
4	Square thread screws,	3-inch			at	$5 00	20 00	
11	" " "	4	"		at	5 00	55 00	
13	" " "	6	"		at	5 00	65 00	
2	" " "	8	"		at	6 50	13 00	
3	" " "	10	"		at	8 00	24 00	
3	" " "	12	"		at	10 00	30 00	
12	" " "	16	"		at	12 00	144 00	
6	" " "	20	"		at	14 00	84 00	
6	socket screws,	4	"		at	5 00	30 00	
9	"	6	"		at	5 00	45 00	
8	"	8	"		at	6 00	48 00	
21	"	10	"		at	7 00	147 00	
21	"	12	"		at	8 00	168 00	
2	sq. thread standard,	16	"		at	14 00	28 00	
2	" "	20	"		at	16 00	32 00	
2	" "	30	"		at	20 00	40 00	
2	" "	36	"		at	25 00	50 00	
87	spindles,	4	"		at	5 00	435 00	
91	"	6	"		at	5 00	455 00	
37	"	8	"		at	5 00	185 00	
21	"	10	"		at	8 00	168 00	
12	"	12	"		at	10 00	120 00	
12	sharp thread socket screws,				at	2 50	30 00	
352	lbs. bolts & nuts assorted,				at	13	45 76	
1,780	" cast steel,						356 00	
1,800	" hammered iron,				at	06	108 00	
	Amounts carried forward,						$103,451 69	$66,403 99

Amounts brought forward,			$103,451 69	$66,403 99
25,065 lbs. wrought iron,	at	04½	1,127 93	
2,900 " forgings,	at	15	435 00	
30,975 " cast iron castings,	at	03	929 25	
1,110 " finished brass,	at	35	388 50	
2,011 " unfinished "	at	25	502 75	
2,810 feet lumber, "assorted,"	at	08½	238 80	
325 wooden plugs,	at	50	162 50	
3 kegs nails,	at	4 50	13 50	
79 assorted handles,			15 00	
135 ⅞ inch eye bolts,	at	45	60 75	
300 ⅝ " gland bolts,	at	25	75 00	
170 ¾ " "	at	27	45 90	
24 ⅞ " "	at	30	7 20	
16 steel caulking irons,	at	1 20	19 20	
35 pipe cutters,	at	2 25	78 75	
24 caulking hammers,	at	2 25	54 00	
45 hand chisels,	at	1 00	45 00	
102 lbs. leather,	at	45	45 90	
193 " heavy picks,	at	1 33	256 69	
Paints, oils, &c.,			98 00	
5 lead pots 12 in. by 14 in.,	at	7 00	35 00	
2 " 8 " 11 "	at	6 00	12 00	
180 gum valves,			253 05	
To balance nominal profit of shop,				$41,947 37
			$108,351 36	$108,351 36

Stop-cocks, Stop-cock Boxes, Frames, and Covers, Fire-plugs, Cases, Lead, and Gasket, delivered from No. 918 Cherry street, during 1874.

	3-inch stop-cocks.	4-inch stop-cocks.	6-inch stop-cocks.	8-inch stop-cocks.	10-inch stop-cocks.	12-inch stop-cocks.	16-inch stop-cocks.	20-inch stop-cocks.	23-inch stop-cocks.	30-inch stop-cocks.	Frames and Covers.	Fire-plugs.	Cases.	Stop boxes.	Pounds lead.	Pounds gasket.
First District	.....	19	73	.....	.....	2	.....	.....	.....	.....	102	57	131	177	16,464	1,530
Second District	2	14	60	15	9	8	.....	.....	.....	.....	115	99	153	211	39,372	1,605
Third District	.....	5	163	.....	.....	1	.....	.....	.....	.....	179	78	98	251	40,719	2,430
Fourth District	.....	25	108	1	6	3	1	1	.....	.....	173	88	186	262	28,426	1,585
Germantown	6	20	48	2	.....	.....	1	1	.....	.....	61	49	46	100	8,821	625
Manayunk	.....	4	33	.....	.....	.....	.....	.....	.....	.....	45	50	37	50	16,419	550
Item 10, Loan of May 19, 1873, First District	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	5,880	170
Item 7, Storage Reservoir	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	4	3,775	.....
Schuylkill Works	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	4	.....	.....
Fifth and Chestnut	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	2	2	.....	.....	.....
Park Commission	.....	8	1	.....	.....	.....	.....	.....	.....	.....	9	.....	.....	9	.....	.....
Fairmount Reservoir	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	.....	294	125
Totals	12	95	486	18	16	14	3	4	1	1	692	423	653	1,068	160,170	8,620

Stop-cocks, Fire-plugs and Casings, Stop-cock Boxes, Frames, Covers, and Ferrules, made and fitted up at the City shop from the year 1867 *to* 1874, *inclusive.*

	3-inch stop-cocks.	4-inch stop-cocks.	6-inch stop cocks.	8-inch stop-cocks.	10-inch stop-cocks.	12-inch stop-cocks.	16-inch stop-cocks.	20-inch stop-cocks.	23-inch stop-cocks.	30-inch stop-cocks.	36-inch stop-cocks.	Total stop-cocks.	New fire plugs.	Fire-plugs cases.	Stop boxes.	Frames and covers.	½-inch ferrules.	⅝-inch ferrules.	¾-inch ferrules.	1 inch ferrules.	Total ferrules.
1867...	.....	34	108	1	4	5	5	.....	.....	.....	.....	157	148	227	433	164	1,770	460	137	117	2,484
1868...	1	51	94	2	4	5	.....	.....	4	2	1	164	143	222	492	165	2,501	257	84	24	2,866
1869...	8	71	175	4	6	8	2	4	2	2	4	286	202	291	600	279	3,700	431	50	.....	4,181
1870...	7	93	208	4	4	10	5	.....	.....	6	6	343	223	307	600	317	4,200	450	100	100	4,850
1871...	.....	113	218	9	13	17	7	6	2	6	4	395	176	254	641	459	5,025	100	25	.....	5,150
1872...	15	120	226	8	15	6	.....	.....	.....	4	3	397	226	324	620	409	5,200	100	50	36	5,386
1873...	12	108	406	.....	7	29	8	10	.....	.....	17	597	333	423	920	692	4,400	170	104	31	4,705
1874...	15	104	560	18	12	12	6	3	1	3	2	736	423	653	1,102	635	4,400	100	100	64	4,664
Totals.	58	694	1,995	46	65	92	33	23	9	23	37	3,075	1,874	2,701	5,408	3,120	31,196	2,068	650	372	34,286

Number of valves raised in the different districts during the year 1874.

Districts.	3-inch.	4-inch.	6 inch.	8-inch.	10-inch.	12-inch.	16-inch.	20-inch.	30-inch.	Total.
First District		6	18		1					25
Second District	12	6	33	6	4	1	3			65
Third District		19	22		1					42
Fourth District		1	38			2				41
Germantown	1									1
Manayunk										
Totals, 1874	13	32	111	6	6	3	3			174
Totals, 1873	5	16	51		3	1	6	2	2	86
Total for two years	18	48	162	6	9	4	9	2	2	260

OPERATIONS

OF

THE WORKS

FOR

1874.

6

CHESTNUT HILL WORKS.

Expenses for 1874.

Wages,	$2,311 98
Coal,	1,619 50
Hardware,	56 54
Packing,	38 45
Oil, &c.,	85 37
Valves, &c.,	14 88
Freight,	10 81
Bricks,	106 25
Thermometer,	2 70
Tin pump,	15 33
Acid,	1 30
Brass Castings,	15 97
Tubing,	11 96
Hauling,	7 00
Car fares, &c.,	18 40
Building stack,	181 25
Grindstone,	17 25
Blacksmithing,	4 50
Bricklaying,	8 75
Cement,	4 50
Painting,	8 92
Lime,	32 90
Lumber,	294 71
Sundry bills,	83 96
	$4,953 18

Operations of the Worthington Pump, at Fairmount, during the months of June, July, August, and September, 1874.

MONTHS.	Running time.	Number of strokes made during the month.	Total number of gallons of water pumped during the month.	Average gallons per day.	Cubic feet of water pumped per month.	Coal consumed.				Tallow consumed.	Oil consumed.
	Days.					Tons.	Cwts.	Qrs.	Lbs.	Lbs.	Qts.
June	9	236,212	24,566,048	2,729,561	3,284,231	28	.....	.....	.....	8	2
July	17	436,470	45,392,880	2,670,169	6,068,567	56	.....	.....	.....	12	4
August	16	452,987	47,110,648	2,944,415	6,298,215	59	10	.....	.....	10	3
September	16	479,950	49,914,800	3,119,675	6,673,102	65	.....	.....	.....	10	3
Totals	58	1,605,619	166,984,376	2,865,955	22,324,115	208	10	.....	.....	40	12

This pump is used in connection with Fairmount Works, and the water pumped by it is included in the operations of these works.

FAIRMOUNT WORKS.

Supplies purchased during 1874.

Gas for lighting works,	$1,151 84
146½ gallons of oil for lighting works,	118 50
240 tons of coal for warming works,	1,698 75
328 gallons of lubricating oil,	402 97
515 pounds of tallow,	79 92
Packing and small stores,	975 20
Repairs,	3,495 76
	$7,922 94

Running Expenses for 1874.

Salaries of engineers, &c.,	$9,250 00
Gas for lighting works,	1,151 84
Oil for lighting works, 90 gallons,	72 90
123 tons of coal for warming works, average price $7\frac{08}{100}$ per ton,	870 84
$333\frac{1}{4}$ gallons lubricating oil, (64 gals. castor), average price about $1\frac{23}{100}$,	409 89
397 pounds of tallow @ 15½ cents,	61 54
Packing and small stores,	975 20
Repairs,	3,495 76
$208\frac{1}{2}$ tons of coal for Worthington pump @ $4\frac{88}{100}$ per ton,	1,017 48
	$17,305 45

Cost of raising water into reservoir, per million gallons,	$\$2.28\frac{24}{100}$
Cost of raising water, per million gallons, one foot high,	$.02\frac{28}{100}$

Operations of the Fairmount Works for the year 1874.

MONTHS.	Running time.	Number of strokes during the month.	Total number of gallons pumped during the month.	Average gallons per day.	Cubic feet of water pumped per month.	Coal consumed in heating mill house.				Tallow consumed.	Oil consumed.	Rain fall during the month.	Mean temperature.
	Days.					Tons.	Cwts.	Qrs.	Pounds.	Pounds.	Quarts.	Inches.	
January	31	2,432,550	719,266,037	23,202,130	96,158,561	20				12	94	4.218	31.48
February	28	2,304,938	681,640,506	24,344,304	91,128,410	20				12	98	2.823	27.89
March	31	2,472,880	701,423,932	22,626,578	93,773,253	20					84	1.595	34.35
April	30	1,784,000	583,623,456	19,454,115	78,024,526	10				20	112	7.509	38.33
May	31	2,074,700	703,300,800	22,687,123	94,024,171	10				17	156	2.697	53.77
June	30	2,278,700	722,911,484	24,915,918	96,645,920					19	142	2.664	68.21
July	31	2,188,210	726,538,304	28,126,812	97,130,789						141	2.759	70.88
August	31	1,763,900	587,183,424	20,461,099	78,500,458					35	135	6.531	65.62
September	30	1,322,600	468,702,044	17,284,528	62,660,701					17	96	3.987	70.12
October	31	1,534,961	568,863,968	18,350,451	76,051,322	10				12	100	1.650	58.62
November	30	1,315,494	484,426,905	16,147,564	64,762,955	15				12	68	2.229	45.02
December	31	1,787,523	634,142,562	20,456,212	84,778,417	18				241	107	2.249	36 01
Totals	365	23,259,956	7,582,023,422	21,504,736	1,013,639,483	123				397	1,333	40.911	*50.26

The tallow and oil used by the Worthington Pump is included in the account of tallow and oil used at these works.

* Yearly average.

SCHUYLKILL WORKS.

Supplies purchased during 1874.

Gas for lighting works,	$573 16
96 gallons of oil for lighting works,	79 50
$1432\frac{18}{20}$ tons of coal,	6,999 25
252 gallons of oil,	448 28
3,808 pounds of tallow,	623 53
Packing and small stores,	501 15
Repairs,	4,997 64
	$14,222 51

Running Expenses for 1874.

Salaries of engineers, firemen, &c.,	$13,050 00
Gas for lighting works,	573 16
110 gallons of oil for lighting works,	91 30
$2008\frac{4}{20}$ tons of coal consumed, at average price of about $4\frac{88}{100}$ per ton,	9,800 02
$208\frac{1}{2}$ gallons of oil consumed, at average price about $1\frac{78}{100}$,	371 13
Packing and small stores,	501 15
Repairs,	4,997 64
2,818 pounds of tallow consumed, at average price about $16\frac{1}{2}$ cents,	464 97
	$29,849 37

Cost of raising water into reservoir per million gallons,	$19.42\frac{68}{100}$
Cost of raising water per million gallons one foot high,	$.16\frac{97}{100}$

Operations of the Schuylkill Works for the year 1874.

MONTHS.	Running time.	Number of strokes during the month.	Total number of gallons pumped during the month.	Average gallons per day.	Cubic feet of water pumped per month.	Coal consumed.*				Tallow consumed.	Oil consumed.
	Days.					Tons.	Cwts.	Qrs.	Pounds.	Pounds.	Quarts.
January	10	48,079	24,281,920	2,428,192	3,246,246	49	06	.....	.....	42	4
February	3	6,936	3,537,360	1,179,120	472,909	21	05	.....	.....	48	12
March	.....	.....	.....	.....	.....	16	11	.....	.....	8	2
April	15	138,574	67,150,590	4,476,706	8,977,351	101	03	.....	.....	125	34
May	26	302,118	145,069,980	5,579,615	19,394,382	208	11	.....	.....	156	44
June	22	334,599	161,114,540	7,323,388	21,539,377	210	01	.....	.....	274	118
July	31	422,936	211,404,010	6,819,484	28,262,568	217	12	.....	.....	332	125
August	31	563,103	276,802,380	8,929,109	37,005,666	270	11	.....	.....	646	144
September	26	581,187	277,767,130	10,683,351	37,134,643	288	09	.....	.....	376	154
October	28	369,658	178,161,420	6,362,908	23,818,372	193	06	.....	.....	381	109
November	23	363,783	182,100,690	7,917,421	24,345,012	178	17	.....	.....	350	80
December	9	25,320	9,115,200	1,012,800	1,218,609	44	02	.....	.....	80	8
Totals	224	3,156,293	1,536,505,220	5,226,008	205,415,135	1,799	14	.....	.....	2,818	834

* The amount of coal given is the total amount consumed for raising steam, banking fires, and without any deductions whatever for ashes or clinkers. These works are not run when water can be supplied from Fairmount.

DELAWARE WORKS.

Supplies purchased during 1874.

Gas for lighting works, - - -	$512 67
1,881 $\frac{7}{20}$ tons of coal, - - -	9,388 00
68 cords of wood, - - - -	612 00
249 $\frac{1}{2}$ gallons of oil (lubricating), - -	264 63
368 pounds of tallow, - - -	60 88
Packing and small stores, - - -	440 00
Repairs, - - - - -	3,499 76
	$14,777 94

Running Expenses for 1874.

Salaries of engineers, firemen, &c., - -	$10,625 00
Gas for lighting works, - - -	512 67
2,206 $\frac{8}{20}$ tons of coal consumed, at an average price of about $5.04 $\frac{1}{2}$, - - -	11,131 29
57 $\frac{1}{2}$ gallons of oil consumed, at an average price of about $1 $\frac{06}{100}$, - - -	60 95
26 pounds of tallow consumed, at an average price of about 16 $\frac{2}{3}$ cents, - - -	4 30
Packing and small stores, - - -	440 00
Wood, - - - - -	612 00
Repairs, - - - - -	3,499 76
	$26,885 97

Cost of raising water into reservoir per million gallons, - - - - -	16.93 $\frac{2}{100}$
Cost of raising water per million gallons one foot high, - - - - -	.14 $\frac{35}{100}$

Operations of the Delaware Works for the year 1874.

MONTHS.	Running time.	Number of strokes during the month.	Total number of gallons pumped during the month.	Average gallons per day.	Cubic feet of water pumped per month.	Coal consumed.*				Tallow consumed.	Oil consumed.
	Days.					Tons.	Cwts.	Qrs.	Pounds.	Pounds.	Quarts.
January	24	218,500	76,912,000	3,204,667	10,282,353	113	5	1	18	.....	14
February	21	196,629	69,213,408	3,295,877	9,253,129	92	6	.....	23	.....	13
March	20	225,270	49,295,040	2,464,752	6,590,246	103	13	3	22	.....	11
April	22	256,821	90,400,992	4,109,136	12,085,694	114	15	3	6	.....	15
May	24	500,877	134,418,336	5,600,764	17,970,366	185	10	3	9	.....	20
June	29	680,444	172,110,040	5,934,829	23,009,363	237	12	.....	8	.....	23
July	30	809,334	200,078,400	6,669,280	26,748,449	269	5	2	24	.....	29
August	29	773,905	190,283,296	6,561,493	25,438,956	255	14	3	6	.....	24
September	29	754,721	187,726,201	6,473,317	25,097,085	270	4	3	8	.....	22
October	28	595,267	160,548,924	5,733,890	21,463,760	222	13	.....	6	.....	21
November	24	451,593	125,042,720	5,210,113	16,716,941	184	12	2	8	13	19
December	24	341,352	102,489,408	4,270,392	13,701,792	156	13	.....	6	13	19
Totals	304	5,804,713	1,558,518,765	4,960,709	208,358,134	2,206	8	1	4	26	230

* The amount of coal given is the total amount consumed for raising steam, banking fires, and without any deductions whatever for ashes or clinker.

BELMONT WORKS.

Supplies purchased during 1874.

Oil for lighting works, 575 gallons,	$477 72
Oil, lubricating, 773 gallons,	888 75
5,563 $\frac{9}{20}$ tons of coal,	27,260 36
424 pounds of tallow,	65 36
Packing and small stores,	706 55
Repairs,	3,491 56
	$32,890 30

Running Expenses.

Salaries of engineers, firemen, &c.,	$10,250 00
Oil for lighting works, 463 gallons,	384 62
5,710 $\frac{16}{20}$ tons of coal consumed, at an average price of about $4.90,	27,982 92
491 gallons of oil (309 gallons lubricating and 182 gallons cylinder oil), at an average price of about 1 $\frac{15}{100}$,	564 65
556 pounds of tallow @ 15 $\frac{1}{2}$ cents,	86 18
Packing and small stores,	706 55
Repairs,	3,491 56
	$43,466 48

Cost of raising water into reservoir per million gallons,	14.63 $\frac{89}{100}$
Cost of raising water, per million gallons, one foot high,	.07 $\frac{8}{100}$

Operations of the Belmont Works for the year 1874.

MONTHS.	Running time.	Number of strokes during the month.	Total number of gallons pumped during the month.	Average gallons per day.	Cubic feet of water pumped during the month.	Coal consumed.*				Tallow consumed.	Oil consumed.
	Days.					Tons.	Cwts.	Qrs.	Pounds.	Pounds.	Quarts.
January	31	473,149	153,297,054	4,945,066	20,494,259	349	13	1	13	100	16
February	28	428,294	133,955,212	4,784,115	17,908,451	302	3	1	9	75	37
March	31	532,189	244,250,362	7,879,044	32,359,139	421	13	3	3	25	86
April	30	527,178	232,794,812	7,759,827	31,122,301	434	18	2	27	40	92
May	31	595,151	263,005,186	8,484,038	35,161,121	491	1	1	20	30	145
June	30	689,079	289,812,964	9,660,432	38,744,915	543	8	2	10	55	170
July	31	717,103	308,194,642	9,941,763	41,202,492	602	2	3	12	86	256
August	31	708,774	295,772,882	9,541,061	39,541,829	584	7	2	18	30	252
September	29	628,018	262,959,946	9,067,585	35,155,073	514	12	3	17	50	230
October	31	584,473	276,477,110	8,918,616	36,962,180	522	5	.....	8	30	212
November	30	562,241	257,076,010	8,569,200	34,368,451	494	18	1	24	10	222
December	31	524,902	251,631,324	8,117,139	33,640,751	449	10	.....	21	25	246
Totals	364	6,970,551	2,969,227,504	8,138,990	396,960,762	5,710	16	1	14	556	1,964

*The amount of coal given is the total amount consumed for raising steam, banking fires, and without any deduction whatever for ashes or clinker.

ROXBOROUGH WORKS.

Supplies purchased during 1874.

Oil for lighting works, 238½ gallons, - -	$186 17
233½ gallons of oil (lubricating), - -	265 97
478 pounds of tallow, - - -	47 80
2,772$\frac{16}{20}$ tons of coal, - - -	12,968 13
Packing and small stores, - - -	376 45
Repairs, - - - - -	2,499 75
	$16,344 27

Running Expenses.

