Department for Supplying the City with Water.

ANNUAL REPORT

OF THE

Chief Engineer of the Water Department

OF THE

CITY OF PHILADELPHIA,

Presented to Councils, January 30th,

1873.

PHILADELPHIA:
E. C. MARKLEY & SON, PRINTERS, 422 LIBRARY STREET
1873.

With the Compliments of

FREDERIC GRAFF,

Chief Engineer.

Department for Supplying the City with Water.

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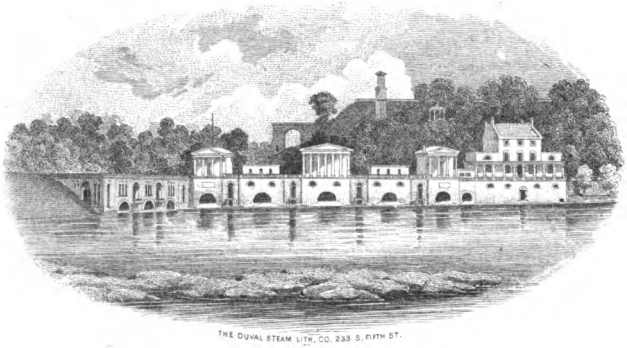
Chief Engineer of the Water Department



THE DUVAL STEAM LITH. CO. 233 S. FIFTH ST.

CITY OF PHILADELPHIA,

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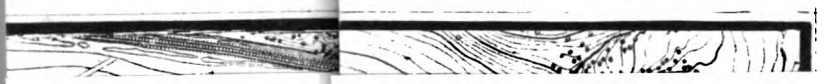

COMMITTEE ON WATER WORKS, 1872.

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Wm. F. Miller,
W. W. Burnell, M. D.,
Wm. B. Hanna,
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Samuel L. Snyder,
Wm. E. Littleton, *Ex. Off.*

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Jas. Bowker,
Jacob M. Davis,
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Wm. Wright,
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Chief Engineer:—FREDERIC GRAFF.

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GEORGE S. MACAULEY, CHARLES ZELL,
T. WEST BLAKE, JAS. H. WATSON.

Messenger:—WM. FORMAN.

Inspectors,

John F. Schiedt,	J. S. Walters,	Jacob L. Warner,	W. L. Stiles,
W. F. Totten,	E. Bowlby,	Peter B. Long,	W. Buggy,
Wesley Stephenson,	M. K. Stuart,	F. M. Pfouts,	E. E. D. Thomas.

Purveyors,
First District—E. B. Cobb, Office, 807 Reed Street.
Second District—Samuel M. Fox, Office, 918 Cherry Street.
Third District—John H. Jeffries, Office, 1420 Frankford Road.
Fourth District—Jacob C. Apple, Office, Corinthian Ave. and Brown St.

Engineers at Works,
Fairmount Works—Joseph Moyer, Wm. Wright
Schuylkill Works—Joshua Bartley, David Pyke.
Delaware Works—Benjamin F. Norman, Joseph Thompson.
Twenty-fourth Ward Works—Abraham Stott, Chris. Betzold.
Roxborough Works—Johnson Hughes, W. H. Saunders.

James M. Kreamer—In charge of Storage Reservoir.
Robert N. Bowers—In charge of Fairmount Dam, and Gen'l Superintendent.
David R. Griffith—Superintendent of City Shop.

Draughtsmen,
John L. Ogden, J. Harry Stewart.

REPORT.

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

GENTLEMEN:—A brief record of the business transactions of the Department for Supplying the City with Water, and a detail of the condition of the several works under its charge, will be found in the following pages.

The rebuilding of the mill-house at Fairmount, and the construction of new turbine wheels and enlarged pumps, which have been in progress for several seasons, are entirely completed, the last wheel having been started to work late in the year 1871. The work was delayed about eight months on account of the necessary loan not having been promptly passed, whereby the greater part of one season suitable for such work was lost. The mill-house and its contents present a neat, substantial appearance—in strong contrast with the shameful state of dilapidation in which they were found when I took charge of the works in March, 1867.

The exterior walls of the building are of Leiperville cut stone, laid in cement; the roof is of iron girders and brick arches; the floors of flag stone; the platforms and staircases only are of wood. A steam heating apparatus has been put up by Messrs. Pancost & Maule, which, from one fire, heats the whole house comfortably, and secures the works from danger of frost in the coldest weather.

A vignette, showing the exterior appearance of the house, will be found upon the title page of this report.

There are yet two old breast wheels in the two ends of the house, one of them still useful, the other in the useless condition in which it was found in 1867. Drawings have been made for the substitution of a turbine wheel and new pump in place of the latter, which can be put in without disturbing the building. Provisions for attaching the pump to the mains having been already made in anticipation, it is hoped that the work will be authorized at an early day.

Members of Councils and others unacquainted with the facts of the case, have intimated that the improvement of the water power works at Fairmount was not judicious, assuming because a drought of unprecedented severity occurred in 1869, causing much inconvenience and delay, that there is not sufficient water to supply additional wheels.

It must be remembered that the new wheels are of an improved kind, and much more economical in the use of water than those now removed. It is quite true that there are times when the supply of the stream is not as ample as is desirable, but there has always been an adequate supply for eight or ten months of the year, and even if the wheels had to be stopped entirely during two or three months each year (which has never yet been the case), it would still be good policy to increase the power to the extent allowable in the present mill-house (and no more has been proposed) on account of the very much greater economy of raising the water by water power than by steam.

The cost in 1871 for raising one million gallons one foot high by water power was one and thirty-eight hundredths of a cent, whilst to do so by steam power cost from eight and five-tenths of a cent to nineteen and nine-tenths of a cent.

In the year 1871, 8,821,728,593 gallons were raised by water power at Fairmount, at a total cost of $12,229.96. To have raised the same quantity by the cheapest of our steam works (Belmont) would have cost $74,984.69, and at the most expensive of our works (then the Delaware Works) the cost would have been $175,552.39. I therefore consider it proper to im-

prove the water power even if it could only be used one half of the year.