Salaries of engineers, firemen, &c., - -	5,850 00
2,774$\frac{14}{20}$ tons of coal, consumed at an average price of about 4$\frac{68}{100}$, - - -	12,985 60
252½ gallons of oil for lighting works, at an average price of about .77, - -	194 43
153 gallons of oil (76½ gallons lubricating and 76½ gallons cylinder oil), at an average price of about 1$\frac{14}{100}$, - - - -	174 42
331 pounds of tallow consumed, at an average price about .10, - - - -	33 10
Packing and small stores, - - -	376 45
Repairs, - - - - -	2,499 75
	$22,113 75

Cost of raising water into reservoir per million gallons, - - - - -	30.70$\frac{65}{100}$
Cost of raising water, per million gallons, one foot high, - - - - -	.09$\frac{19}{100}$

Operations of the Roxborough Works for the year 1874.

MONTHS.	Running time.	Number of strokes during the month.	Total number of gallons pumped during the month.	Average gallons per day.	Cubic feet of water pumped per month.	Coal consumed.*				Tallow consumed	Oil consumed.
	Days.					Tons.	Cwts	Qrs.	Pounds.	Pounds	Quarts.
January	28	325,091	55,934,345	1,997,655	7,477,854	229	1	.....	.....	90	37
February	26	321,051	50,657,145	1,948,352	6,772,346	197	15	2	.....	103	38
March	26	247,750	55,836,850	2,147,571	7,464,953	189	14	.....	18	39	54
April	26	204,466	53,610,620	2,061,947	7,167,195	205	12	2	.....	15	53
May	26	226,723	54,797,485	2,107,595	7,325,867	193	10	2	.....	32	47
June	26	224,304	66,169,680	2,544,988	8,846,214	248	2	.....	19	.....	47
July	26	267,610	70,994,350	2,730,552	9,491,223	284	11	1	.....	28	59
August	26	240,039	70,811,505	2,723,519	9,466,779	267	16	1	17	.....	56
September	26	235,368	63,791,660	2,453,525	8,528,297	244	17	2	.....	24	53
October	27	212,594	62,803,730	2,326,064	8,396,221	234	5	.....	12	.....	54
November	26	198,372	58,519,640	2,250,755	7,823,481	242	17	3	21	.....	57
December	27	190,640	56,238,800	2,082,918	7,518,556	236	9	3	.....	.....	57
Totals	316	2,894,308	720,165,810	2,281,237	96,278,986	2,774	13	3	03	331	612

* The amount of coal given is the total amount consumed for raising steam, banking fires, and without any deduction whatever for ashes or clinker.

FAIRMOUNT.

Theoretical Capacity of Pumps.

Numbers of Wheels.	Kind of Wheel.	Pump.				Piston Rod			Gallons Capacity.		Strokes per minute.	Gallons per Day.
		Diameter.	Diameter.	Area of Pump in inches.	Stroke in inches.	Diameter.	Displacement. Gallons per stroke.	Displacement. Gallons per revolut'	Pump.	Wheel.		
1	Turbine	16	.....	201.06	72	$3\frac{5}{8}$	3.21	3.21	122.11	122.11	12	2,110,060
2	Breast	16	.....	201.06	54	$3\frac{1}{2}$	2.25	2.25	91.75	91.75	14	1,387,260
3	Turbine	22	22	380.13	72	5	6.12	12.25	230.84	461.68	8	5,318,553
4	Turbine	22	22	380.13	72	5	6.12	12.25	230.84	461.68	8	5,318,553
5	Turbine	22	22	380.13	72	5	6.12	12.25	230.84	461.68	8	5,318,553
6	Removed	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	Turbine	$18\frac{7}{16}$	$18\frac{3}{8}$	266.08	72	4	3 91	7.83	161.95	323.90	11	5,130,576
8	Turbine	$18\frac{5}{16}$	$18\frac{1}{2}$	266.08	72	4	3.91	7.83	161.95	323.90	11	5,130,576
9	Turbine	$18\frac{9}{16}$	$18\frac{3}{8}$	267.90	72	4	3.91	7.83	163.09	326.18	11	5,166,690
										Total.....		34,880,821

Theoretical Capacity of the Steam Works.

Works.	Engines.	Number of pumps. Single acting.	Number of pumps. Double acting.	Diameter. Piston.	Diameter. Plunger.	Stroke in inches.	Capacity per stroke or revolution, gallons.	Diameter of piston rod.	Displacement, gallons.	No. of strokes per minute.	No. of rev's per minute.	Daily capacity.
Schuylkill	Old Cornish	1			30	120	367.2			10		5,287,680
	Side Lever	1			36	120	528.7			10		7,598,880
	Compound		2	28½		182	502.6				14	10,132,416
Belmont	No. 1 Worthington		2		22 1/16	48	78.125	4	2.611	48		5,400,000
	No. 2 "		2		22½	48	81.31	4	2.611	48		5,620,147
	No. 3 "		2		28	48	126.296	4½	3.304	48		8,729,579
Delaware	Worthington		2		24	48	93.001	3½	2.000	48		6,428,229
	Beam Engine		1	19½		72	181.204	4½	4 956		18	4,696,807
	Horizontal Eng.		1	18		72	152.812	4⅞	5.818		18	3,960,887
Roxborough	Cornish	1			20¼	120	167.3			10		2,409,120
	Worthington		2		22	48	77.336	4½	3.304	40		4,454,553
Fairmount	Worthington		2		16	24	20.523	3	.734	80		2,364,249
											Total,	67,082,547

Amount of Water pumped by all the Works from 1854 to 1874, inclusive, in U. S. Gallons.

YEAR.	FAIRMOUNT.		DELAWARE.		SCHUYLKILL.		TWENTY-FOURTH WARD AND BELMONT.		ROXBOROUGH AND GERMANTOWN.		TOTALS.	
	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total water pumped.	Daily average.	Total for all the works.	Total daily average.
1854	2,286,402,222	6,264,115	618,173,121	1,693,625	1,366,011,559	3,742,497	.....	.....	.....	.....	4,270,786,902	11,700,786
1855	2,783,736,850	7,611,756	56,780,060	1,556,197	1,525,987,725	4,178,096	9,538,170	103,606	.....	.....	4,876,528,635	13,344,323
1856	2,867,188,965	7,833,849	769,566,040	2,102,639	1,980,637,500	5,500,329	52,577,642	143,654	.....	.....	5,683,361,324	15,528,309
1857	3,059,797,730	8,383,007	811,462,085	2,223,183	2,315,832,461	6,344,746	121,948,840	334,654	.....	.....	6,317,903,116	17,309,323
1858	3,038,418,667	8,379,229	757,187,690	2,074,456	2,819,641,992	7,725,044	204,177,624	559,396	.....	.....	6,839,425,959	18,738,153
1859	3,390,271,757	9,288,415	868,567,100	2,379,635	2,643,736,620	7,243,114	265,456,170	727,277	.....	.....	7,168,031,647	19,638,442
1860	3,612,989,017	9,867,378	872,144,980	2,379,727	2,696,960,210	7,360,849	283,646,070	774,112	.....	.....	7,465,740,277	20,382,066
1861	3,731,785,628	10,224,070	983,805,740	2,695,358	2,527,182,710	6,928,788	353,313,900	967,956	.....	.....	7,596,079,938	20,728,985
1862	3,564,724,753	9,766,369	909,126,440	2,490,757	3,038,527,420	8,324,732	420,507,810	1,152,076	.....	.....	7,932,886,423	21,733,935
1863	5,586,712,091	15,306,060	1,182,539,680	3,239,834	2,203,769,280	6,037,724	525,754,090	1,440,422	.....	.....	9,498,775,141	26,024,041
1864	5,970,801,329	16,358,360	1,090,884,060	2,988,723	1,725,444,660	4,727,245	519,877,800	1,420,548	.....	.....	9,307,007,849	25,498,651
1865	7,082,015,640	19,402,791	1,429,591,700	3,916,689	2,005,038,484	5,493,266	539,923,360	1,468,283	.....	.....	11,050,569,184	30,275,532
1866	7,721,817,582	21,155,664	1,271,841,020	4,835,897	947,652,428	3,484,016	606,665,380	1,662,099	106,369,060	537,217	10,614,344,464	29,080,396
1867	7,990,416,594	21,951,694	427,935,060	3,926,010	1,590,248,454	5,5 2,590	677,717,190	1,856,759	177,104,2'0	562,236	10,863,421,498	29,771,018
1868	8,024,530,911	21,929,053	705,442,350	2,475,825	2,337,365,642	6,401,394	727,824,780	1,987,579	190,015,200	584,776	11,985,178,883	33,378,628
1869	7,489,611,063	20,519,482	1,042,780,953	2,987,911	2,735,569,020	7,494,710	928,561,491	2,544,004	218,229,800	619,971	12,414,752,336	34,040,409
1870	8,134,985,170	22,253,242	1,186,131,144	3,443,932	3,003,737,166	8,484,688	*850,011,192	2,426,246	227,946,600	641,277	13,392,808,272	37,249,385
1871	8,821,728,593	24,195,782	1,007,378,521	3,038,640	2,201,294,172	6,117,928	1,054,210,990	2,896,748	†413,787,205	1,379,775	13,498,399,481	37,631,379
1872	7,220,091,685	19,898,776	1,474,531,040	4,664,265	2,223,287,070	6,328,765	1,456,756,728	3,998,035	518,811,050	2,025,076	13,100,018,461	37,583,594
1873	8,717,538,594	24,077,029	1,364,109,884	4,444,619	1,508,295,800	4,190,625	1,959,966,670	5,360,343	673,287,495	2,203,928	14,223,198,443	40,276,184
1874	7,582,023,422	21,504,736	1,558,518,765	4,960,709	1,536,505,220	5,226,908	2,969,227,504	8,138,990	720,165,810	2,281,287	14,533,425,097	42,111,730

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

† The Roxborough Works commenced pumping December 21, 1870.

The Germantown Works were abandoned September 30, 1872. Included in the total amounts for Roxborough for 1871, 128,098,800 gallons, and for 1872, 59,114,200 gallons, were pumped at the Germantown Works.

Amount of water pumped by all the Works during the years 1869, 1870, 1871, 1872, 1873, and 1874.

MONTHS.	1869.		1870.		1871.		1872.		1873.		1874.	
	Gallons of water pumped during the month.	Average number of gallons pumped per day.	Gallons of water pumped during the month.	Average number of gallons pumped per day.	Gallons of water pumped during the month.	Average number of gallons pumped per day.	Gallons of water pumped during the month.	Average number of gallons pumped per day.	Gallons of water pumped during the month.	Average number of gallons pumped per day.	Gallons of water pumped during the month.	Average number of gallons pumped per day.
Jan	877,284,223	28,507,994	823,501,020	26,629,192	1,002,008,583	33,421,326	898,095,642	31,789,666	980,447,053	33,600,583	1,029,691,356	35,777,710
Feb.....	857,235,551	30,850,764	816,808,722	29,377,975	907,177,896	33,644,729	905,458,774	32,428,841	916,928,311	34,713,907	939,003,631	35,551,767
March.....	804,817,745	26,219,793	821,476,247	28,676,516	1,038,157,449	34,298,641	910,517,957	30,313,407	1,012,454,477	34,055,188	1,050,806,184	35,117,945
April.....	1,044,170,483	35,074,275	1,054,488,246	36,454,860	1,081,525,860	36,496,286	999,794,625	34,103,906	1,066,502,276	36,582,865	1,027,580,470	37,861,731
May	1,120,558,740	36,530,528	1,204,765,895	37,445,368	1,155,557,242	37,706,406	1,230,409,231	40,899,031	1,207,246,648	39,730,741	1,200,591,787	44,459,135
June.....	1,197,573,103	39,935,103	1,220,092,275	40,669,741	1,241,946,831	41,518,289	1,173,692,567	42,080,065	1,250,050,022	45,826,238	1,436,684,756	50,379,555
July	1,294,468,963	41,757,063	1,397,614,410	46,008,735	1,266,880,762	41,506,545	1,278,226,160	42,943,079	1,405,737,764	47,676,064	1,562,602,586	54,287,891
August...	1,139,394,772	36,754,670	1,328,758,809	43,663,187	1,307,712,052	42,354,705	1,344,344,562	45,954,377	1,378,043,723	45,686,697	1,467,964,135	48,216,281
Sept.....	1,111,435,089	37,047,836	1,201,946,583	41,105,307	1,226,827,488	41,156,843	1,185,883,590	40,764,905	1,293,369,018	44,248,521	1,310,861,781	45,962,305
Oct.....	1,098,648,339	35,440,337	1,264,416,410	40,845,543	219,210,376	40,125,119	1,187,763,266	39,777,853	1,297,820,631	43,020,189	1,246,855,152	41,691,929
Nov.....	970,776,989	32,359,234	1,186,284,027	39,880,989	1,098,477,072	37,605,607	1,038,793,747	36,214,583	1,121,617,063	38,891,829	1,107,165,965	40,095,053
Dec.....	898,388,339	29,151,189	1,072,655,628	35,035,201	952,917,870	31,742,505	947,008,335	33,133,416	1,192,981,324	39,281,389	1,053,617,294	35,939,461
Totals.....	12,414,752,336	34,040,409	13,392,808,272	37,249,385	13,498,399,481	37,631,379	13,100,018,461	37,583,594	14,223,198,443	40,276,184	14,533,425,097	42,111,730

Amount of Water pumped by all the Works during the year 1874.

Months.	Gallons of Water pumped during the month.	Average number of gallons pumped per day.
January	1,029,691,356	35,777,710
February	939,003,631	35,551,767
March*	1,050,806,184	35,117,945
April	1,027,580,470	37,861,731
May	1,300,591,787	44,459,135
June	1,436,684,135	50,379,555
July	1,562,602,586	54,287,891
August	1,467,964,756	48,216,281
September	1,310,861,781	45,962,305
October	1,246,855,152	41,691,929
November	1,107,165,965	40,095,053
December	1,053,617,294	35,939,461
Totals	14,533,425,097	42,111,730

* Schuylkill Works not running.

Total pumpage and its percentage at the different water works, for 1874, *and a comparison with* 1873.

Works.	1873.	Per cent.	1874.	Per cent.
Fairmount.				
Water power	8,707,827,386		7,415,039,046	51
Steam power	9,711,208		166,984,376	1
Total	8,717,538,591	61	7,582,023,422	52
Spring Garden	1,508,295,800	11	1,536,505,220	11
Delaware	1,364,109,884	9	1,558,518,765	11
Belmont	1,959,966,670	14	2,969,227,504	21
Roxborough	673,287,495	5	720,165,810	5
Totals	14,223,198,443		14,533,425,097	

The usual yearly increase is about 10 per cent. The increase of 1874 over 1873 is only $2\frac{1}{5}$ per cent. This is to be attributed to the general depression in business and the drought which required the Department to request a check of the waste of water which will reach 20 per cent. of the entire supply. I would recommend rating wash paves at $10 per annum, and during the dry season water for sprinkling should be obtained from the rivers, and the fountains of the various societies should be subject to the control of the Department.

Average Monthly Overflow at Fairmount Dam.

Months.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.
January	.....	8.54	17.50	19.56	6.37	4.68	6.72	11.69
February	.....	4.46	17.83	17.16	11.96	3.35	2.08	7.57
March	.....	18.00	13.03	15.60	17.48	6.19	12.26	9.32
April	.....	13.53	11.30	18.80	6.36	11.16	14.95	14.07
May	11.5	13.88	9.62	9.30	9.29	5.32	12.98	9.91
June	8.8	11.23	9.00	10.80	10.43	4.25	56	.....
July	7.0	8.88	4.55	10.28	9.97	3.92	1.98	4.67
August	13.8	7.50	3.11	9.85	9.20	10.06	15.29	2.52
September	8.6	13.42	5.93	4.92	13.59	11.75	5.56	.....
October	12.1	11.73	19.00	7.35	10.37	9.96	14.39	3.32
November	10.5	16.48	14.60	7.11	14.83	16.66	9.73	1.26
December	8.7	11.93	19.68	9.41	7.19	4.42	9.50	9.01
Averages	10.75	11.63	11.34	11.68	10.59	7.64	8.83	6.11

Calculated overflow at Fairmount Dam (in United States Gallons) per twenty-four hours.

Inches on Dam.	John W. Nystrom's Formula, $C=K(500\times10t)$ 1,000,000	H. P. M. Birkinbine from Francis' Formula, $2=3.33(L-0.1nH)H^{\frac{3}{2}}$	Department, from Box's Formula, $G=d\times\sqrt{d}\times l\times2.67$
1	57,000,000	50,928,819	51,305,011
2	104,000,000	144,085,050	145,114,398
3	186,000,000	266,288,623	266,517,043
4	303,000,000	409,413,959	410,440,089
5	451,000,000	572,629,306	573,578,496
6	617,000,000	753,249,466	754,010,726
7	788,000,000	948,681,238	950,199,552
8	975,000,000	1,159,990,816	1,160,799,897
9	1,185,000,000	1,383,843,492	1,385,235,302
10	1,430,000,000	1,621,276,715	1,622,352,844
11	1,660,000,000	1,870,162,525	1,871,768,217
12	1,920,000,000	2,130,564,903	2,132,904,960
13	2,205,000,000	2,401,268,148	2,403,841,536
14	2,532,000,000	2,682,528,368	2,686,307,328
15	2,868,000,000	2,977,544,427	2,980,302,336
16	3,185,000,000	3,278,958,579	3,283,905,024

Table showing the number of days in each month, when the water was the same height on the dam.

Inches.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1													
2						2							2
3							1	5	4	2			12
4						8	4	5	9	4	1	1	32
5		1				4	4	8	7	4	6		34
6						1	4	2	3	8	8	1	27
7						3	2	1		1	7		14
8						2	1	1		2			6
9		1			1		1		1				4
10		1	1			1	1					1	5
11		2			3	3	1			1	2		12
12	2	3		1	1	1		1	1			1	11
13	2	4		4	2	2	1						15
14	2	2	3	3	2	2						1	15
15	2		6	1	4							1	14
16	5		4	1	4	1	1				1	6	23
17	4	2	4	2	3			1				2	18
18	2	6	5	4	1		1		1			6	26
19	3	2			1			1			1	3	11
20	2		2	1			1		2	2		3	13
21			4		2		2	2		2	1	2	15
22	2						1		1	2			6
23		1		1	1		1		1		3	1	9
24	1	1	1	2				1				1	7
25							1					1	2
26			1		1					1			3
27	1			1	1		1	1		1			6
28				1	2								3
30		1		1	1								3
31				3									3
33		1		1	1			1					4
34	1			1									2
36							1						1
40				1									1
41							1	1					2
43				1									1
45	1												1
48	1												1
49										1			1

The following table, which is taken from the Pennsylvania Hospital Reports, exhibit the monthly rain-fall during the last forty years, and the yearly total since 1810, inclusive:

Rain Fall at Philadelphia, from Pennsylvania Hospital Reports.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1810	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32.66
1811	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34.97
1812	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.30
1813	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35.63
1814	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43.14
1815	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34.67
1816	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27.95
1817	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36.01
1818	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.18
1819	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23.35
1820	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.61
1821	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32.18
1822	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.86
1823	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41.85
1824	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38.74
1825	0.84	3.26	4.63	.83	1.72	3.59	2.06	3.70	2.61	1.25	1.36	3.72	29.57
1826	1.11	2.13	5.80	3.87	.19	4.655	3.63	2.75	2.00	5.83	1.85	1.28	36.145
1827	2.86	3.55	1.23	2.83	2.50	2.09	2.97	5.75	.79	5.91	4.76	3.26	38.50
1828	2.05	2.75	3.35	3.82	3.49	2.69	5.33	1.51	4.62	1.39	6.71	.26	37.97
1829	5.37	3.75	2.87	4.99	2.68	3.44	4.35	4.61	2.01	2.30	3.97	1.51	41.85
1830	1.63	2.06	4.115	1.815	3.75	5.99	4.07	3.87	2.93	4.31	5.35	5.18	45.07
1831	6.22	2.44	3.97	5.20	1.07	3.56	4.17	5.39	5.33	4.51	1.88	1.20	44.94
1832	4.58	2.66	1.90	2.98	5.40	1.55	2.62	5.69	1.40	3.41	2.59	5.09	39.87
1833	3.97	1.24	2.22	.70	5.88	5.28	4.15	3.39	3.82	10.05	2.18	5.67	48.55
1834	2.49	2.22	2.02	2.83	3.52	3.99	4.35	.62	3.57	3.29	3.01	2.33	34.24
1835	2.75	1.81	3.83	4.33	1.99	6.27	6.55	2.05	2.63	1.22	3.19	2.68	39.30
1836	7.62	2.99	1.75	3.47	2.28	7.31	2.91	1.97	1.82	3.59	3.34	3.61	42.66
1837	2.50	3.58	3.76	2.83	4.86	2.83	5.89	4.06	2.28	.66	3.23	2.56	39.04
1838	2.20	2.19	3.171	3.586	3.577	6.609	2.376	2.780	9.519	4.896	3.350	1.044	45.238
1839	5.037	3.424	1.504	1.507	6.073	8.922	2.516	4.644	2.919	2.831	3.100	6.262	43.739
1840	1.841	3.009	2.626	6.827	2.688	5.948	4.538	5.554	2.502	5.734	2.486	3.647	47.400
1841	7.837	1.387	5.821	6.456	3.269	3.114	3.280	9.102	1.895	3.198	4.224	5.917	55.500
1842	1.358	4.265	2.835	5.307	5.865	3.192	11.805	3.786	1.269	1.712	3.487	3.657	48.538
1843	1.440	2.540	4.415	4.723	2.045	1.686	4.543	9.255	4.856	3.220	4.148	4.041	46.912
1844	4.052	1.449	4.430	1.354	3.091	3.351	5.284	2.399	4.034	5.025	2.951	2.753	40.173
1845	3.760	4.738	2.415	2.580	1.599	3.725	2.763	7.298	2.155	2.529	2.500	3.959	40.021
1846	4.630	3.330	4.598	2.112	3.444	3.300	4.604	4.272	.249	2.444	7.970	3.437	44.39
1847	4.730	4.569	4.700	.585	1.567	3.305	2.765	3.182	8.070	3.000	2.836	5.785	45.094
1848	2.030	1.443	2.756	1.541	4.902	4.433	3.281	1.714	1.805	3.747	2.343	5.007	35.002
1849	.730	2.610	5.470	1.752	3.995	2.195	2.933	6.975	1.404	5.595	2.600	5.836	42.095
1850	4.770	2.870	4.750	2.665	6.500	2.030	5.970	8.329	7.732	1.092	3.320	4.515	54.543
1851	1.230	3.110	3.475	4.565	4.817	3.438	2.524	2.555	1.130	3.025	8.356	2.275	35.500
1852	2.011	2.710	4.270	6.445	3.034	4.030	4.060	4.400	1.293	2.267	6.055	5.174	45.749
1853	1.845	4.440	2.462	3.835	5.173	1.100	6.296	3.088	4.463	3.470	2.320	2.165	40.657
1854	2.331	4.203	1.615	7.750	6.935	2.390	3.024	.842	3.798	1.545	2.834	2.910	40.180
1855	2.337	2.352	1.684	2.050	2.965	7.949	6.400	2.786	4.000	4.111	2.037	5.425	44.096
1856	4.537	1.237	2.232	3.515	2.595	1.986	1.508	6.000	4.014	1.296	2.070	2.937	33.927
1857	3.532	.790	1.831	6.786	5.547	7.500	3.915	7.590	1.105	2.690	1.450	5.550	48.286
1858	2.595	2.285	1.087	4.640	5.015	4.495	1.345	4.941	1.492	1.842	5.615	4.500	39.852
1859	6.675	3.660	6.985	5.610	2.250	6.013	4.071	4.736	7.681	3.132	3.820	3.490	58.123
1860	3.225	2.755	1.415	3.800	3.817	2.885	.985	8.401	2.850	4.520	6.130	3.310	44.093
1861	5.245	2.065	3.925	3.705	6.640	3.880	2.560	3.137	4.402	3.797	4.875	2.092	46.44
1862	4.795	4.640	3.553	4.160	2.308	6.975	2.465	.925	3.980	4.770	4.790	1.650	45.011
1863	4.720	4.680	5.885	7.015	4.510	4.250	6.009	1.447	.875	2.465	2.700	4.633	49.189
1864	1.705	.551	5.170	3.795	8.685	2.345	3.770	1.920	7.165	1.820	3.930	5.145	46.001
1865	3.610	5.825	4.710	2.830	7.210	4.750	2.970	3.770	7.960	3.050	3.960	5.610	56.255
1866	3.145	6.615	2.150	2.930	4.680	2.960	2.520	2.181	8.705	4.145	1.760	3.465	45.256
1867	1.762	3.892	5.465	1.810	7.320	11.025	2.387	15.816	1.720	4.320	2.940	2.730	61.187
1868	3.620	2.520	3.360	5.440	7.005	4.370	3.514	2.056	8.908	1.787	5.280	3.595	51.405
1869	4.280	4.760	5.305	2.120	4.235	5.585	2.885	1.280	3.250	6.320	3.725	5.115	48.860
1870	4.075	2.532	4.060	5.605	6.280	2.895	3.947	5.115	1.710	3.895	2.102	1.889	44.105
1871	3.466	3.086	5.814	1.829	3.383	3.775	6.811	5.971	1.772	4.863	4.293	2.259	47.320
1872	1.267	1.185	3.377	2.497	2.808	4.223	11.215	8.319	3.820	5.363	3.381	3.662	51.117
1873	6.048	5.607	2.242	4.191	4.783	.887	5.553	12.289	4.045	5.889	4.995	1.757	58.286
1874	4.218	2.823	1.595	7.509	2.697	2.664	2.759	6.531	3.987	1.650	2.229	2.249	40.911

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

DISTRIBUTION.

Service and supply mains have been laid in the following streets in 1874.

First District.

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

Street.	Location.	Size. Inches.	Feet.
Broad, (both sides),	From South to Carpenter,	6	3,356
Cantrell,	" Fifth to Sixth,	6	450
Coleman,	" Dickinson (south,)	6	216
Copia,	" Sixteenth (west),	6	345
Crumbach,	" Twelfth (west),	6	160
Deshong,	" Twenty-fifth to Twenty-sixth	6	492
Dickinson,	" Seventeenth (west),	6	307
"	" Long Lane to Twenty-first,	6	276
Eighth,	From Dickinson to Cross,	6	288
Eleventh,	" Snyder to McKean,	6	450
"	" Mifflin to Moore,	6	450
Ellsworth,	" Eighteenth to Nineteenth,	6	490
"	" Twenty-fourth to Twenty-sixth,	6	900
"	" Twenty-ninth to Sutherland,	6	560
Federal,	" Broad to Fifteenth,	6	480
Hazelwood,	" Montrose to Carpenter,	6	195
Jackson,	" Fifth to Sixth	6	450
Lambdin,	" Dickinson (south),	6	88
Latona,	" Thirtieth to Thirty-first'	6	400
Lingo,	" Dickinson to Reed,	6	450
McKean,	" Broad to Watt,	6	197
Mercey,	" Sixth (west),	4	295
Montrose,	" Seventeenth to Eighteenth,	4	459
"	" Terminus west of Twenty-third to Twenty-fourth,	4	143

Street.	Location.	Size.	
		Inches.	Feet.
Morris,	From Moyamensing Ave. to Second,	6	545
Moyamensing Av.,	" Fifth to Seventh,	6	1,046
Mount Holly,	" Tasker to Dickinson,	6	436
Nineteenth,	" Wharton to Reed,	12	545
Ninth,	" Dickinson to Cross,	6	288
Oscar,	" Gray's Ferry Road to Sutherland,	6	540
Patton,	" Terminus (south) of Gray's Ferry Road to Reed,	6	780
Pemberton,	" Twenty-third to Gray's Ferry Road,	6	240
Reed,	" Twentieth to Long Lane,	6	580
Riggs,	" Muller to Dodier,	6	195
"	" Verner to Sutherland,	6	450
Seventeenth,	" Dickinson (south),	6	88
Snyder Av., (both sides)	From Fifth to Sixth,	6	900
St. Albans,	" Twenty-second to Twenty-third,	6	468
Stretch,	" Dickinson (south),	6	228
Tasker,	" 185 feet east of Twelfth to Thirteenth,	6	635
Taylor,	" Eighth to Ninth,	6	450
Twelfth,	" 246 feet south of Dickinson to 168 feet north,	6	414
Twentieth,	" Wharton to Reed,	6	450
Twenty-first,	" Dickinson (south),	6	228
Twenty-fourth,	" Terminus south of Ellsworth to Federal,	6	156
Twenty-sixth,	" Terminus north of Galloway to Federal,	6	96
Watt,	" McKean (south),	6	170
Webster,	" Twenty-fourth to Grey's Ferry Road,	6	370
Wharton,	" Eighteenth to Long Lane,	6	1,250

Street.	Location.	Size. Inches.	Feet
Wharton,	From Thirty-fourth to Schuylkill Avenue,	6	1,186
Winton,	" Fifth to Sixth,	6	450
"	" Tenth to 70 feet east of Eleventh,	6	430
Federal,	" Twenty-third to Grey's Ferry Road,	20	2,678
Moyamensing Av.,	" Christian to Washington Av.,	12	896
Washington Av.,	" Twenty-first to Twenty-second,	20	625
Twenty-second,	Washington Av. to Alter,		
Connections,	east and west sides of Broad, on South	6	60
"	Bond, across Tasker,	4	96
"	Griffith and Tasker,	4	60
"	with 20-inch main,	6	84
"	" " "	4	24
Plug connection for Buckley & Co.'s Mill,		4	62
Plug connection,		4	742
Connections,		6	60
Total number of feet of new pipe laid,			30,898
Number of feet of new pipe laid,		4	1,881
"	" " "	6	24,273
"	" " "	12	1,441
"	" " "	20	3,303
Total number of feet,			30,898

Or 5 miles 4,498 feet.

Second District.

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

Street.	Location.	Size. Inches.	Feet.
Allen,	From Forty-first to east of Budd,	4	240

Street.	Location.	Size. Inches.	Feet.
Aspen,	From Thirty-sixth to Thirty-seventh,	6	412
Aspen,	" Forty-fourth to Forty-fifth,	6	412
Belmont avenue,	" Westminster Avenue (north),	6	24
Brooklyn,	" Hutton to Westminster,	6	326
Chelsea,	" Fifty-sixth to Fisher Ave.,	6	138
Chestnut,	" Forty-second to Forty-fourth,	8	960
Chestnut,	" 360 feet east of Forty-eighth to west side of Fifty-fourth,	8	3,837
Church,	" Thirty-eighth to Saunders Avenue,	6	360
Elm,	" Dead end, west of Thirty-eighth to Thirty-ninth,	6	330
Fifty-second,	" Market to Baltimore Av.,	6	4,381
Fifty-sixth,	" Vine to Chelsea,	6	273
Fortieth,	" Lancaster to Elm,	6	356
Forty-first,	" Girard Ave. to 100 feet Road,	6	420
Forty-first,	" North to south side of Girard Avenue,	6	100
Forty-second,	" Haverf'd to Westminster,	6	2,737
Forty-seventh,	" Spruce northward,	6	370
Girard Avenue,	" Girard Avenue Bridge to Belmont Avenue,	12	5,050
Grape,	" Thirty-ninth east to dead end,	6	400
Holly,	" Westminster to Myrtle,	6	730
Jefferson,	" Belmont Avenue east to dead end,	6	190
Lancaster Avenue,	" Fifty-second to west side Fifty-fourth,	6	1,283

Street.	Location.	Size.	
		Inches.	Feet.
Market,	From Forty-third to Fifty-third,	10	5,423
Markoe,	" Seneca to Huron,	6	808
Paschall,	" Lancaster Pike to Fifty-first,	6	515
Paschall,	" Fifty-second to west side of Fifty-fourth,	6	1,283
Poplar,	" Fortieth to Forty-first,	6	560
Seneca,	" Forty-eighth to west side of Fiftieth,	6	1,200
St. James,	" Twenty-second to Twenty-third,	6	327
Storey,	" Union to Fortieth,	4	311
Spruce,	" Forty-fifth to west side of Forty-seventh,	8	1,164
Thirty-fourth,	" Spruce to the Almshouse grounds,	6	630
Thirty-fourth,	" Elm to Sycamore,	6	400
Thirty-seventh,	" Aspen, south, connecting dead ends,	6	206
Vine,	" Fifty-seventh to west side of Sixty-fifth,	6	4,440
Walnut,	" Thirty-second to Thirty-fourth,	6	1,380
"	" Forty-fourth to Bridge, west of Fifty-second,	8	4,794
Warren,	" Boudinot to Baring,	4	260
Westminster Av.,	" Belmont Av. (north),	12	24
Connections Mary and Transcript Streets,		6	48
" Lex Street with dead end,		4	32
" Southern Steamship Company, plug,		4	180
" Zoological Garden,		4	8
" " "		12	12
Plug connections,		4	1,582
For repairs,		3	23

Street.	Location.	Size. Inches.	Feet.
For repairs,		4	18
" "		6	4
" "		8	3
" "		16	16
Total number of feet of new pipe laid,			48,985
Number of feet of new pipe laid,		3	23
" " " "		4	2,631
" " " "		6	25,048
" " " "		8	10,758
" " " "		10	5,423
" " " "		12	5,086
" " " "		16	16
Total number of feet,			48,985
Or 9 miles, 1,465 feet.			
Took up main from old mill house,		20	342
" " at Almshouse,		8	810
" " " " lot,		10	60
Lowered pipe on Thirty-fourth from Elm to Haverford,		6	320
Lowered pipe on Vine from Sixty-third to Sixty-fifth,		6	625

Third District.

Account of Iron Pipes laid in the Eleventh, Twelfth, Sixteenth, Seventeenth, Eighteenth, Nineteenth, Twenty-third, and Twenty-fifth Wards.

Street.	Location.	Size. Inches.	Feet.
Allegheny,	From Belgrade to Kensington Av.,	6	8,582
Amber,	" Clearfield to Allegheny,	6	857
Anthracite,	" Almond to Belgrade,	6	312
Apple,	" Huntingdon to Lehigh,	6	560

Street.	Location.	Size. Inches.	Feet.
Belgrade,	From William to Clearfield,	6	1,692
Cambria,	" Creek to Oram,	6	541
Commerce,	" York to Huntingdon,	6	1,624
Cumberland,	" Sixth to Marshal,	6	233
Edgemont,	" 312 feet south of Tioga to Venango,	6	1,080
Elizabeth,	" Emerald to Jasper,	6	420
Emerald,	" Orleans to Washington,	6	258
"	" Clearfield to Willard,	6	1,372
Fisher,	" Allegheny to Division,	6	540
Fox,	" Cedar to Memphis,	6	409
Front,	" Somerset to Westmoreland,	6	2,160
Gaul,	" Montgomery to Vienna,	6	360
"	" Cumberland to Huntingdon,	6	783
Hope,	" Susquehanna to Dauphin,	6	584
Huntingdon,	" Second to Fifth,	6	1,470
Indiana,	" Hart Lane to Front,	6	1,616
Jasper,	" Huntingdon to Lehigh,	6	667
Jenney,	" Clearfield to Ann,	6	800
Kensington Av.,	" Indiana to Old Front,	6	17,374
Neff,	" Almond to Belgrade,	6	144
Ocean,	" Green to Dana,	6	184
Old Front,	" Kensington to Frankford Rd.,	10	702
Ormes,	" Cambria to dead end,	6	282
Philip,	" Berks to Norris,	6	504
Randolph,	" Amber to Trenton R. R.,	6	392
Reese,	" Lehigh to Cambria,	6	1,102
Richmond,	" Lehigh to Somerset,	6	453
Salmon,	" Allegheny to Westmoreland,	6	747
Summer,	" Somerset to Fremont,	6	444
Trenton Av.,	" William to Cambria,	6	216
"	" Wayne to Cambria,	6	72
Tucker,	" Sepviva to Trenton Railroad,	4	330
Venango,	" Frankford Road to 75 feet east of Tulip,	6	1,702

Street.	Location.	Size. Inches.	Feet.
Venango	From Kensington Av. to K,	6	480
Victoria,	" Lambert to Myrtle,	6	894
Wildey,	" Montgomery to Vienna,	6	360
Willard,	" Dead end,	6	396
William,	" Frankfd. Rd. to Trenton Av.,	6	967
"	Between Amber and Trenton Avenue,	4	48
Connection for Garnet and Hart Creek,		6	12
" "	Meadowcraft's Mill (plug),	4	24
"	on Indiana Avenue,	6	12
"	Adams with Commerce,	6	12
For repairs,		4	59
"		6	60
"		10	10
Plug connections,		4	557
Total number of feet of new pipe laid,			55,459
Number of feet of new pipe laid,		4	1,018
" " " " "		6	53,729
" " " " "		10	712
Total number of feet,			55,459

or 10 miles 2,659 feet.

Took up on Sixth from 300 feet south of Indiana to Allegheny,		4	1,152
Lowered Richmond, from Lehigh to Somerset,		6	225
Relaid Sixth 300 feet south of Indiana to Allegheny,		10	1,368

Fourth District.

Account of Iron-pipes laid in the Thirteenth, Fourteenth, Twentieth, Twenty-first, Twenty-eighth, and Twenty-ninth Wards.

Street.	Location.	Size. Inches.	Feet
Arlington,	From Seventeenth to Eighteenth,	6	456
Berks,	" Twenty-third to Twenty-fifth,	6	864

Street.	Location.	Size. Inches.	Feet.
Bolton,	From Twenty-third to Twenty-fourth,	6	432
Broad (west side)	" Dead end to Indiana,	6	2,232
Cambridge,	" Twenty-seventh to Twenty-eighth,	6	432
Diamond,	" Twenty-ninth to Ridge Av.,	6	516
Eighteenth,	" 180 feet south of Berks to Diamond,	6	1,212
Eleventh,	" Diamond to dead end north of Susquehanna,	6	792
"	" Huntingdon to North,	6	324
"	" Somerset to Indiana,	6	1,056
Fifteenth,	" 540 feet south of Diamond to 360 feet north,	6	900
Gratz,	" Jefferson to Oxford,	6	528
Gross,	" Twenty-ninth to Thirtieth,	6	456
Marston,	" Columbia to Jefferson,	6	1,056
Master,	" Twenty-seventh to Twenty-eighth,	6	456
Montgomery,	" Ridge to Twenty-eighth,	6	1,416
Mt. Pleasant,	" Taney to Twenty-eighth,	6	864
Nevada,	" Tenth to Eleventh,	6	420
Norris,	" Broad to Fifteenth,	6	432
"	" Seventeenth to Eighteenth,	6	456
"	" Twentieth to Twenty-first,	6	540
Page,	" Seventeenth to Eighteenth,	6	444
Park Av.,	" Berks to Norris,	6	564
Perot,	" Twenty-fourth to Twenty-fifth,	6	456
Ralston,	" Twenty-third to Twenty-fourth,	6	420
Redner,	" Twenty-third to Twenty-fourth,	6	372
Ringgold,	" Brown north,	6	300
Seventeenth,	" Diamond to Susquehanna,	6	480

Street.		Location.	Size. Inches.	Feet.
Seybert,	From	Twenty-fifth west,	6	240
Sixteenth,	"	Diamond to Susquehanna,	6	456
"	"	Allegheny to Cambria,	6	1,848
Stewart,	"	Twenty-first to Twenty-second,	6	480
Stiles,	"	Broad to Thirteenth,	6	648
Susquehanna,	"	Broad to east of Germantown Road,	6	1,704
Taney,	"	Poplar to Brown,	6	828
Twenty-eighth,	"	Mt. Pleasant south to connect,	6	150
Twenty-eighth,	"	264 feet south of Columbia, to Montgomery,	6	804
Twenty-fourth,	"	Vine to Wood,	6	480
Twenty-ninth,	"	Ridge Av. to Susquehanna,	6	1,104
Twenty-seventh	"	Brown to Mt. Pleasant,	6	1,872
" "	"	Ridge Avenue (south),	6	876
Twenth-sixth,	"	Penna. Avenue to Brown,	6	900
Warnock,	"	York to Cumberland,	6	552
West College Av.	"	Dead end to Thompson,	6	180
Woodstock,	"	Norris street (south),	6	36
Yardley,	"	Master (north),	6	264
York,	"	Warnock (west),	6	240
"	"	Twenty-seventh to Twenty-ninth,	6	840
Poplar,	"	Twenty-second east to connect Reservoir,	30	132
Ridge Avenue,	To complete main,		12	240
Twenty-second,	"	South College Avenue to Poplar,	20	290
Twenty-second,	"	S. College Av. to Poplar,	16	12
Thirty-third,	"	Ridge Avenue (south),	12	48
Belmont Works,			3	1,062
" "			4	48
" "			6	24
" "			30	51

	Size. Inches.	Feet.
Fairmount Works,	6	180
Connection Ridge Avenue Depot,	4	72
" Fairmount Market,	4	144
Spring Garden Works (stop connections),	4	12
Storage Reservoir,	4	96
" "	12	12
" "	36	420
For connection,	4	24
" "	6	556
" "	10	168
" "	12	108
Plug "	4	672
For repairs,	4	91
" "	12	6
" "	6	224
Total number of feet of new pipe laid,		38,070
Number of feet of new pipe laid,	3	1,062
" " "	4	1,159
" " "	6	34,362
" " "	10	168
" " "	12	414
" " "	16	12
" " "	20	290
" " "	30	183
" " "	36	420
Total number of feet,		38,070
Or 7 miles 1,110 feet.		
Lowered Eleventh and Lehigh Avenue,	6	48
" Broad and Dauphin,	6	120
" " Susquehanna,	6	48
" " Thompson,	6	120
" " Eleventh, between Somerset and Indiana,	6	300

	Size. Inches.	Feet.
Lowered Nineteenth and Columbia Avenue	6	48
" " Oxford,	6	48

FRANKFORD.