When the old Twenty-fourth Ward Works were abandoned, it left the small duplex engine, which had done such good service (first at Schuylkill Works and afterward at the Twenty-fourth Ward Works), at our disposal; it was moved to Fairmount and re-erected in an ornamental building constructed to receive it, upon the old wharf next south of the steamboat landing. An old tubular boiler, brought from the Delaware Works, after being repaired, was used to supply the steam, a twelve-inch main was laid to the stone stand pipe tower and carried vertically up the inside of the tower into the northwest corner of reservoir No. 2.

This engine gave us the ability to increase our supply in Fairmount reservoirs to the extent of nearly three million gallons per day. The apparatus was used to advantage nearly two months of the hottest weather.

The important work of building a new dam was commenced June 1, 1872; it is built immediately in front of the old one, upon the rock at the west end, and upon the cribs sunk in 1865, at the east end. It was at first thought that this crib was not sufficiently good to carry the new dam, but a thorough examination induced its use; with the precaution, however, of sinking a new crib in front of the old one, and of taking out and reconstructing about thirty feet of its eastern end, which was found to be insecurely founded upon a pile of loose stones. These have been removed, and a new section of crib will be sunk to the solid rock.

A crib of solid timber has been sunk at the eastern terminus of the new dam, upon which a stone pier will be built early in the spring; the crib will be loaded with stone during the intervening time, so that it may settle as much as possible before the masonry pier is put upon it. The location for this pier was cleared entirely of all loose stone and other material by the aid of dredges and submarine divers; it is founded securely upon

the solid rock, in some places 24 feet 9 inches below ordinary low tide.

The stone for the masonry is already dressed; prepared for setting as early as the next season will permit.

The stone for filling the dam was quarried upon the grounds of the Park, on the west side of the river, upon a location selected for a proposed Park road; two objects are thereby accomplished: filling the dam at a reasonable cost and commencing the bed of the future Park drive.

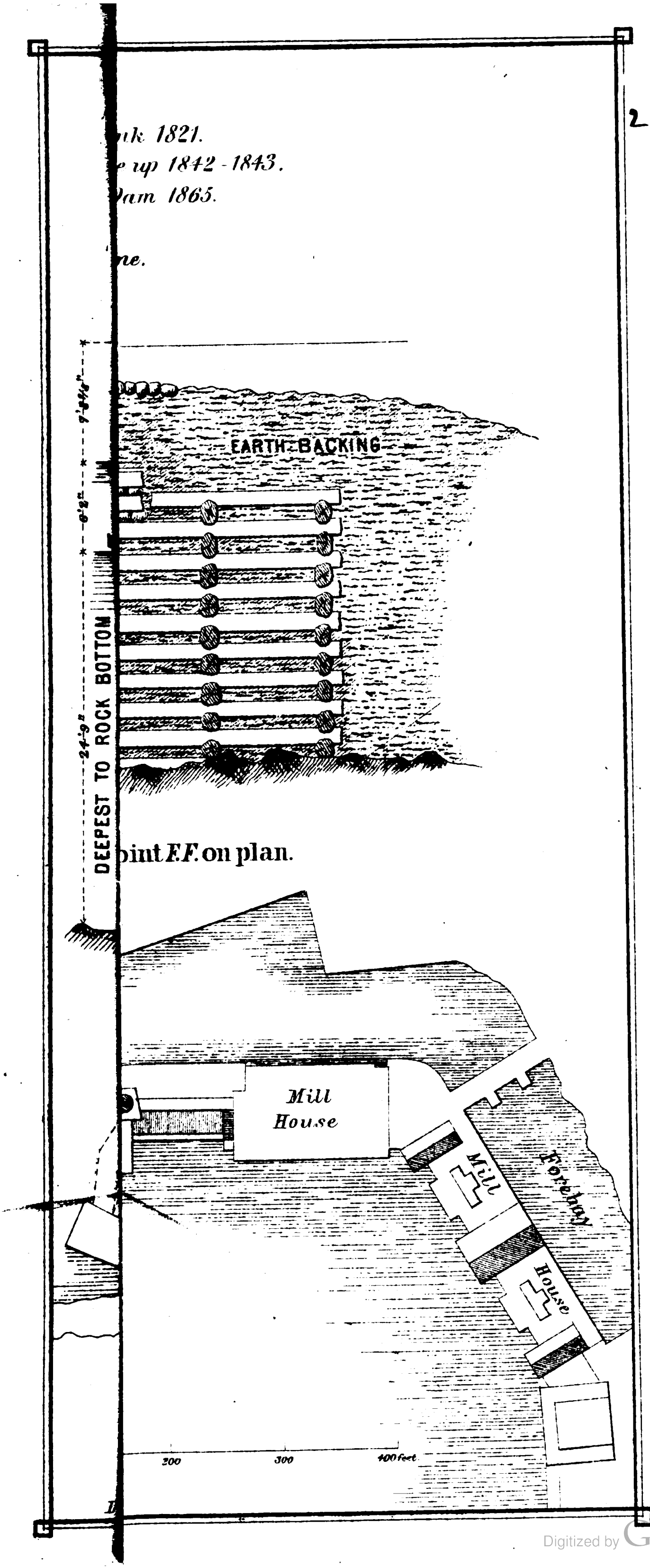
Two freshets occurred during the autumn, which carried away the temporary coffer dam erected on the comb of the old dam. This caused a delay of about a month, and has unfortunately prevented the completion of the dam. The thirty foot section of crib, and about 40 feet of the dam being unfinished, no part of the intended crib has yet been sunk in front of the old crib; all of the oak decking required has not arrived. The unfinished portion of the dam will, therefore, be temporarily decked with white pine plank, and it is believed that the work can be made secure for the winter.

When finished, the total length of over fall will be 1112 feet. It will be seen from the drawing upon the opposite page that the form of over-fall has been changed; the old one was found objectionable on account of its being vertical. Timber and floating matter which could not get away promptly (particularly during the rise of the tide), returned with a recoil and battered the face of the dam. By the form now adopted, such floating matter will be projected forcibly away from the face of the work, and will soon find its way into the current of the stream.

The building of the dam has been done by days' work by Wm. Taxes, wharf builder, under the faithful and intelligent superintendence of Robert N. Bowers, and it is believed to be a solid, creditable job.

The white pine timber was supplied by Messrs. Gillingham & Garrison, and the white oak for the decking by Messrs. Daniel

2



Williams & Sons; both these firms have faithfully performed the terms of their respective contracts.

The first dam at Fairmount was built in 1819–20–21, of hemlock timber. A part of this was taken down in 1842–3, and rebuilt with white pine from low tide upward. The work had to be done in coffer dams of large size, at considerable extra expense; and during its progress great risk was incurred of carrying away the coffer dam and with it the entire dam. In 1842 this result was but barely escaped, and it was this danger that induced the building of the new dam in front of, and without disturbing, the old structure; only a slight and comparatively inexpensive coffer dam was required to be placed upon the comb of the old dam.

The first dam was found to be decayed and unsafe at the end of twenty-one years, the second was found to be in the same condition at the completion of twenty-nine years. The new one is built of first quality white pine in such manner that the timber will be always kept wet, the deck plank being laid with spaces between them to allow a portion of the water flowing over it to pass into the body of the work, thus avoiding dry rot. It should be perfectly safe for at least thirty five or forty years.

The reservoirs and grounds attached to these works are in excellent order.

The female figure which has stood for many years upon the rock overlooking the forebay, was carved by Mr. Wm. Rush, and erected at the Centre Square Works in 1809; it was very much decayed and likely to become a complete wreck. As a relic of the first works supplying the City with water, it was thought desirable that it should be perpetuated. Robert Wood & Co. undertook to reproduce it in bronze, using the decaying wooden figure for the model; they succeeded admirably, and have produced an artistic and creditable work. But the dark color of the metal would naturally make it ineffective if placed against the rock in the position that it formerly occupied. It has, therefore, been mounted on a pile of large rocks in the cen-

tre of the marble fountain basin in the garden of the works, where it presents a fine appearance.

At the Schuylkill Works not any new work has been done; the compound double cylinder engine has done good service. There are some mechanical defects in the steam valve gear, which cause rather more noise than is desirable; these may be corrected hereafter. It has proved itself to be more economical in running expenses than any engine in the department.

It is proposed next season to put in an engine at these works capable of raising into the new storage reservoir not less than 20,000,000 of gallons per twenty-four hours. If the plans now prepared are carried out, this can readily be placed in that part of the building now occupied by the bell crank engine, No. 3 (now much too small). The inlet to supply it with water is already prepared as far as the division wall of the boiler and engine house, and a drop gate put in at that point, so that comparatively little labor will be required to carry the inlet far enough through the solid rock to supply the new engine.

The side lever Cornish and No. 1 Cornish engines have both done excellent service without accident; they are now undergoing the slight ordinary repairs which a continued summer's work renders necessary.

The reservoirs and grounds are in good order.

At the reservoir the thirty-six inch ascending main attached to the double cylinder engine has been connected by a short branch main carried around the reservoir to the thirty-inch main leading from the Schuylkill to the Corinthian Avenue reservoirs, in such manner as to enable that engine, by the proper manipulation of the necessary stops, to pump into the Schuylkill reservoir or directly into the Corinthian Avenue reservoir, as may be desired.

This is a matter of very considerable importance in case the supply from the water power works into the latter named reservoir is defective on account of low water in the river or from other causes.

The water level in all the reservoirs has been kept up with remarkable regularity during the summer. Never, in the past six years, has it been maintained with anything like the same regularity. The benefit of this has been felt in all parts of the City, and not any reasonable cause for complaint has existed.

This is due to the increase and proper efficiency of all our pumping machinery, and in a measure to the additional storage capacity afforded by the new reservoir at the Delaware Works. These works were, for the first time in six years, able to supply their special district—without assistance from those upon the Schuylkill River.

At the Delaware Works the Duplex engine has run without any delays during the whole season, for several months keeping up the daily supply without any assistance from the other engines. During the hottest months, only, was it necessary to run one of the other engines in conjunction with it.

A coal shed has been erected upon the wharf, provided with derricks and hoisting apparatus for readily unloading the canal boats by which the coal is usually received; a small railroad track passes through it, directly into the boiler-houses.

The engines and boilers are all in good order, requiring only such repairs and examinations as the men employed at the works are capable of making.

At the reservoir, the roadway leading to the top of the new one was finished early in the season; a new pale fence has been put around the old and new reservoirs and they are both in excellent condition.

At the Belmont Works, the two engines have worked satisfactorily during the season. No. 1, after running almost constantly for ten years and a half without repairs, is now undergoing such renovation as the engineers in charge of the works are able to do without assistance from the machine shop; it will be in good working order in a few days, requiring only a few new gum joints and a re-grinding of the valves.

Some members of your honorable body, and others, having expressed doubts as to the capacity of these engines to do the duty and pump the water required by contract, an investigation by experts was ordered by Councils, and duly made. As this annual report reaches many other cities, and parties who have not had the opportunity of seeing the special report of the experts, it is considered desirable to publish it here, and it will therefore be found at the end of this report. It will be seen that all claims set up for the engines have been vindicated by the rigid, intelligent examination of the very capable gentlemen appointed to make the trial.

A contract has been made for a third engine, after a delay of very many months, caused by the tardiness of Councils in passing the resolutions necessary for the purpose, and by the unavoidable time consumed in making the test, to which reference is made above.