Account of Iron Pipes laid in Frankford.

Street.	Location.	Size. Inches.	Feet
Arrott,	From Frankford Road to Leiper,	6	562
Bridge,	" Tacony Rd. to Frankford Rd.,	6	5,736
Elizabeth,	" Sellers to dead end,	6	137
Foulkrod,	" Leiper to Penn,	6	252
"	" Frankford Rd. to Mulberry,	6	1,368
"	" Bridge to Frankford Street,	6	804
Franklin,	" Sellers to Oxford Pike,	6	1,590
Harrison,	" Frankford Road to Penn,	6	540
"	" Willow to Jackson,	6	1,578
Jackson,	" Bridge to Harrison,	6	792
Mulberry,	" Orthodox to Harrison,	6	1,966
Orchard,	" Tacony to Church,	6	1,412
Pilling,	" Adams to Unity,	6	456
Tacawana,	" Church to Orthodox,	6	1,368
Plug connections,		4	330
Total number of feet of pipe laid,			18,891
Number of feet of new pipe laid,		4	330
" " " "		6	18,561
Total number of feet,			18,891

Or 3 miles 3,051 feet.

Lowered Orthodox, from Thompson to Gaul,	6	800

GERMANTOWN.

Account of Iron Pipes laid in Germantown District.

Street.	Location.	Size. Inches.	Feet.
Chew,	From Locust to Chelton Av.,	6	800
Coulter,	" Germantown Av. to Green,	6	761
Eighteenth,	" Cayuga to Wingohocking,	6	522
Lehman,	" Wayne Street (east),	6	914
Marion,	" Lehman to Rittenhouse,	3	324
Mill,	" Dead end to Cedar Lane,	6	1,133
Osceola,	" Pastorius to Hermann,	6	210
Pastorious,	" Hancock to Osceola,	6	383
Prospect Av.,	" Union Avenue (north),	6	381
Rex,	" Dead end to Spruce Mill Rd.,	6	716
Sixteenth,	" Allegheny to Tioga,	6	1,674
"	" Venango to Erie,	6	592
Union Av.,	" End of pipe N. E. and connected,	6	1,265
Wayne,	" Chelton Av. to Rittenhouse,	6	837
Woodbine,	" Chew (southwest),	6	341
Connection on Allen's Lane,		16	32
Outlet at reservoir,		20	48
Waste on 10-inch main, Mt. Airy Av.,		3	166
Repairs,		3	24
"		4	242
"		6	65
"		10	24
Plug connections,		4	370
Total number of feet of pipe laid,			11,824
Number of feet of new pipe laid,		3	514
" " "		4	612
" " "		6	10,594
" " "		10	24
" " "		16	32
" " "		20	48
Total number of feet,			11,824

	Size. Inches.	Feet.
Or 2 miles 1,264 feet.		
Relaid Chew, from Duy's Lane to Cottage,	6	769
" Magnolia, from Woodbine east to Locust,	6	386
" Penn, from Main to Chew,	6	568
		1,723
Lowered on Germantown Av. near Price,	10	120

MANAYUNK.

Account of Iron Pipes laid in Manayunk.

Street.	Location.	Size. Inches.	Feet.
Chestnut,	From Main to Cresson,	4	216
Dawson,	" Ridge Av., to Cresson,	6	768
East,	" Terrace to dead end,	6	24
Hemlock Terrace,	" Righter to Vicavious,	6	984
Jefferson,	" Washington to Fowler,	6	816
Monastery,	" Miskey west to dead end,	6	48
Mulberry,	" Baker (east),	4	468
"	Between Poplar and lower line of school-house walk,	4	36
Queen,	From Ridge Av. to Thirty-fifth,	6	1,620
Ridge Avenue,	" Nicetown Lane to Scott's Lane,	6	3,936
"	" Wissahickon Av., to Manayunk Pike,	6	1,488
Righter,	" Sumac Terrace to Hemlock Terrace,	6	624
River Road,	" Washington to Cinnaminson,	6	2,496
Shurs' Lane,	" Main to Ridge,	6	3,000
Spencer,	" Ridge Av., (east),	6	768
Sumac Terrace,	" Ridge Av. to Righter,	6	816
Terrace,	" East to Adams,	6	780
Wabash Avenue, between Belmont Avenue and Centre,		4	18
Washington, from Fountain to Cinnaminson,		6	840
Belmont Av. and Cresson for Reading R. R.,		6	54
Engine house, Roxborough Water Works,		6	84
" " "		4	588

Street.	Location.	Size. Inches.	Feet.
Schofield's Alley, from Main Street (west),		6	96
"	" "	4	48
Connection East near Terrace,		4	12
" Plug,		4	516
Total number of feet of pipe laid			21,144
Number of feet of new pipe laid,		4	1,902
" " " "		6	19,242
Total number of feet,			21,144
Or 4 miles 24 feet.			
Lowered Monastery, between Ridge Av. and Miskey,		6	108
Lowered School Lane and Ridge Av.,		6	108
" on Grape Street,		6	72
" on Fleming Street,		4	60
" at Schuylkill Falls,		6	160
			508

Recapitulation of pipe laid in the several districts during the year 1874.

WARDS.	3-inch.	4-inch.	6-inch.	8-inch.	10-inch.	12-inch.	16 inch.	20-inch.	30-inch.	36-inch.	Totals.
First District, 1, 2, 3, 4, 26	.....	1,881	24,273	.....	.....	1,441	.....	3,303	.....	.....	30,898
Second District, 5, 6, 7, 8, 9, 10, 24, 27	23	2,631	25,048	10,758	5,423	5,086	16	.....	.....	.....	48,985
Third District, 11, 12, 16, 17, 18, 19, 23, 25	.....	1,018	53,729	.....	712	.....	.....	.....	.....	.....	55,459
Fourth District, 13, 14, 15, 20, 21, 28, 29	1,062	1,159	34,362	.....	168	414	12	290	183	420	38,070
Frankford	.....	330	18,561	.....	.....	.....	.....	.....	.....	.....	18,891
Germantown	514	612	10,594	.....	24	.....	32	48	.....	.....	11,824
Manayunk	.....	1,902	19,242	.....	.....	.....	.....	.....	.....	.....	21,144
Totals	1,599	9,533	185,809	10,758	6,327	6,941	60	3,641	183	420	225,271

Being a total of 42 miles 3,511 feet.
Total number of feet of pipe laid, as per last report.....3,095,076
Total number of feet of pipe laid during the year..... 225,271

Total.....3,320,347
Or 628 miles 4,507 feet.

Length of pipe laid since consolidation.

YEARS.	MILES.	FEET.
1855	6	44
1856	10	2,079
1857	12	324
1858	13	3,484
1859	22	784
1860	19	224
1861	11	2,368
1862	9	954
1863	10	4,161
1864	6	4,287
1865	8	4,754
1866	12	2,964
1867	15	4,971
1868	15	148
1869	22	1,884
1870	26	1,953
1871	30	572
1872	27	3,661
1873	39	4,816
1874	42	3,511
Totals, - -	363	423

Account of the number of holes drilled for making new attachments to public mains during the year 1874.

Months.	½-inch diameter.	⅝-inch diameter.	¾-inch diameter.	1-inch diameter.	Total holes drilled and attachm'ts made.	Shut-offs.
January	111	4	1	1	117	15
February	82	1	1	2	86	7
March	310	8	5	0	323	31
April	399	6	1	2	408	21
May	420	1	3	4	428	38
June	479	8	3	3	493	30
July	442	11	5	2	460	27
August	424	8	9	5	446	25
September	486	12	2	7	507	36
October	521	7	4	6	538	38
November	536	8	9	5	558	32
December	210	5	4	4	223	37
Totals	4,420	79	47	41	4,587	337

The following attachments were made in the wards.

Wards.	½-inch diameter.	⅝-inch diameter.	¾-inch diameter.	1-inch diameter.	Total holes drilled and attachm'ts made.	Shut-offs.
First District, 1, 2, 3, 4, 26	1,006	1	2	1	1,010	43
Second District, 5, 6, 7, 8, 9, 10, 24, 27	717	39	22	18	796	93
Third District, 11, 12, 16, 17, 18, 19, 23, 25	1,276	13	8	12	1,309	99
Fourth District, 13, 14, 15, 20, 21, 28, 29	998	16	12	2	1,028	91
Germantown	201	6	2	3	212	5
Manayunk	222	4	1	5	232	6
Totals	4,420	79	47	41	4,587	337

Statement of fire plugs in the different wards.

FIRST DISTRICT.

Number of plugs, as per last report,		852
First	Ward,	12
Second	"	2
Third	"	3
Fourth	"	2
Twenty-sixth	"	43
		914

SECOND DISTRICT.

Number of plugs, as per last report,		1,252
Sixth	Ward,	1
Eighth	"	1
Twenty-fourth	"	38
Twenty-seventh	"	33
		1,325

THIRD DISTRICT.

Number of plugs, as per last report,		1,449
Eighteenth	Ward,	1
Nineteenth	"	7
Twenty-third	"	28
Twenty-fifth	"	46
		1,531

FOURTH DISTRICT.

Number of plugs, as per last report,		855
Fourteenth	Ward,	1
Fifteenth	"	8
Twentieth	"	3
Twenty-eighth	"	25
Twenty-ninth	"	13
		905

GERMANTOWN.

Number of plugs, as per last report,		236
Twenty-second Ward,		29
Twenty-eighth "		5
		270

MANAYUNK.

Number of plugs, as per last report,		133
Twenty-first Ward,		35
Twenty-eighth "		6
		174

Total fire plugs in all the Wards, - - - - 5,119

The following shows the number of attachments made in the different districts during the year 1874, for fire purposes only, in places of public amusement, hotels, manufactories, &c.

Number, as per last report,		130
First District,	1	
Second "	3	
Third "		
Fourth "	2	
Germantown,	1	
Manayunk,	1	
	—	8
Total,		138

There are now 68 public drinking fountains supplied by the department, free of charge, as follows:

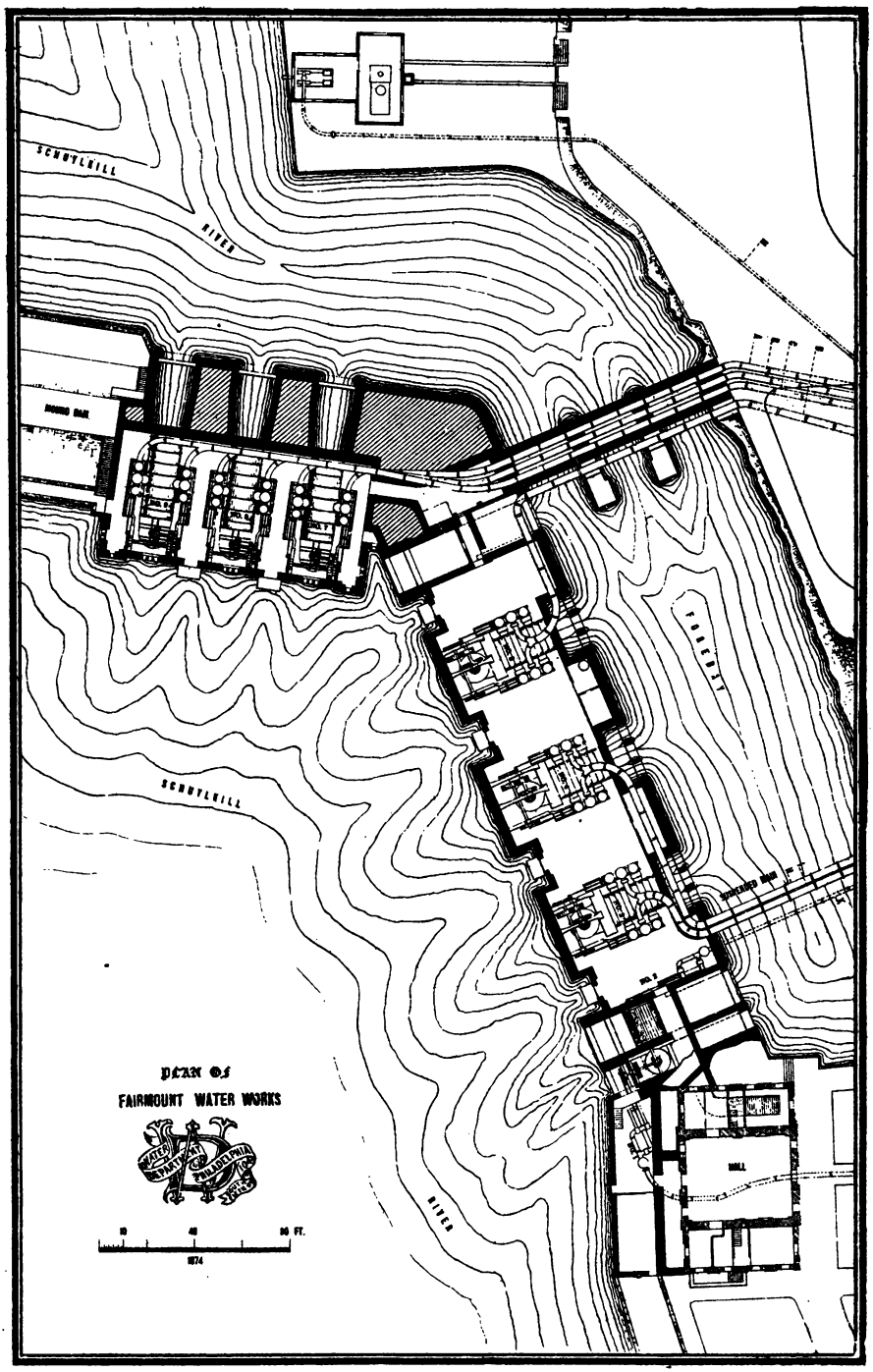
Erected by the Fountain Society, as per last report,	50	
Added during the year,	11	
	—	61
Erected by the Society for Prevention of Cruelty to Animals, as per last report,	6	
Added during the year,	1	
	—	7
Total,		68

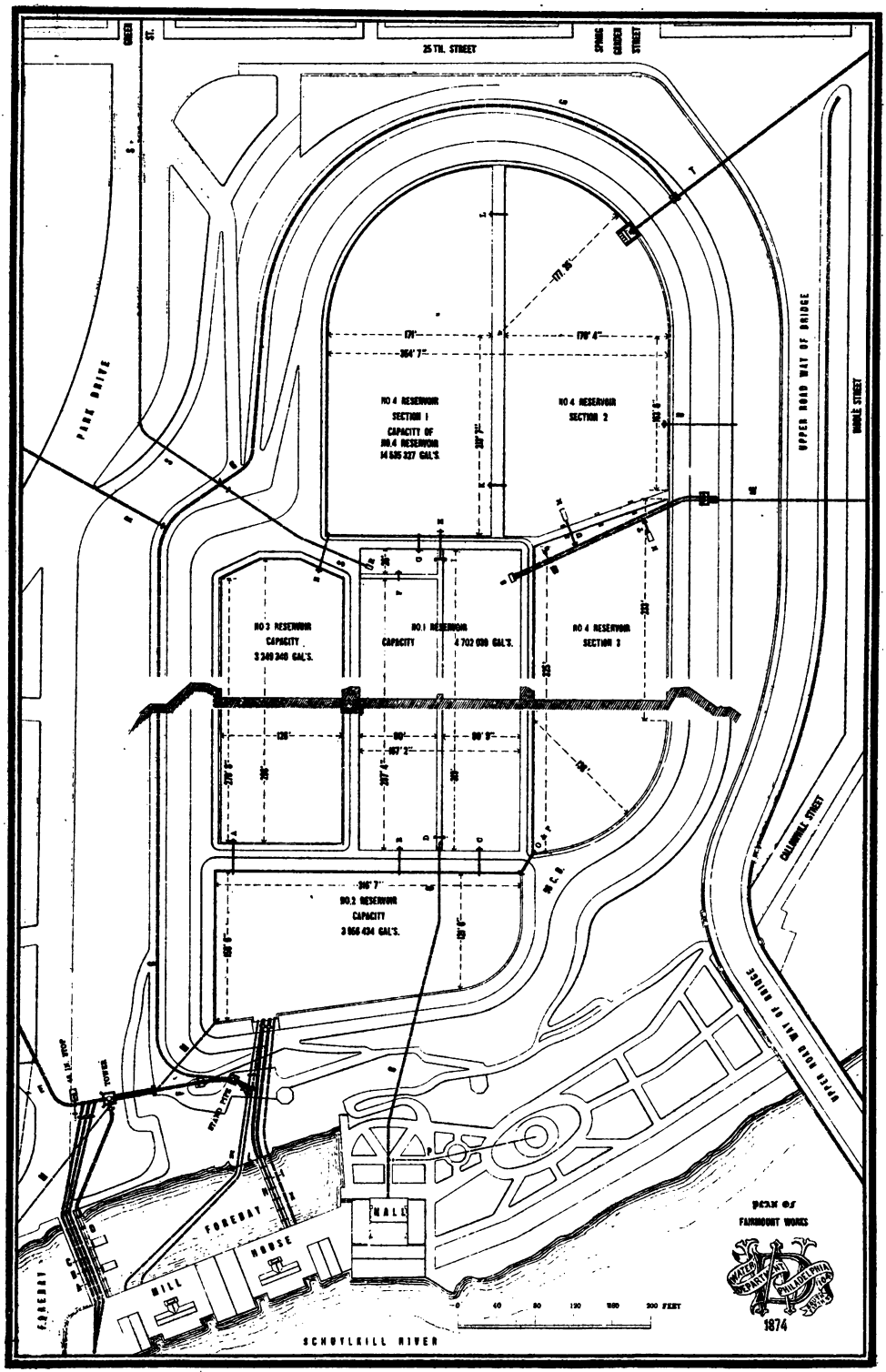
The following table exhibits the number of repairs to mains, stops, and plugs, by different districts, during the year 1874.

DISTRICTS.	Repairs to mains.	Repairs to stops.	Repairs to plugs.
First, - -	71	397	760
Second, - -	41	366	489
Third, - -	104	264	556
Fourth, - -	130	405	1,024
Germantown,	23	138	77
Manayunk, -	28	22	46
Totals, -	397	1,592	2,952

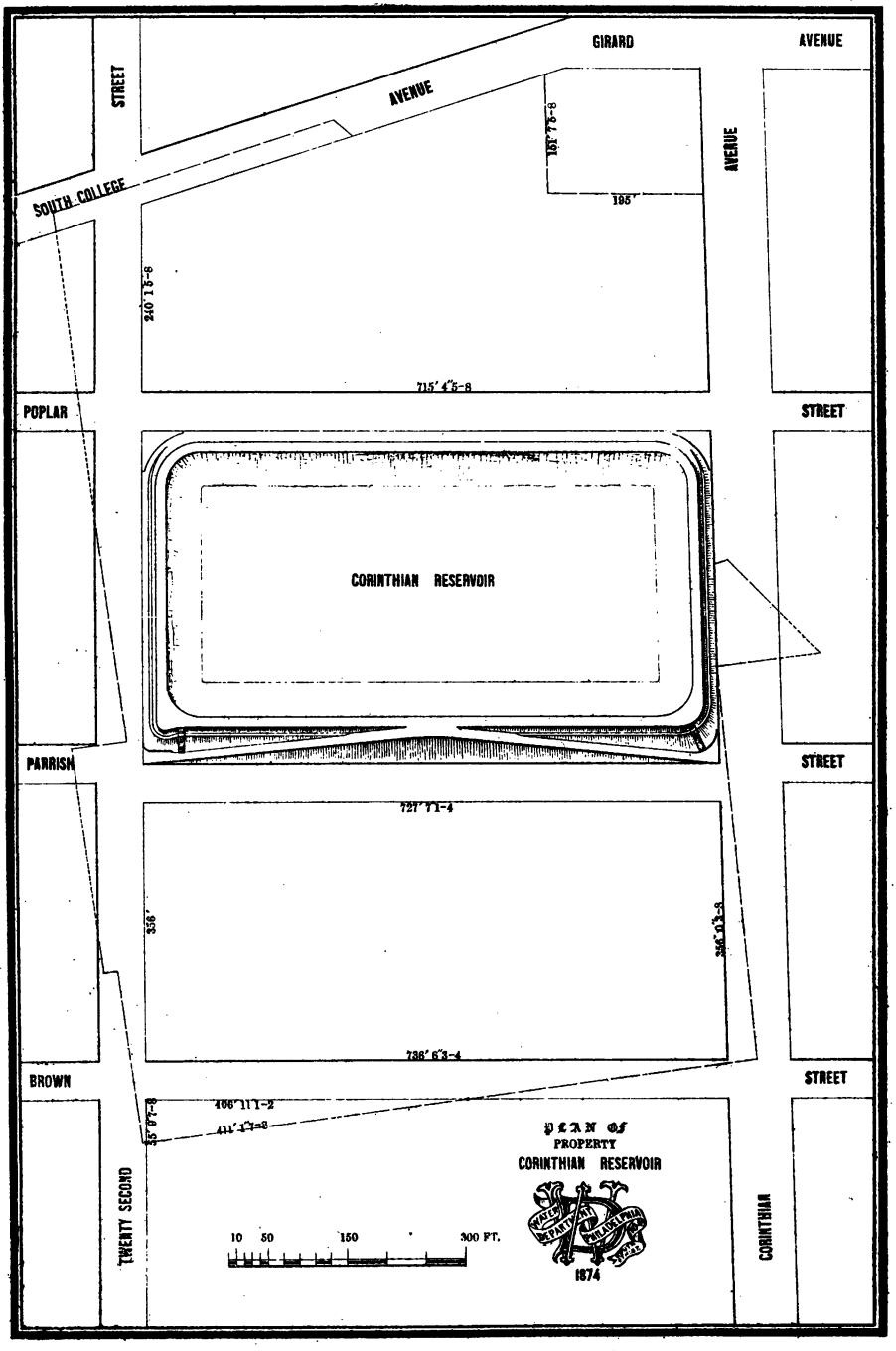
Account of new stops and fire-plugs for 1874.