As soon as this engine shall be in use, a large district upon the east side of the river can be added to that already supplied from these works; the work upon it is progressing favorably in the shop of the contractor. This engine will be capable of raising 8,000,000 gallons per twenty-four hours, instead of 5,000,000, the quantity raised by each of the other engines; the total pumping capacity of the works will be 18,000,000 gallons per twenty-four hours.

The submerged main crossing the river from these works, has not given any trouble whatever, and is believed to be in good order.

The work at the western section of the reservoir was continued during the summer under the difficulties attendant upon the removal of the mass of rock found in it; the water was let into it December 19, 1872. It must be remembered that for one entire season, work could not be done here on account of the want of the necessary appropriation. The discharge end of the pumping main of No. 1 engine has been carried to the centre of the bank dividing the eastern and western sections of the reservoir; it is

there turned up and formed into a fountain, with a flow of water over the horizontal lip of thirty-six inches diameter, from which it falls into a cast-iron basin of nine feet diameter, and thence into a square granite basin, from which it is finally discharged into the two sections of the reservoir. When in use, this will be seen from the Park Road leading to George's Hill, and will form a handsome and attractive feature.

At the Roxborough Works, after considerable unavoidable delay, the Worthington Duplex engine was successfully started to work on August 1st, 1872. Three nights afterwards, the breeches pipe upon the pumping main just beyond the engine house burst, without causing any accident to the engine; the appliances upon the engine (provided as guards against such accidents) acted promptly and successfully; this, (with the vigilance of the engineer on duty, Johnson Hughs,) saved the engine from the slightest injury. Had the Cornish engine been working at the time the main burst, there can be but little doubt that a most serious and destructive accident would have resulted. Owing to the delay in obtaining a new and stronger breeches pipe, the engine could not again be started until September 17th, 1872, since which time it has easily kept up the supply in the reservoir.

Opportunity is now being taken to make the much needed repair to the Cornish engine, which had necessarily been overworked. The new engine house has been plastered, the open roof completed, the old house has been re-plastered and finished to conform in appearance with the new one; an addition in length of fifty feet has been made to the coal shed.

A new gang of boilers will be required here and the boiler house will have to be enlarged for the purpose, there being room for such enlargement between the present boiler house and the coal shed. When the estimate for a new engine was made for these works, the price was predicated upon the actual cost of the Cornish engine then in use; it has however been possible by adopting the Worthington engine, to get a machine capable of pumping double the quantity of water of the Cornish engine, for a little more than half the cost; there is therefore a balance

upon that appropriation which it is proposed to devote, as far as it will go, to the construction of the new boilers and boiler house.

The boilers now in use are set four in a nest in one furnace, which is now a serious disadvantage; for, if they had been set two in a furnace, six of them would be ample to run the new engine up to its capacity of 5,000,000 gallons per day; but owing to the setting, eight have to be used, and of course the engine cannot be run with that economy of fuel that it is capable of developing if the boilers were properly arranged. When the new gangs are put in, the old ones should be re-arranged two in a nest, similar to the boilers of like kind in use at the Schuylkill and Belmont Works.

The lift at these works is excessive, the pressure against the new engine being equal to a static head of 340 feet; the friction on the main employed is considerable, it being too small for the engine, the twenty-inch main laid for the Cornish engine being for the present in use.

The Roxborough Works will be much tried next summer to keep up the supply; if anything happen to the Duplex engine, the Cornish engine, will, it is feared, be inadequate to supply. Provision should be made at once for the No. 2 engine in the new engine house and a new ascending main.

The reservoir remains tight and is in good order.

The small engines put up at the reservoir to afford a better supply to Germantown have not yet been required, as the demand made upon the main has not yet exceeded its capacity to deliver the proper quantity of water at its present height in the Germantown reservoir. The latter reservoir has never been filled to the height intended and desirable; when this is done, and the demand of Germantown exceeds 1,000,000 gallons per day, the small engines referred to will be required.

The Germantown Works were abandoned September 30, 1872, and the reservoir (which up to that time had been partially supplied from Roxborough) is now entirely fed from these works.

The sixteen and ten-inch supply main upon Main Street, from the reservoir to Wister Street, was finished, and has proved eminently useful.

There have not been any reasonable complaints as to the quality of the water delivered from any of the works during the season. In the early part of the year, the City Solicitor commenced proceedings against some of the mill owners at Manayunk to restrain them from all unnecessary discharge of foul matter into the Schuylkill; but Councils subsequently directed these proceedings to be suspended, and therefore the parties in question are still permitted (by the virtual sanction of Councils) to violate all the laws of justice and the common decencies of life by continuing to discharge foul matter into the river wantonly and unnecessarily. It is much to be regretted that the measures provided for such cases by the wisdom of the State Legislature should not be rigidly enforced.

In compliance with the urgent demands of the part of the city called Frankford and its vicinity, a report was made of several sources of supply from the Delaware; one of the plans proposed (the most expensive of them) was selected by the "Committee on Water," and a loan has been passed for the execution of the works. The report in question will be found at the end of this report.

A loan has also been granted for the purchase of the Chestnut Hill Water Works, heretofore the property of private individuals; it has not yet come into the possession of the city. The water rents charged by the owners of these works have been so far in excess of those demanded by the city that many customers have been deterred from getting a supply; the extension of the mains has also been limited. It is feared that when the rates are reduced to city prices, and the mains further extended, the works will soon prove inadequate to the demand.

The company, by its charter, have the right to lay pipes and supply parties situate outside the city limits in Montgomery Co.; there is every reason to doubt if the city can legally do this, unless some special legislation may make it possible.

The work of constructing the large storage reservoir in the East Park (after two years' delay in obtaining the necessary loan) was commenced November 9th, 1871, and carried forward energetically; during part of the season difficulty was experienced in getting a sufficient number of men. A very large amount of work has been done, much of it entirely of a preparatory character, such as stripping of the black, vegetable and unsuitable soil from the base of the embankments, and its cartage to spoil bank for future use upon the outside slopes of the banks when finished. This soil was in places 15 or 18 inches deep, and had to be hauled to very considerable distances.