DISTRICTS.	No. of stops.	No. of plugs.
First, - - - - -	73	62
Second, - - - -	91	73
Third, - - - - -	172	82
Fourth, - - - -	114	50
Germantown, - - -	54	34
Manayunk, - - - -	33	41
Totals, - - - -	537	342





PHILADELPHIA PHOTO-LITHOGRAPHIC CO., 410 CHESTNUT STREET



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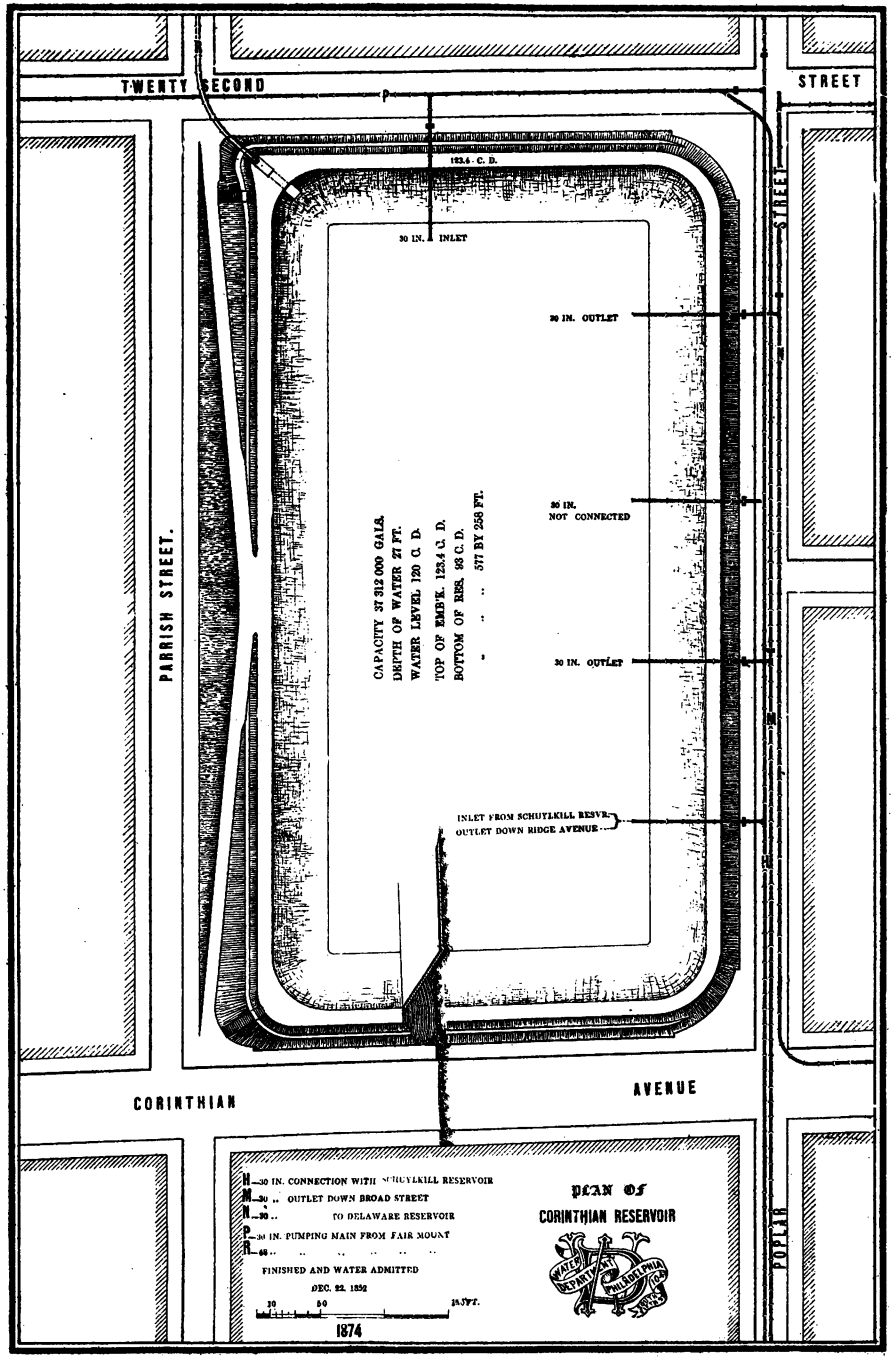

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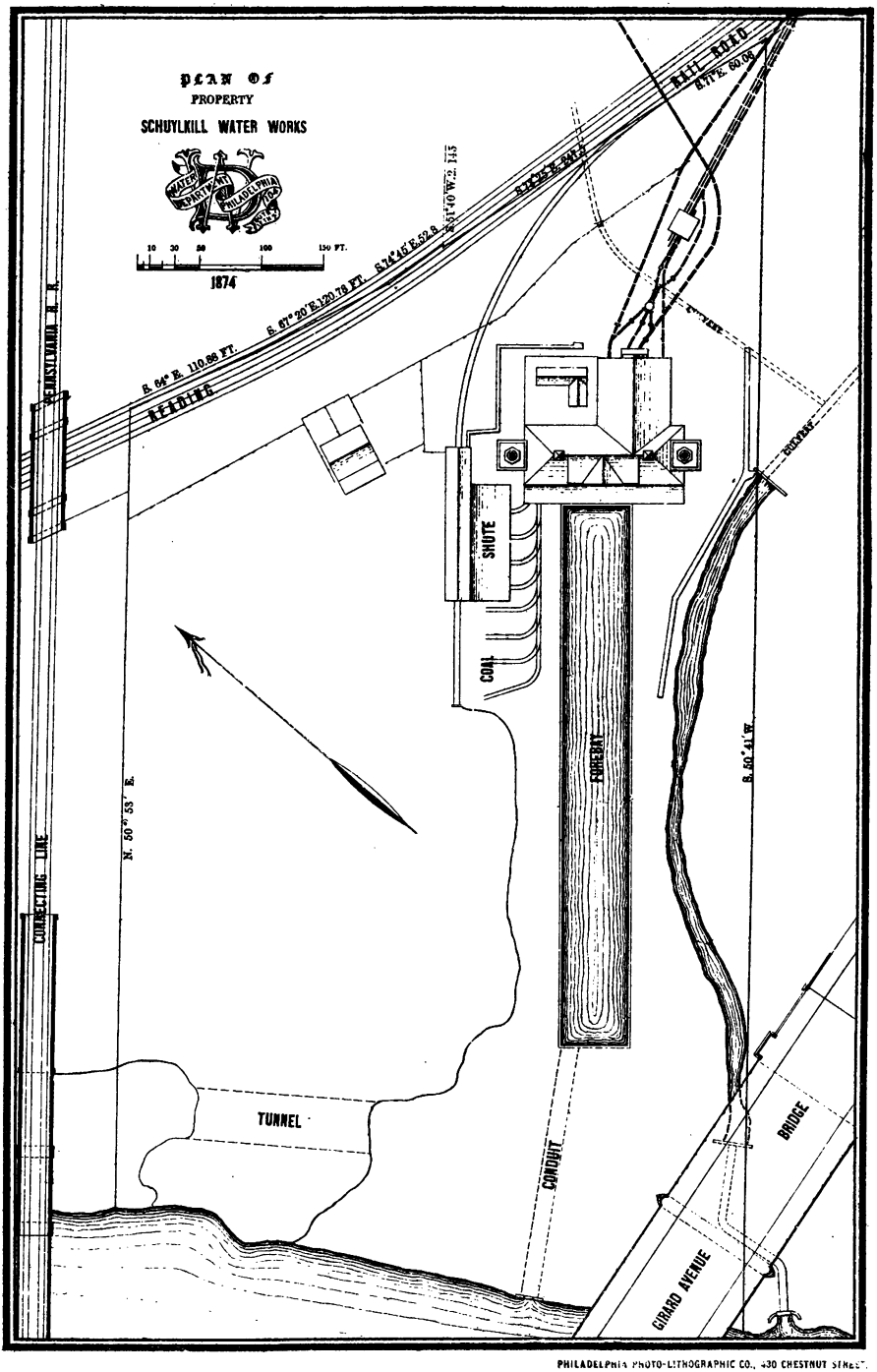

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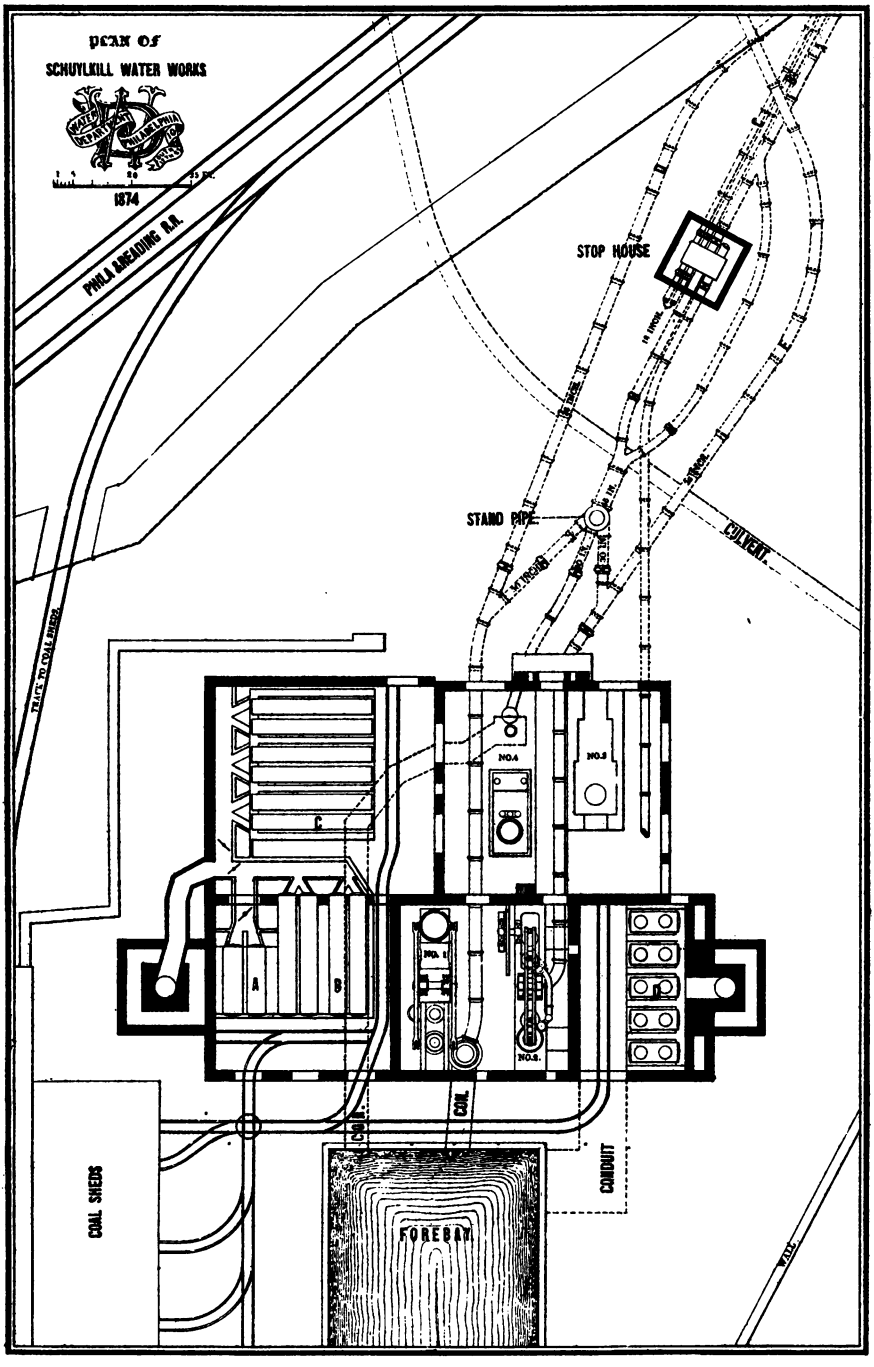

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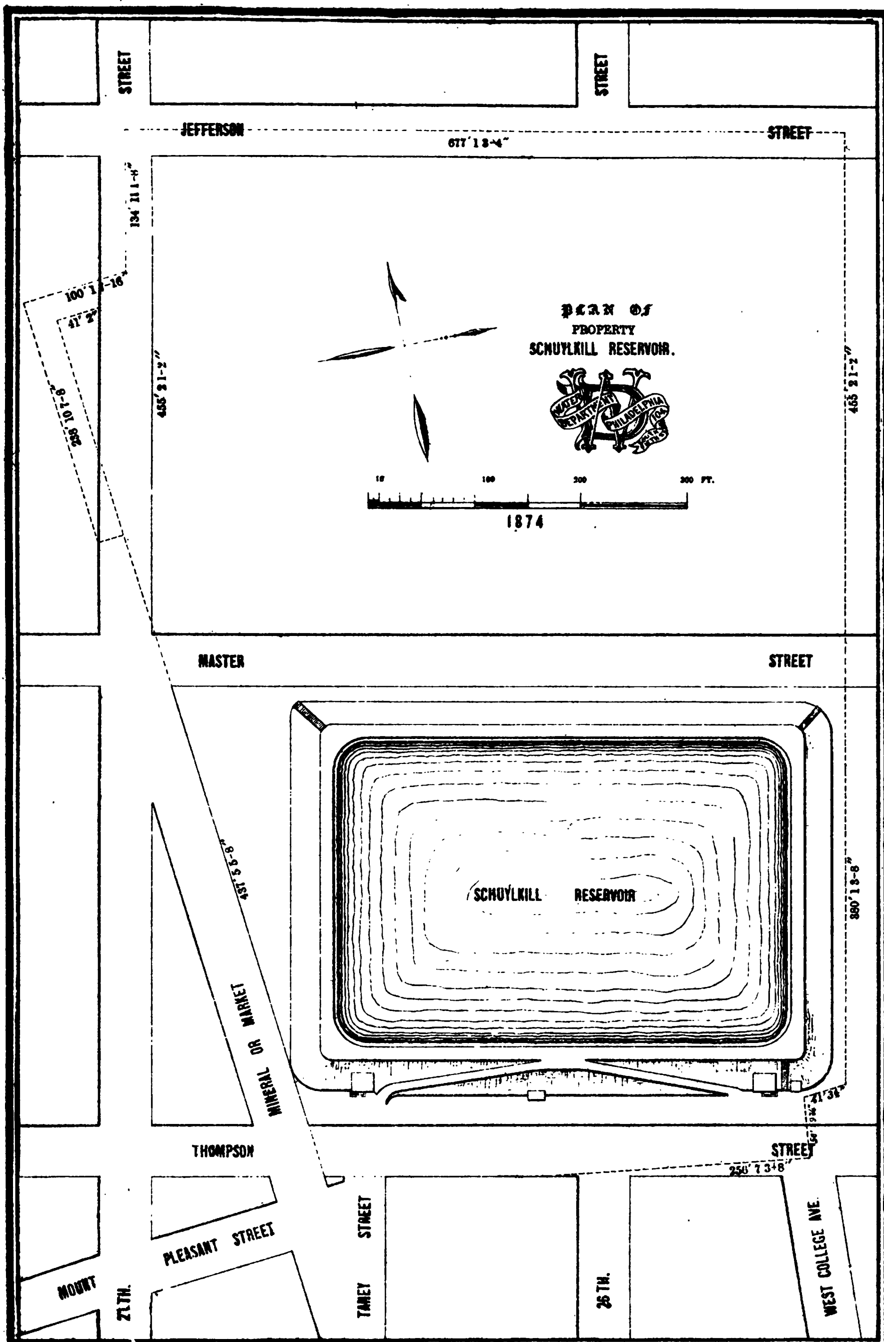

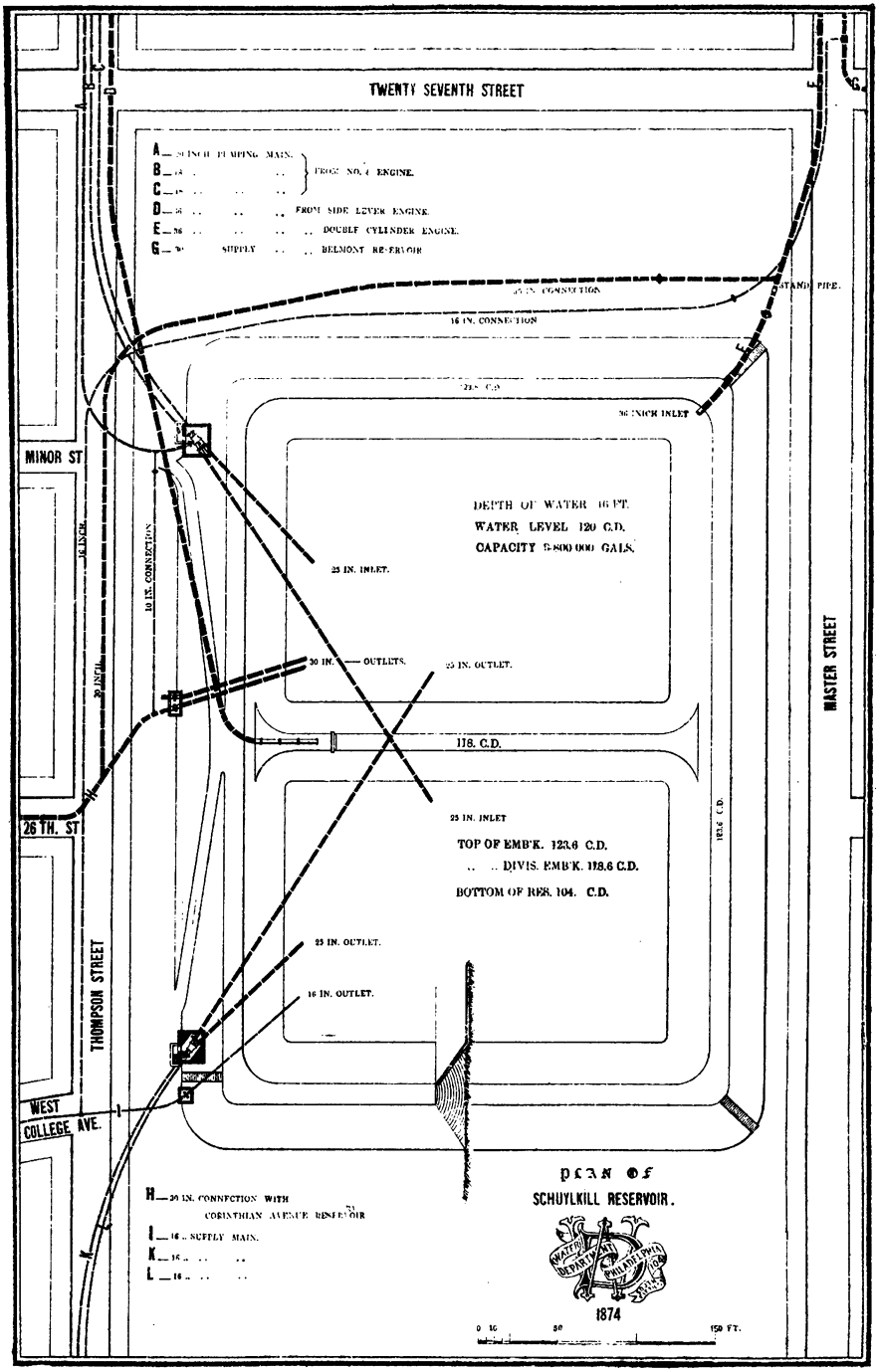

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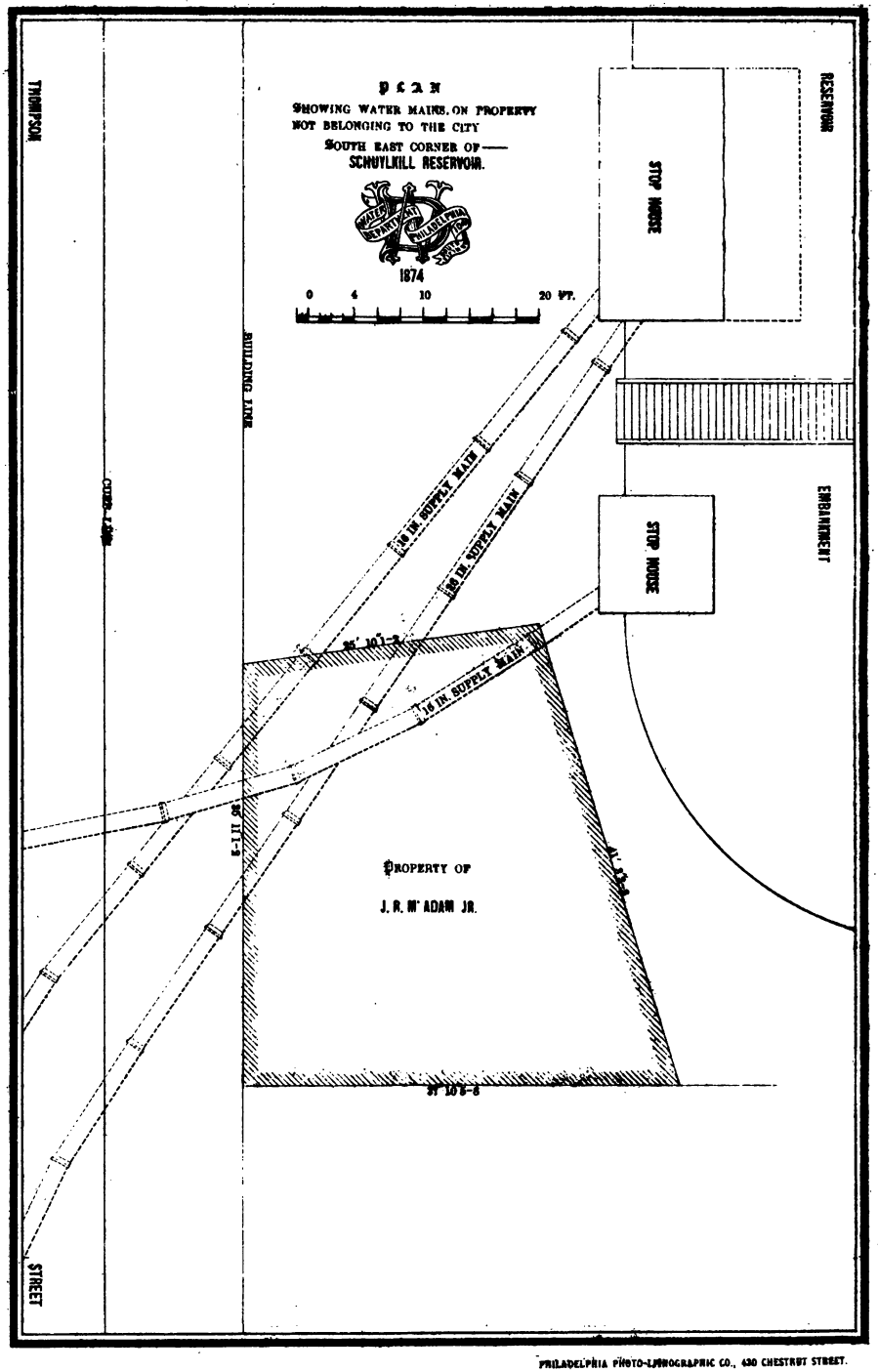

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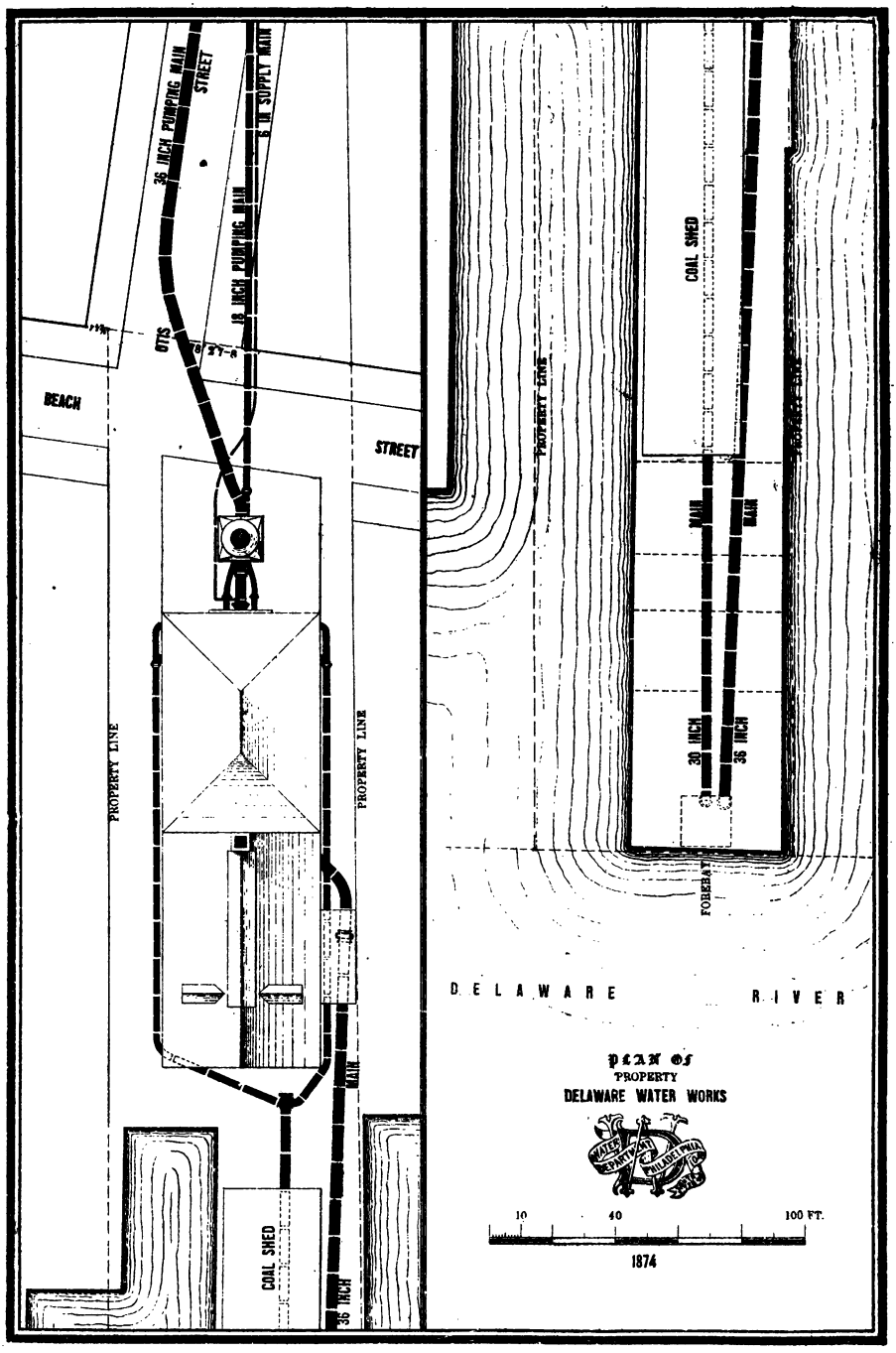

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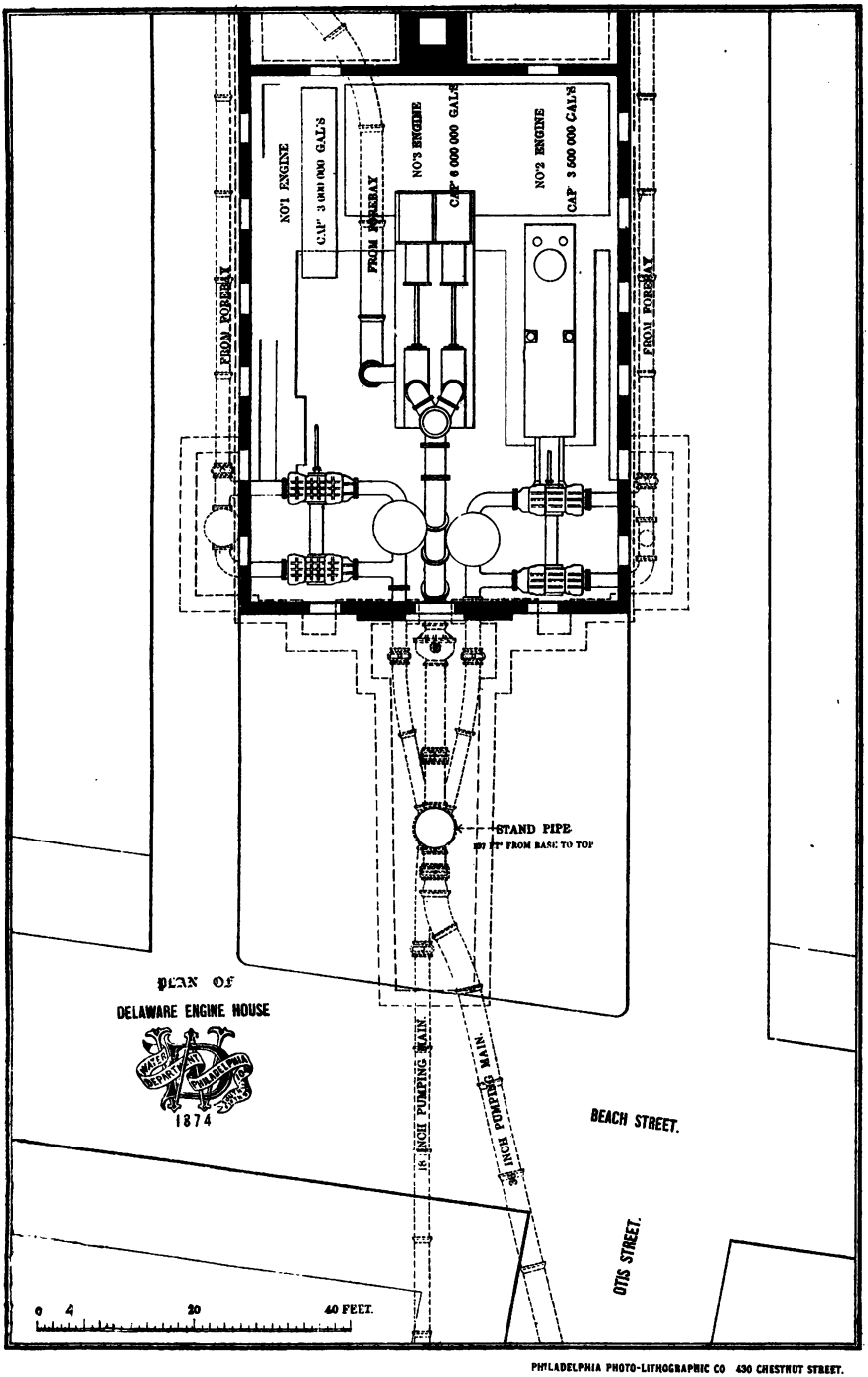

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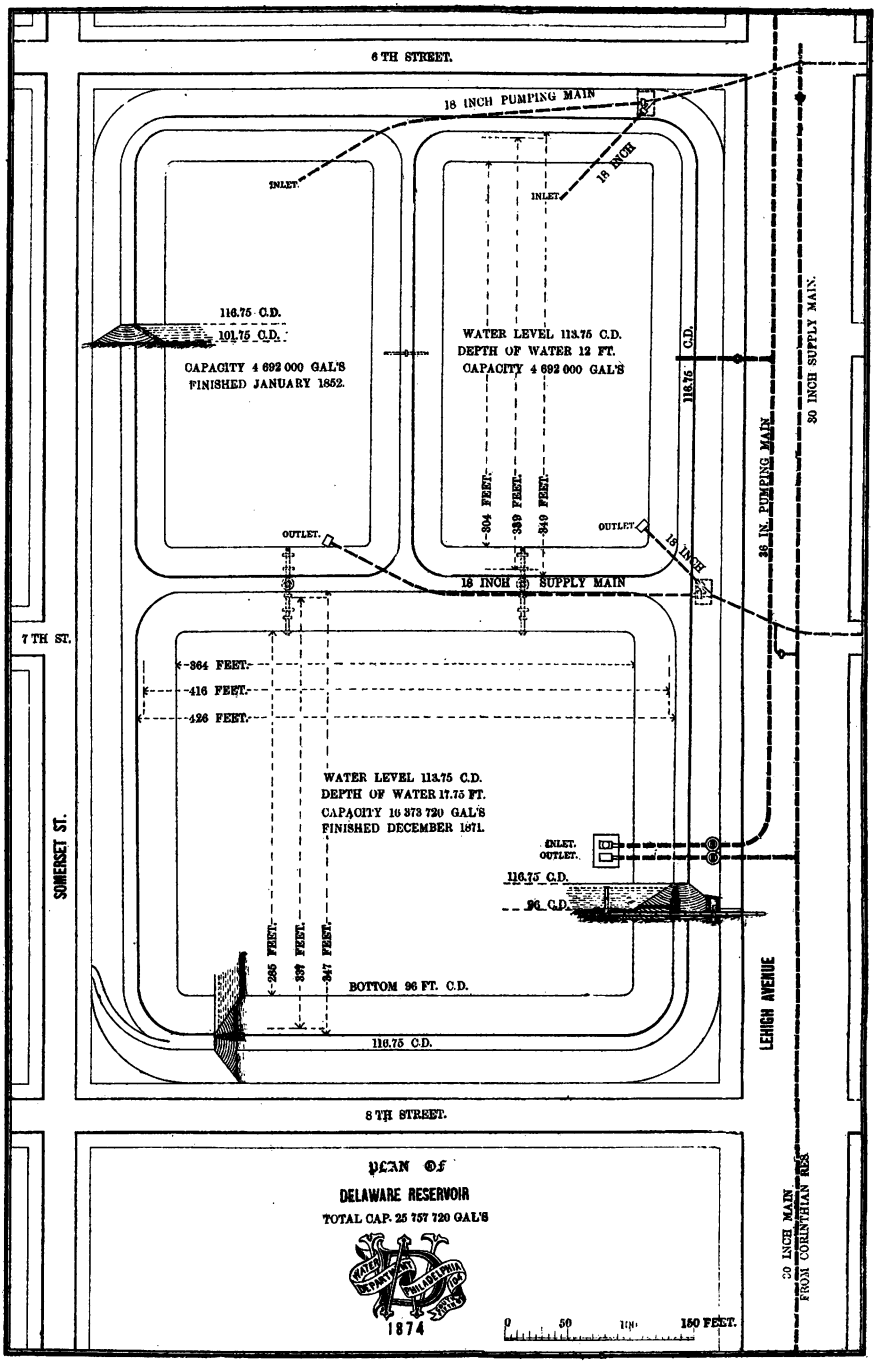


PHILADELPHIA PHOTO-LITHOGRAPHIC CO., 430 CHESTNUT STREET.

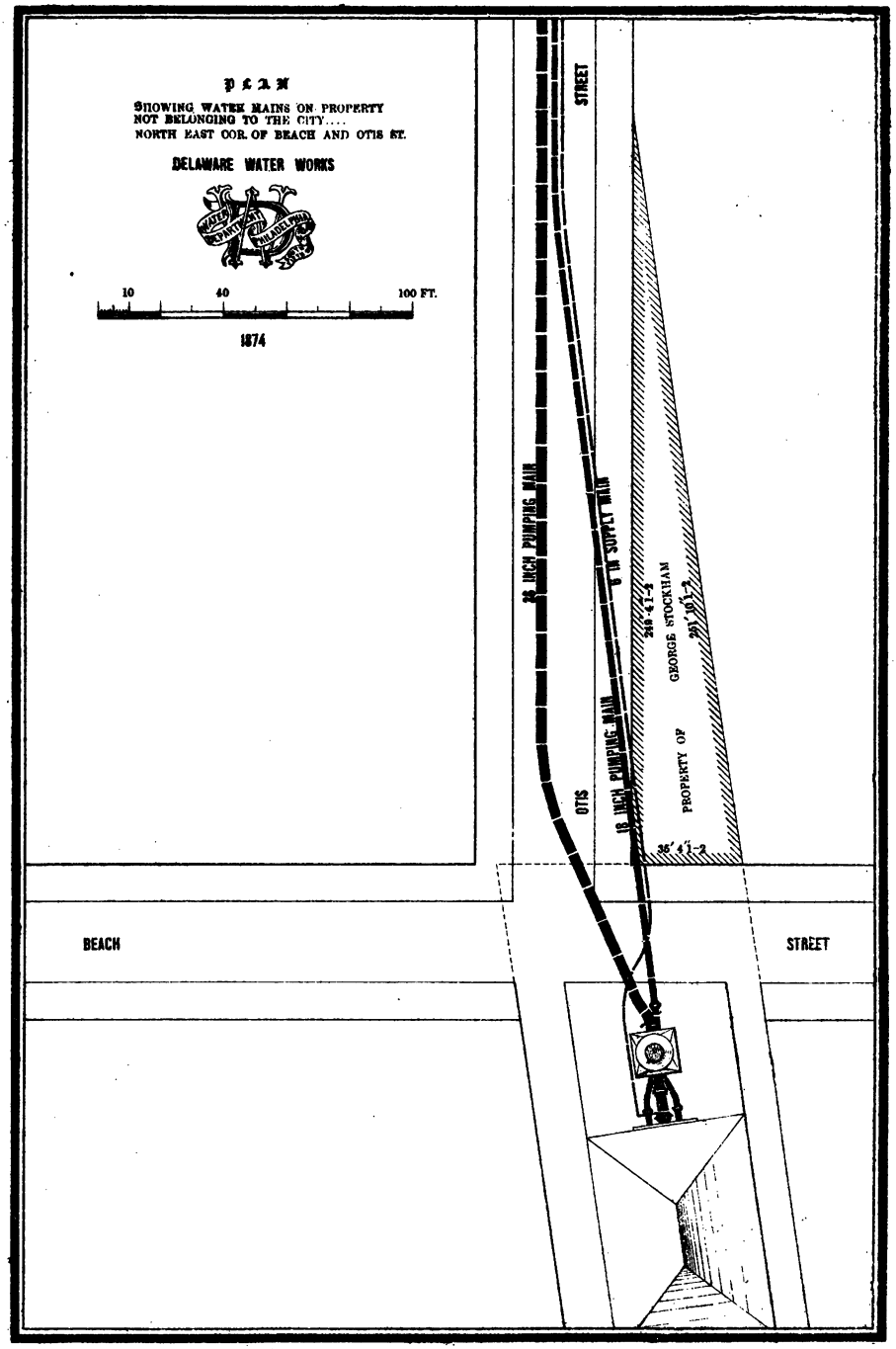
PLAN

SHOWING WATER MAINS ON PROPERTY NOT BELONGING TO THE CITY.... NORTH EAST COR. OF BEACH AND OTIS ST.

DELAWARE WATER WORKS

10 40 100 FT.