The preparation of the ground for the reception of the new embankment, and the construction of the puddle wall through the centre of the same, occupied much time and labor, as it is a work upon which the future safety of the reservoir may mainly depend, and upon which the strictest care is required. This work has been done for nearly the whole circuit of the embankment, nearly one and one-half miles in extent. The raising of the banks can go on rapidly and without interruption next year.

Considerable work was required in making new park roads over the heads of two valleys, at the points where the reservoir crossed the old roads.

For safety, in case of accident, and for the convenience of temporary repairs, the reservoir will be divided into two unequal parts by an embankment, which will be raised not quite to the normal height of the water in the reservoir; so that when the reservoir is entirely filled, this bank will not show—and the surface will present the appearance of a single sheet of nearly one hundred acres in area.

A map will be found in the front of this report showing the ground plan of the East Park and the space occupied in it by the reservoir, together with the inlet and outlet gate and screen houses, the supply mains, and the routes which may be followed by the future discharge mains; also a position for new pumping works at the Schuylkill Works, to be erected and used when the old works have been entirely filled with engines. This work has

been put under the immediate charge of Assistant Engineer James M. Kreamer, who has obtained experience on similar work at the Belmont and Delaware Reservoirs under the present Chief Engineer. The general superintendent of the work is Edward S. McGlue, who was employed in the same capacity at the Delaware Reservoir.

Owing to the selection of the intersection of Broad and Market Streets for the new Public Buildings, it became necessary to take up the two large supply mains upon Broad Street, and to relay the thirty-inch main around the square on the Juniper Street side, and the twenty-inch upon the Merrick Street side; this required 875 feet of new main of each size, with four quarter circle curves of 50 feet radius each. Owing to the late period at which the castings were received, the work is not yet finished. The making of attachments at each end of the old main will be a process causing some inconvenience, for whilst this is being done the supply to the lower part of the city will be much impaired.

The 30-inch main being used exclusively for all that part of the city situate below South Street, that section will of course be much inconvenienced during the time employed in making the attachment; a cold season was therefore chosen for the work when the demand for water is at the minimum, and the inconvenience felt will be less.

The cost of the work is being defrayed by the Public Buildings Commission.

The extension of the works, with their improved efficacy, has been very marked during the past six years, and may be shown briefly by the following statistics:

The pumping capacity obtained by new wheels at Fairmount, and new steam engines at Belmont, Schuylkill, and Delaware Works has been increased 56,373,718 gallons per day.

The storage capacity of the works by new reservoirs at Belmont and Delaware Works is increased 64,357,071 gallons.

The distributing pipes of the city have been increased by the laying of 138 miles of pipe.

And finally, the income of the works has been increased from $670,220.13 per annum in 1866, to $1,054,781.51 in 1872.

Entire new works, including engine house, boiler house, boilers, engines, and reservoirs, ascending and descending mains have been erected in place of the dilapidated pumping station and insufficient temporary stand pipe which supplied the Twenty-fourth Ward.

An entire new mill house, stocked with enlarged wheels and pump, has been ereeted at Fairmount.

A new and complete reservoir has been added to the Delaware Works.

And a new dam almost completed, at Fairmount.

The most serious difficulty under which the City now labors (and in fact most other cities of the United States that have been more than twenty years supplied), is the insufficient size of the distributing pipes to meet the yearly rapidly increasing demands; therefore, owing to the excessive overdrafts made upon them, the water they can deliver is drawn off at the lower levels and prevented from rising to the upper stories of the houses; and this notwithstanding the water levels of the reservoirs are maintained at their maximum height.

It was difficult to apply any remedy for this inconvenience until the power and storage of the works had been sufficiently increased and secured, so as to properly supply mains of increased size. This should be the next great work undertaken by the Department.

The total receipts of the department from all sources have reached the very large sum of $1,054,281.51, being an excess of receipts over the expenses of maintaining the works of $572,844.35 a profit which, of course, to that amount reduces the sum necessary to be raised by taxation.

It affords me great gratification to be able to make so satisfactory a report of the good condition and present efficiency of all the works under my charge. There is no steam engine or boiler which is not capable of doing full duty, no wheel and pump (except, of course, the abandoned one) that is not ready for daily use; no reservoir but that is in complete order; no

building out of repair. I have no hesitation in saying that there has been no period in the past twenty years when the same could have been said.

I have pleasure in calling special attention to the report of the Register, upon the business of his department, the exhibit therein made being of the most satisfactory character.

The following table shows the cost of raising one million gallons one foot high at each of the works in the years 1872 and 1871; the cost includes coal used for firing, banking, and running, without deductions for ashes or clinker, wages, oil, tallow, repairs, and all expenses of every kind incident to the daily running of the works.

		In 1872.	Per million gallons.
Fairmount Works,		water power, turbine wheels, -	.01 92/100
Belmont	"	two Worthington's duplex steam engines, - - - - -	.07
Roxborough	"	one full Cornish, one Worthington duplex steam engine, - -	.09 9/10
Schuylkill	"	two full Cornish, one double cylinder rotative, one bell crank rotative, - - - - - -	.11 2/10
Delaware	"	one high and one low pressure rotative, one Worthington duplex, - - - - - -	.13 2/10
		In 1871.	
Fairmount Works,		water power, - - - - -	.01 38/100
Belmont	"	Worthington's duplex steam engines, - - - - - -	.08 5/10
Schuylkill	"	two full Cornish, one low pressure rotative engine, - -	.10 9/10
Roxborough	"	one full Cornish steam engine, -	.12 7/10
Delaware	"	one high and one low pressure rotative engine, - - -	.19 9/10

Very respectfully,

FREDERIC GRAFF,
Chief Engineer Water Department.