1874



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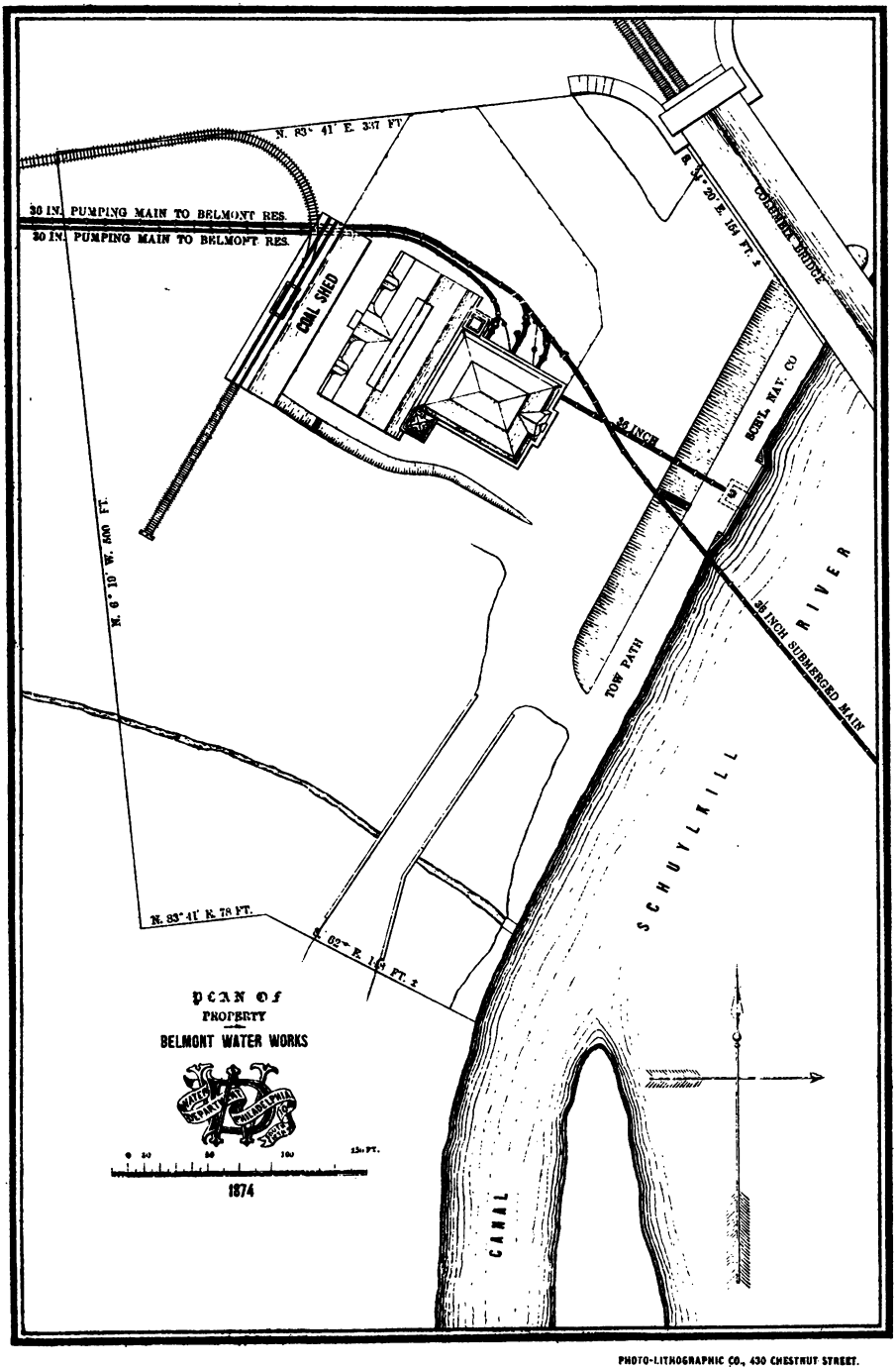

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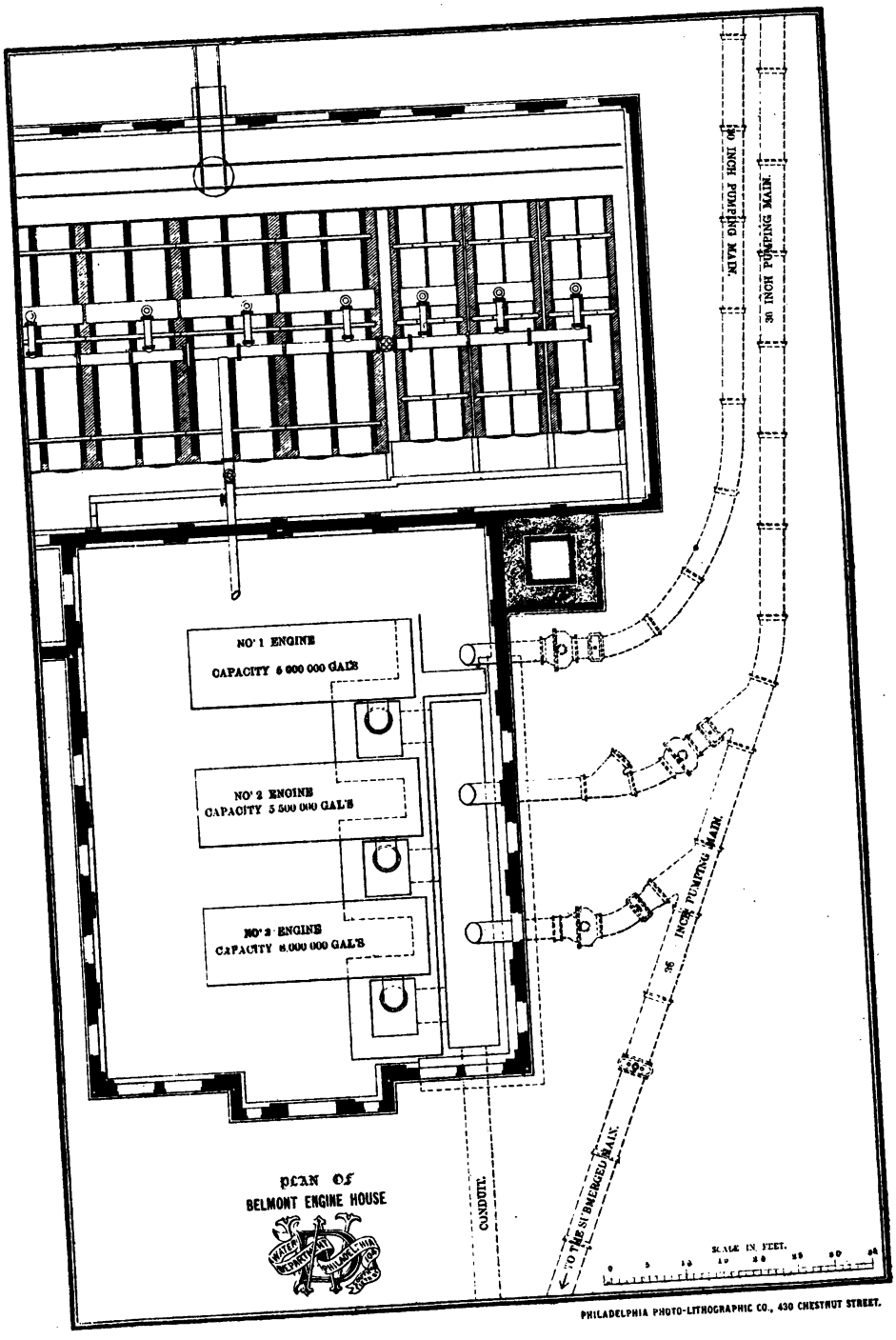

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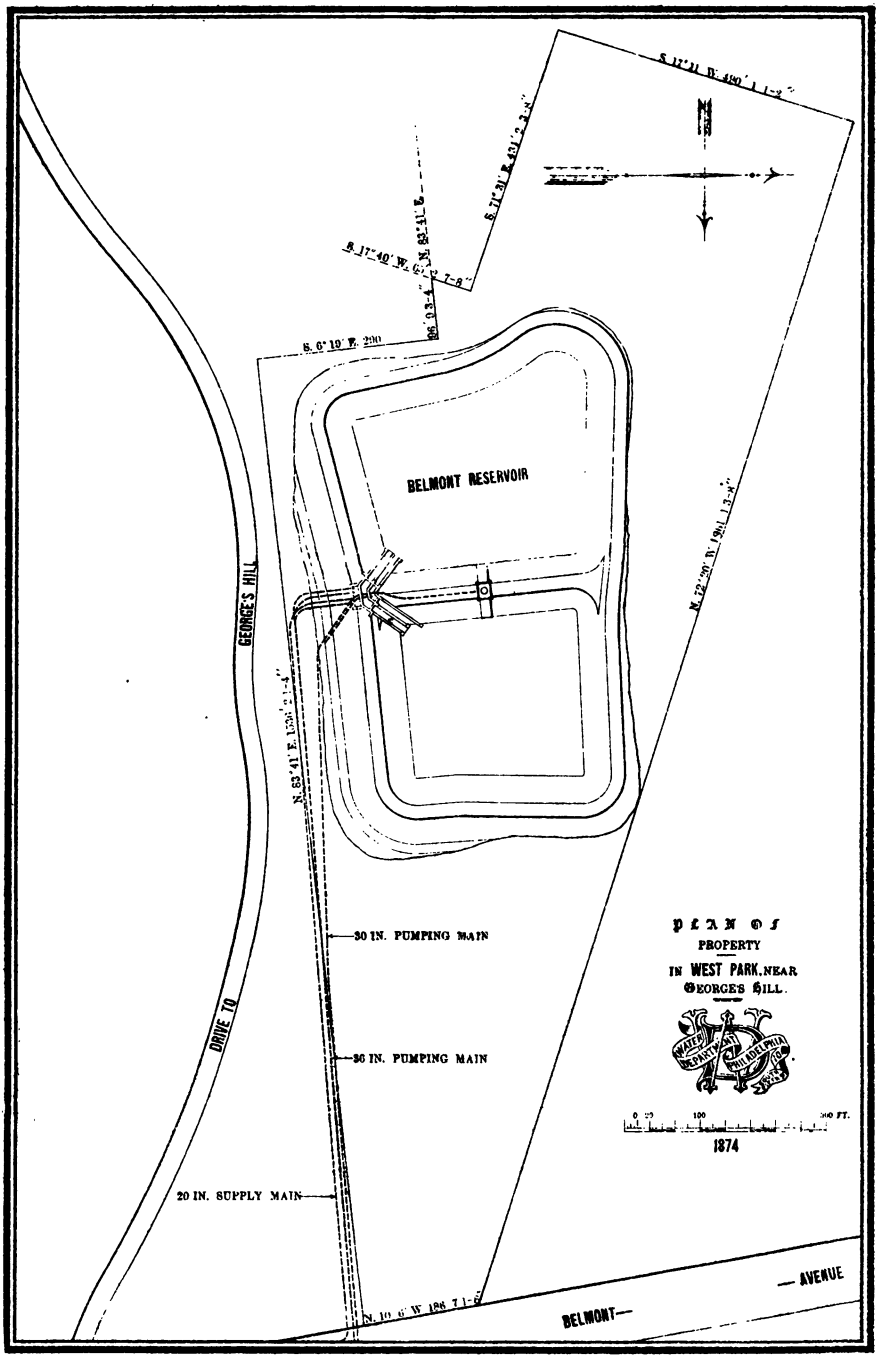

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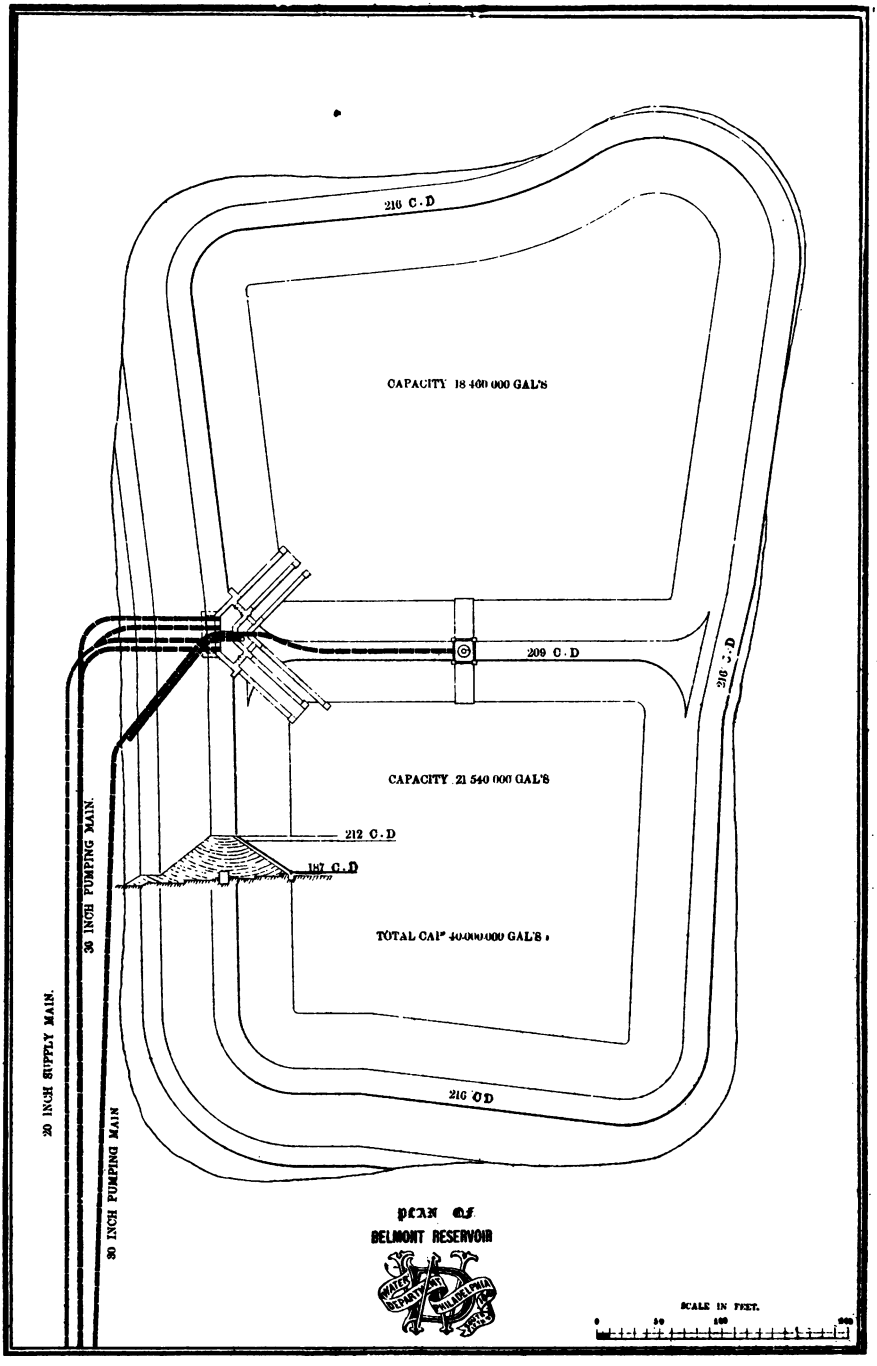
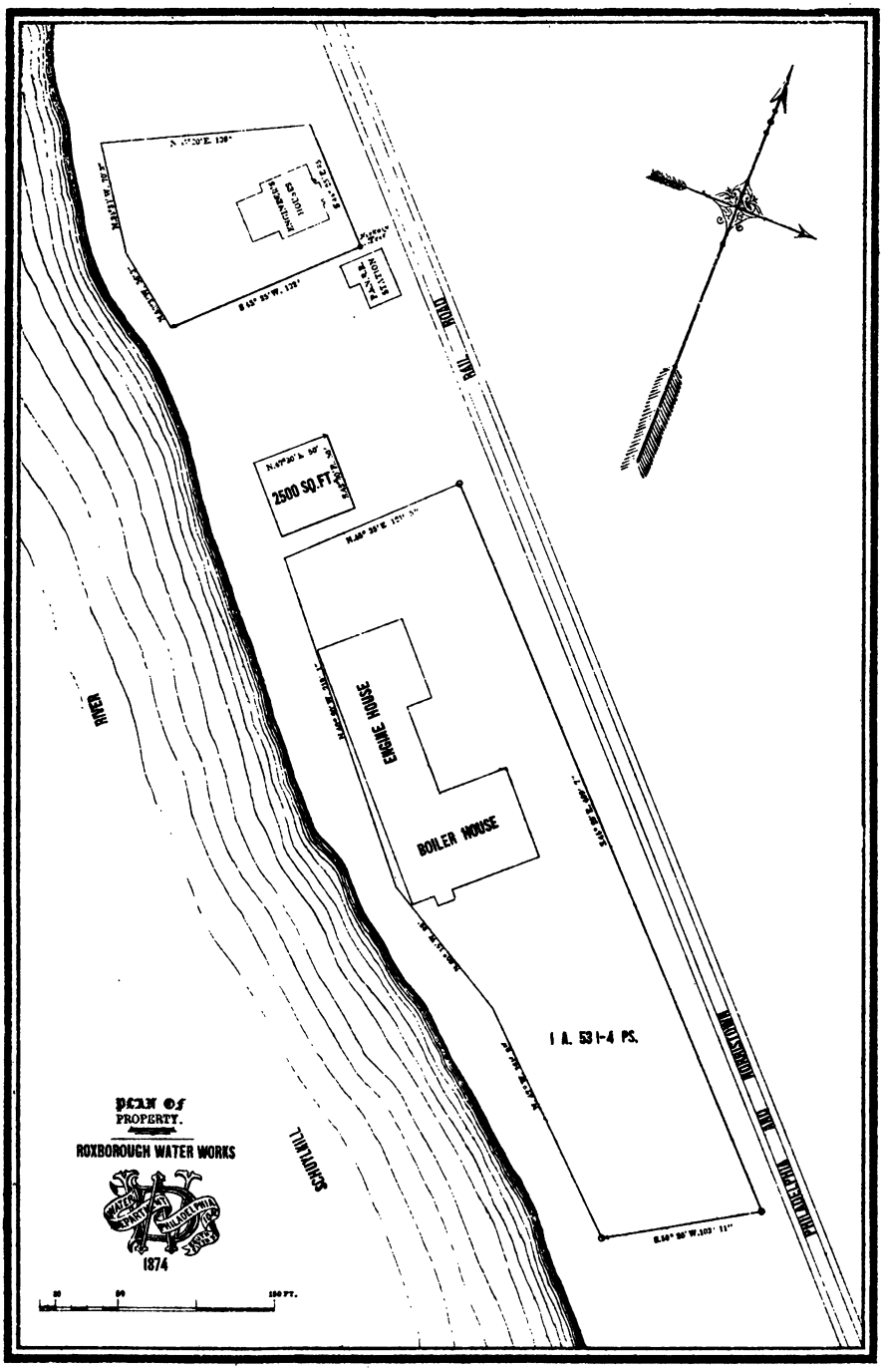


PLAN OF
BELMONT RESERVOIR

PHILADELPHIA PHOTO-LITHOGRAPHIC CO. 430 CHESTNUT STREET.