December 31, 1872.

REPORT ON BETTER SUPPLY OF FRANKFORD.

Philadelphia, May 9, 1872.

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

GENTLEMEN:—Your Committee on Water Works, to whom were referred the petitions from the citizens of Frankford, Twenty-third Ward, praying for a better supply of water, would report having referred the same to the Chief Engineer, from whom they have received the report herewith annexed, and to which they have given their careful consideration; and would respectfully recommend the adoption of the site, according to the plan and estimate No. 3 (of annexed report,) for pumping works to be situated at the Delaware River, at the foot of the lane which divides the property of Joseph Harrison, Jr., and for a reservoir situate on Township Line Road, west of the Castor Road, with suitable ascending and descending mains. All of which is herewith submitted.

E. A. SHALLCROSS, *Ch'n*,
JAS. B. ALEXANDER,
WM. WRIGHT,
JAMES BOWKER,
WM. CHARLTON,
WM. W. BURNELL,
WM. DIVINE,
WM. F. MILLER,
WM. B. HANNA,
CHAS. THOMSON JONES.

Philadelphia, April 16, 1872.

To the Committee on Water.

GENTLEMEN:—The petition of a number of the citizens of Frankford, asking for a better supply of water, having been referred to me for examination, I beg leave to present the following brief report upon the means of supplying that place and its surroundings, by an independent works, situate upon the Delaware River. It would have been made earlier but for the severity of the winter, and the accumulated ice upon the river, which prevented that thorough examination of the shore by soundings, which it was desirable to make.

Five points upon the river, supposed to be suitable for pumping stations, were examined, and four locations for reservoirs were levelled, and their altitude and distance from the river, and from the centre of Frankford, ascertained.

The first of the locations for pumping stations to which attention was given, were those which had been pointed out as suitable by some of the prominent citizens of the place, at the foot of Dark Run Lane, and at Salter's Lane; of these the latter appeared to be the best thought of, and it probably is the better of the two as it is further removed from the possibility of contamination, which might arise from the discharge of Frankford Creek during the rise of the tide.

Soundings, however, exhibited that the information as to the depth of water given by the citizens above named was incorrect, it being represented that quite deep water existed within an exceedingly short distance of the shore. The soundings show that the depth at low tide, at a distance of two hundred feet from the shore, is not more than eight feet. It is therefore evident that it will be necessary either to build a pier to that distance, or further, or to sink a submerged pipe, terminating in a suitable inlet chamber, guarded by a permanent ice breaker.

This arrangement can, of course, be readily effected, but was evidently not anticipated by the citizens who pointed out this locality. The position appears to have been selected for two reasons, first, because the City owned a small piece of ground on the river at this place; and second, because of its proximity to the point at which it was thought a reservoir should be erected, viz., upon the Bristol Turnpike near the Cemetery. Examination by the level exhibits that this ground is not sufficiently elevated for the purpose, and therefore, as will be seen further on, this point for a reservoir is abandoned.

The other points upon the river, which were examined and soundings taken, were just above Tacony, at the foot of the Township Line Road, at Ten Mile Point, or foot of what is called Delaware Avenue, and at the foot of the public road which divides the property of Joseph Harrison, Jr.

The latter is, undoubtedly, the most desirable in several respects. In the first place, it is above the mouth of Pennepack Creek, and the shore projects well into the river at a point where it is contracted in its width, which produces a greater depth of water or

a slightly increased velocity of current—both advantages, for in such cases impurities that would accumulate in coves at points where the river expands and becomes more shallow, are swept past projecting points and contracted places. A bulk head has been built here, which could be a little extended so as to form a suitable inlet chamber, from which a main could be laid over the intervening flats to the fast land, upon which the engine house can be erected.

A serious disadvantage, however, is its distance from a suitable position for a reservoir, and from Frankford, if the supply of that place alone is considered; but if we look forward, as we undoubtedly should, to the supply of Holmesburg, Collegeville, Tacony, Bustleton, and other small places, this objection may lose its weight.

Ten mile Point would be somewhat nearer to the reservoir contemplated, but is not available because of its being below and quite near to the House of Correction, now building, and also the Pennepack Creek; this latter objection may at some future day apply to the position at the foot of Township Line Road, and possibly to Salter's Lane, but would not effect the position at Harrison's. There are now several factories, print works, &c., upon this creek, not sufficient in number at present to contaminate the water to any appreciable extent, but these may increase as the country becomes more thickly populated; the drainage into the river from the creek will then be very objectionable, as it will receive the surface water from probably not less than eighteen or twenty square miles of country, within which limit is Bustleton and other small places; it will therefore be well to consider carefully if it be safe to place any works for the present and future supply at any point below the Pennepack Creek.

The position at Township Line is nearer to the reservoir, but is probably too near Tacony, although above that place on the river a very long submerged main would be required with inlet chamber, the same as at Salter's Lane.

The following facts were ascertained in regard to locations for reservoir. First. As to that referred to in the early part of this

report, on Bristol turnpike, near Cedar Hill. This would be quite near to Dark Run landing and to Frankford, but a reservoir could not be built here at a reasonable expense, having a water level of more than one hundred and three feet above City datum, or only fifteen feet above the highest curb in Frankford.

The next place which would answer, if Salter's Lane Landing be used, admits of a water level of one hundred and ten feet, or twenty-two feet above the highest curb.

The next location is on Castor's Lane, and would admit of a water level of one hundred and twenty-two feet, or thirty-four feet above the same curb.

The last point is situated on Township Line Road, west of Castor's Road, and is the highest ground to be found in the neighborhood; it would admit of a reservoir having its water surface one hundred and thirty-one feet high, or forty-three feet above the highest curb.

A number of trial estimates have been made; those which are considered necessary to present to your attention are given below.

No. 1—Engine-house at Salter's Lane.