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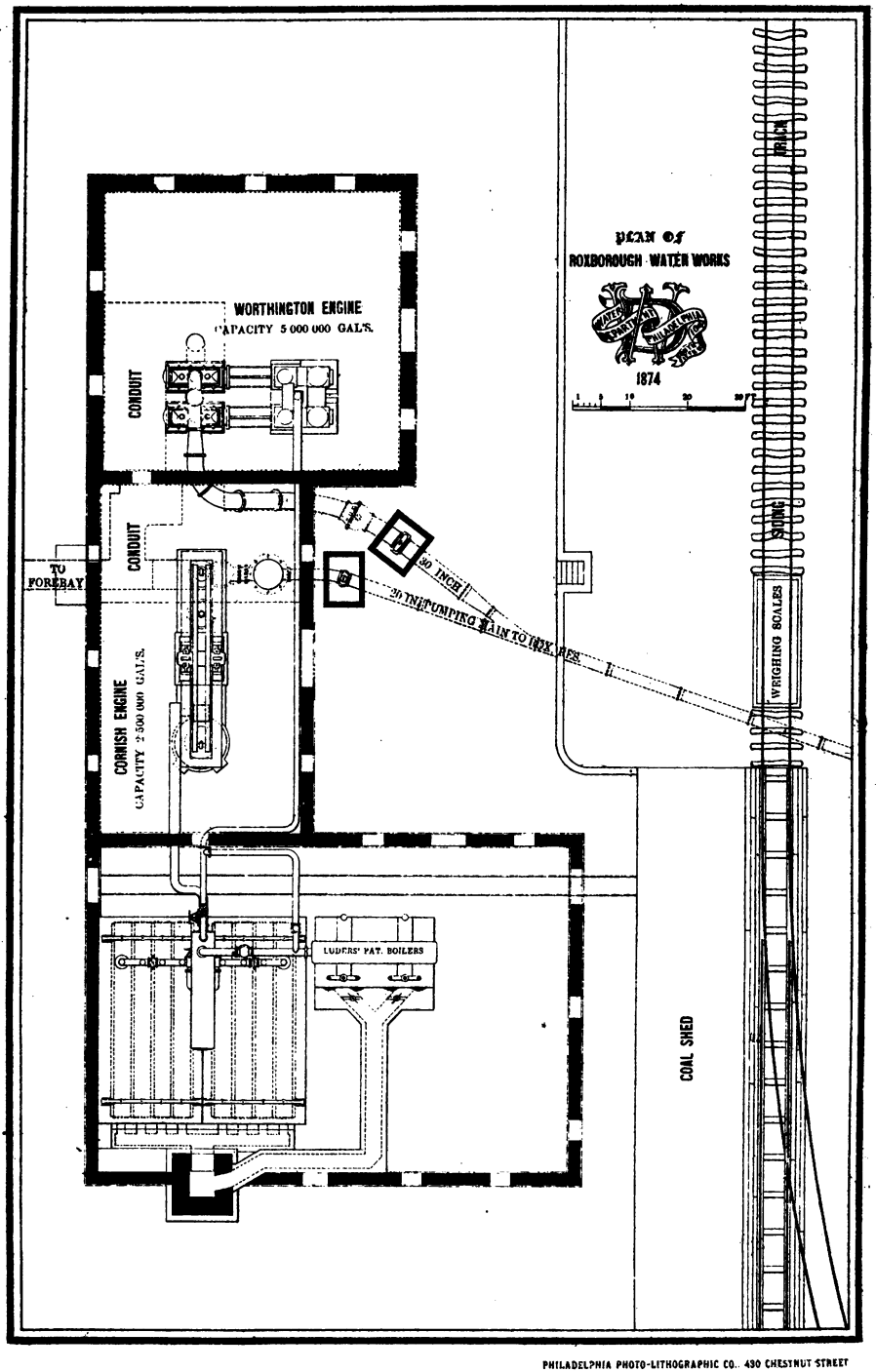

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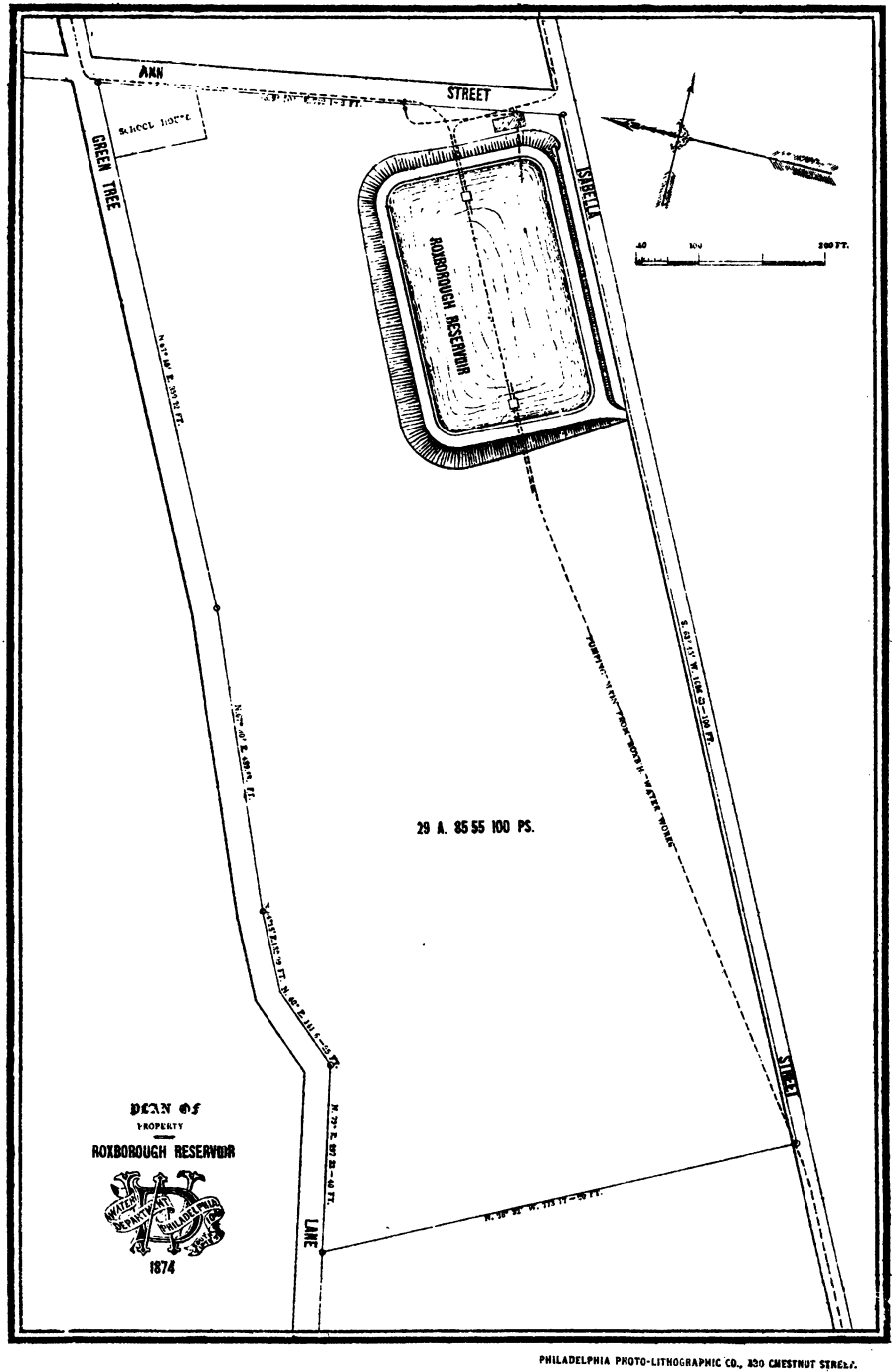
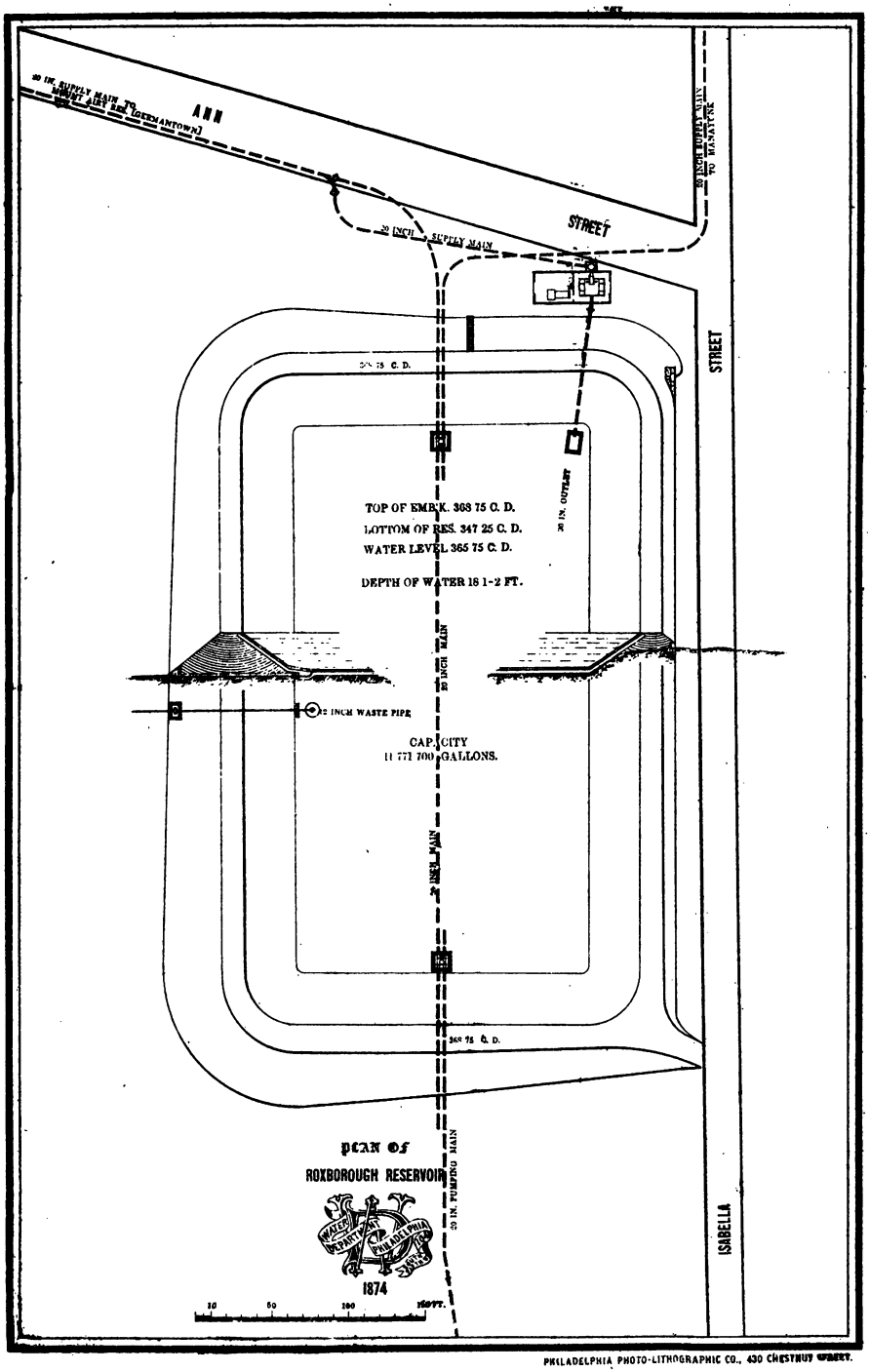


PHILADELPHIA PHOTO-LITHOGRAPHIC CO., 230 CHESTNUT STREET.



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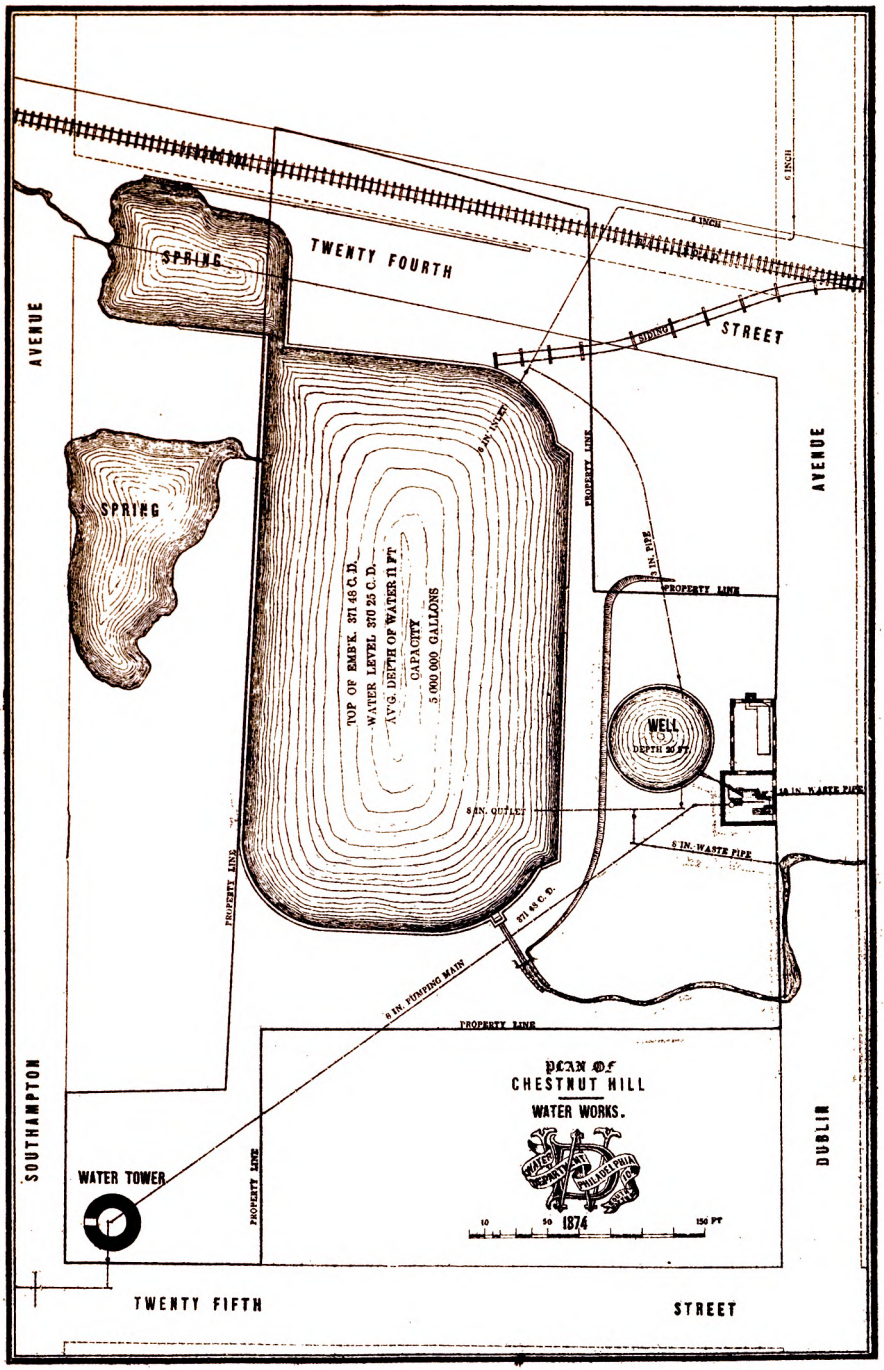

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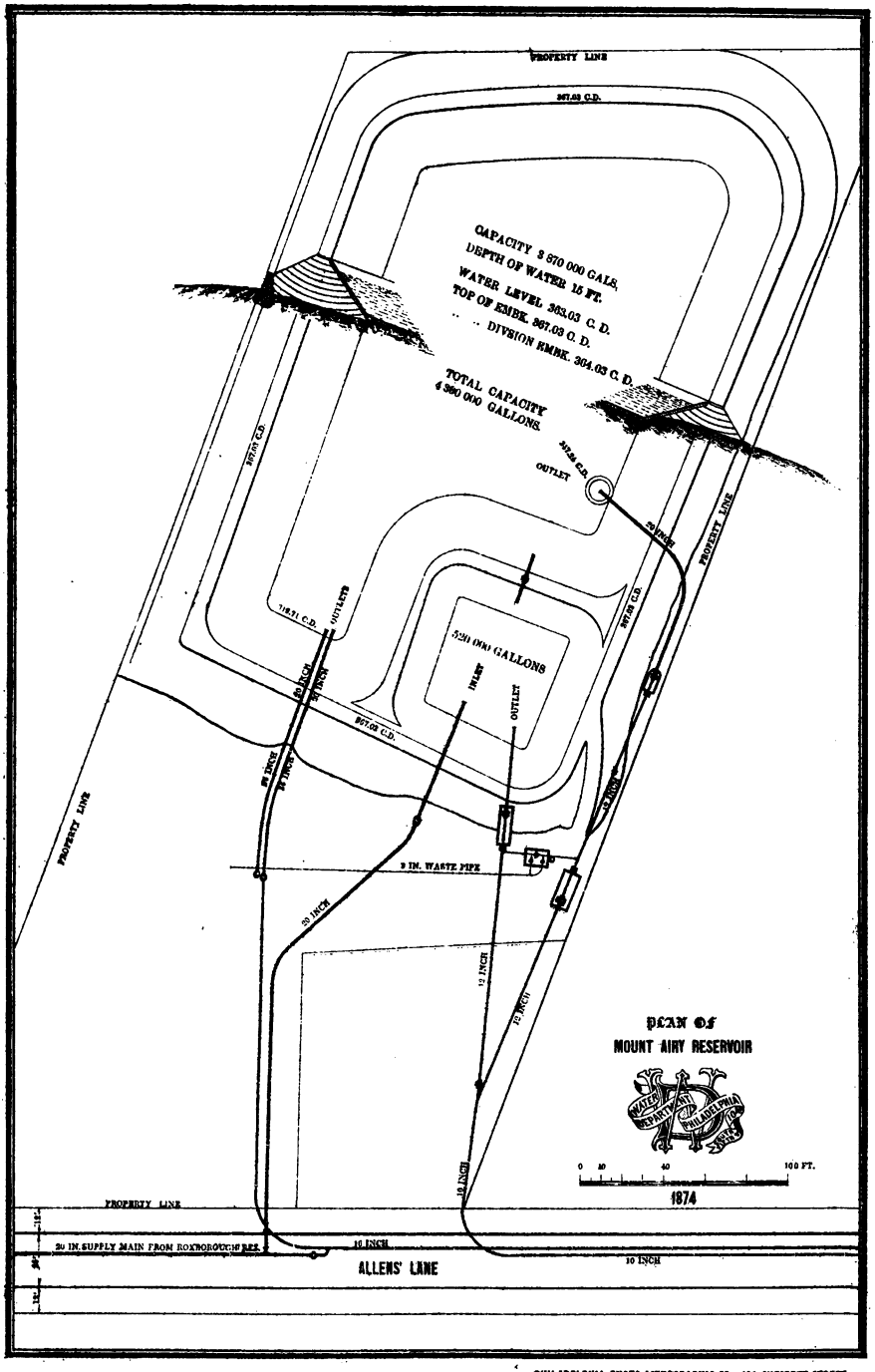

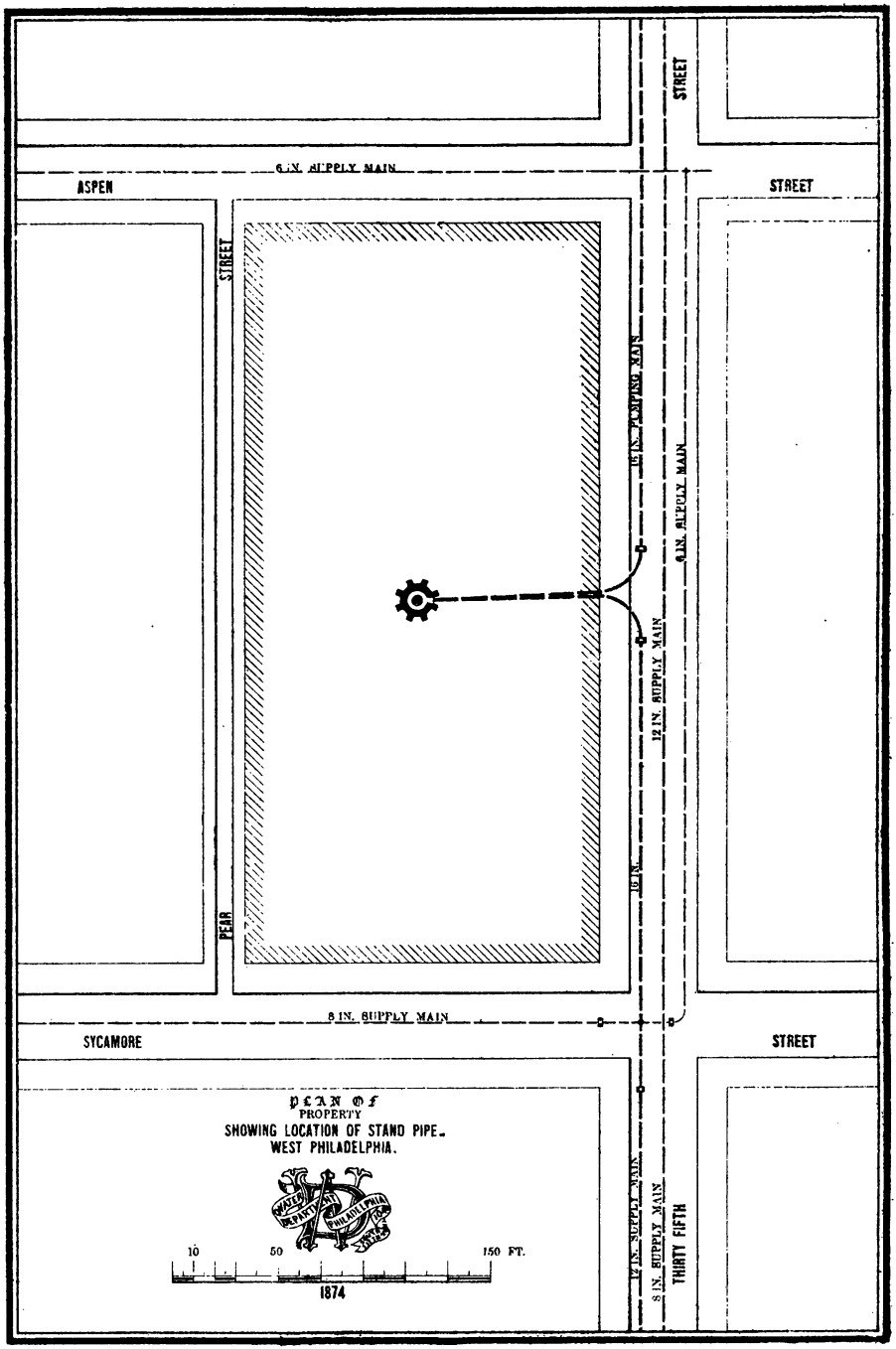

PHILADELPHIA PHOTO-LITHOGRAPHIC CO., 430 CHESTNUT STREET.