For engine and boiler-house,	$25,000		
For stack,	4,000		
Piling and foundations, house and stack,	12,000		
		$41,000	
250 feet submerged main, 36-inch, @ $30,	$7,500		
Dredging inlet, and ice breaker,	5,000		
Two engines, to pump 5,000,000 gallons per day each,	72,000		
Boilers, and setting,	17,000		
		101,500	
		$142,500	
Add 10 per cent. for contingencies at the river,		14,250	
			$156,750
Reservoir in Castor's Lane, to contain 10,000,000 gallons,		$125,000	
Ten per cent. for contingencies,		12,500	
			137,500
Land damages, for engine-house, mains, and reservoir,			12,000
			$306,250

13,000 feet ascending main, 30-inch, @ $12.50,	$162,000	
10,500 feet descending main, 20-inch, @ $6.50,	68,250	
Cocks and branches,	3,000	
	$233,250	
Add 5 per cent. for contingencies,	11,662	
		244,912
Total cost of works,		$551,162

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No. 2—Works at foot of Township Line road.

Engine-house, engines, boilers, &c., same as before,	$130,000	
Submerged pipe, inlet, &c.,	32,000	
	$162,000	
Contingencies, 10 per cent.,	16,200	
Pumping station,		$178,200
Reservoir on Township Line Road, as before,		137,500
		$315,700
All land damages, for engine-house, mains, and reservoir,		12,000
		$327,700
Ascending main, 16,100 feet, of 30 inches, with cocks and branches,	$204,250	
Descending to Smithfield pike, thence to Frankford road and Oxford pike, 16,500 feet, 20-inch,	109,250	
Five per cent., contingencies,	15,725	
Main,		330,225
		$657,925

No. 3—Works at Harrison's Place.

Engine-house, engines, boilers, &c., same as before,	$130,000	
Submerged main and inlet,	8,000	
	$138,000	
Contingencies, 10 per cent.,	13,800	
Pumping station,		$151,800
Reservoir, as above,		137,500
		$289,300
Land damages, as above,		12,000
		$301,300
23,500 feet ascending main through Holmesburg, and cocks,	$296,750	
16,500 feet descending main, same as last,	109,250	
Five per cent., contingencies,	20,000	
Main,		426,300
		$727,600

All the above contemplate first-class works, with distinct ascending and descending mains and duplicate engines and boilers.

The difficulty with the supply at Frankford at present arises from the fact that there is no separate main for that purpose, the one used being very long, small in diameter, and has much duty to perform in supplying a large district, with many factories, situated between the Delaware Reservoir and Frankford; therefore, an adequate supply cannot be insured at the terminus of the main. This is very clearly shown by the almost immediate increase of water pressure at Frankford as soon as the factories above referred to are stopped for the day.

This defect could be corrected by laying a separate main from the reservoir, which should not be connected at any point on the

route, but would serve exclusively for the supply of Frankford. That the cost of this may be seen, an estimate for a main of suitable size for the future wants is given as follows:

For a main 24 inches diameter, from the Delaware Reservoir to Frankford, capable of delivering, at the latter place, 5,000,000 gallons per day—4½ miles long, - - - - - - - - - - $237,006

This would be sufficient for the supply for several years; but to lay a main that would be equal to the full capacity of the works that have been estimated for, above the cost, would be as follows:

For 4½ miles 30-inch main, capable of delivering 9,500,000 gallons per day, - - - - - - $316,050

Of the points suggested and examined for the pumping station, there can be no doubt that the one at Harrison's is the best suited for the reasons given before. But the distance from the point upon which it would be necessary to build the reservoir is very great, being somewhat more than 4½ miles, and the reservoir is also too far from the centre of Frankford, the effect of this latter distance being to virtually diminish the advantage derived from its superior height, as will be seen by the following calculation of the quantity of water which a main of twenty inches diameter would be capable of delivering in Frankford from this reservoir, and from that on Castor's Lane, which, although lower in height, is nearer to the point of discharge.

In the former case, this discharge would be about 4,653,072 gallons per day, whilst in the latter it would be about 5,170,080 gallons per day.

The advantages of this plan are the superior river front and its freedom from probable early contamination, and the facility by which Holmesburg, Collegeville, Bustleton, &c., can be supplied, in addition to Frankford.

If, however, it is considered by the Committee and Councils, that the risks of contamination at Salter's Lane, from the Pennepack Creek, House of Correction, &c., are not sufficient to con-

demn that location, then the reservoir on Castor's Lane can be made to answer the purpose, and will furnish an adequate supply to Frankford, at a smaller cost.

My own opinion is, that the almost positive immunity from risk of impure water, afforded by the position at Harrison's, would amply repay the city for the additional cost which would be incurred if that situation be selected.

Estimates have been made for supplying the place by means of a stand pipe; but as such a plan is exceedingly uncertain, it cannot have my approval. The estimate is therefore not presented.

Very respectfully,

FRED. GRAFF,

Chief Engineer Water Dept.

REPORT OF EXPERTS AND ENGINEERS

APPOINTED TO TEST THE DUTY AND CAPACITY OF THE WORTHINGTON PUMPING ENGINES AT BELMONT.

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

GENTLEMEN:—The undersigned experts, appointed by your honorable bodies to test the Worthington Pumping Engines at Belmont, beg leave to present the following report.

On examination it was decided to make trial with Engine No. 2, which has been in operation for the past twelve months.

The tests were of two kinds.

First. The duty test, by which is meant the ability of the engine to perform a given amount of work, and is expressed in the

usual way of pounds raised one foot high with one hundred pounds of coal.

This test takes into account the actual resistance against which the engine works, is calculated from the known dimensions of the pump, the observed pressure in the pump main, and speed of engine, and is independent of the actual delivery into the reservoir.

Second. The capacity test, or actual discharge at the reservoir.

This is expressed in cubic feet or gallons, and the amount by which this falls short of the theoretic or calculated capacity of the pumps, represents the amounts lost by leakage through the pump valves and by the plunger and other causes.

For the purpose of bringing the whole work within the period originally assigned, the two tests were conducted at the same time; observations of the delivery at the reservoir being conducted whilst those connected with the working of the engine were being made.

Duty Test.

Previous to the test, the pressure gauges were carefully compared with standard test gauges, and a certified statement of their variations obtained. The coal scales were tested and sealed by the official sealer of weights and measures. The pressure gauges on the engines indicated the resistance, measured from the centre of the gauge to the delivery in the reservoir. A float and gauge rod marked the level of water in the pump well. The whole resistance, or load, on the engine, therefore, is expressed in feet, by adding the height due to the indicated pressure on the gauge to the vertical distance from the centre of the gauge to the level of water in pump well. The counter attached to the engines indicated every fourth stroke, and the reading was checked every half hour by actual count of the strokes.

The feed water for the boilers was accurately measured in a tank of ascertained capacity, and charged to the boiler as delivered. The correctness of the manner of measurement was verified at the commencement of the test.

The coal consumed was carefully weighed, one or more assistants being on duty in the fire room during the whole test, and having a constant supervision of the matter.

Half-hour observations were taken of the engine counter, the indicated water pressure, height of well gauge, steam pressure at engine and boilers, speed of engines, length of stroke, condition of vacum, and temperature of feed water. These observations were made by not less than three persons at the same time, and their notes carefully compared and verified as the test progressed.

The feed water was constantly in charge of an assistant, and every separate charge of water to the boilers entered in a separate book, kept for the purpose.

The fires were carefully observed at commencement of test, steam in boilers being at forty-eight pounds pressure, and water in glass gauges standing at two and one-half inches.

The test commenced at 4.40 P. M., on Wednesday, May 15th, and continued till Friday, May 17th, at 5 o'clock P. M., being of forty-eight hours and twenty minutes duration.

SUMMARY OF RESULT.

		hours.	mins.
Duration of test,		48	20
Reading of counter at close of test,	959273		
" " " commencement,	924372		
Number of strokes, as per counter,			34901
Counter indicating every fourth stroke,			34901×4,=139604
Average strokes per minute,			48.139
Diameter of water plunger in inches,			22.5
" " piston rods "			4
Mean area of plungers in inches,			391.33
" length of stroke "			49.347
Displacement of plunger in cubic inches,			19.311
" " " " gallons,			83.6
" " " (water at temperature of 66° = 62.297 pounds per cubic feet),			696.2

Mean water pressure, in pounds, per sq. inch, - -		86.724
Height due to this pressure, in feet (water at 66°) -		200.46
Distance from centre of gauge to water in pump well, in feet, - - - - - - - - - - -		17.28
Total height, including frictional resistance, in feet, -		217.74
Average steam pressure at boiler, in pounds, per square inch, - - - - - - - - - - -		48.85
Average steam pressure at engine, in pounds, per square inch, - - - - - - - - - - -		46.66
Vacuum at engine, in inches, - - - - -		26.5
Average temperature of feed water, degrees, - -		129.59°
Coal charged to boilers, in pounds, - -	40330	
Ashes and clinkers, - - 4349		
$\frac{1}{3}$ of this available for firing, - - -	1450	
Correction of weight to raise water at, Close of test to original level, - -	38880 10	
Total coal for work of engine, - - - -		38890
Water charged to boilers, in cubic feet, -	5212	
Less leakage (Temp. 138°, weight, 61.52 pounds, per cubic foot, -	40	
		5172
5172 cubic feet 61.62 pounds	=	318181
Loss of water in boiler during test, pounds - -		530
Total water evaporated, in pounds, - - -		318711
Pounds of coal to evaporate this amount of water, -		38880
Evaporative power of boilers, - - $\frac{318711}{38880}$	=	
pounds water, with one pound coal, - - -		8.19

The correction of weight of coal is obtained in this way. At the close of the test, the water in boilers was $0.\frac{17}{100}$ inches lower than at commencement. The engine is therefore charged with coal sufficient to bring the deficiencies of water (530 pounds) from 130°, the temperature of feed water, to temperature of steam at 48 pounds, 295°.07, or 10 pounds of coal.

On the other hand, by reason of this deficiency, the boilers had evaporated so much more water than appeared to be delivered by them, and had done it without the use of this additional ten pounds; consequently, 530 pounds has been added to the weight of water delivered by the feed pump.

The duty of the engine is thus calculated.

Duty calculated from actual evaporation—

Displacement of plunger in pounds per stroke.		Stroke of engine in hours and minutes. 48 20		Height of delivery in feet.	
696.2	×	139.604	×	217.74	× 100 =

38890 pounds of coal.

54,416,694 pounds raised one foot high with 100 pounds of coal, being in excess of the guaranteed duty, $8\frac{33}{100}$ per cent.

On the basis of an evaporation of 9½ pounds of water, with one pound of coal, which the contract with Mr. Worthington allows, the duty would be 63,120,707 pounds, or an excess of $26\frac{24}{100}$ per cent. over the contract requirement.

CAPACITY TEST BY WEIR.

The quantity of water discharged at the reservoir was measured over a wier, carefully constructed under the direction of Mr. T. H. Risdon, a gentleman practically acquainted with this mode of measuring water. Under his directions also the observations and calculations were made. From these it appears that the pumps delivered into the reservoir, in forty-eight hours and twenty minutes, 1,500,584.52 cubic feet of water, equal to 11,225,122 gallons, or at the rate of 5,573,853 gallons in twenty-four hours, being $11\frac{47}{100}$ per cent. in excess of 5,000,000 gallons guaranteed by the contract.

The discharge of the pumps, calculated from the displacement of the plungers, was 5,795,200 gallons in twenty-four hours, being more than that determined by weir measurement by $3\frac{8}{100}$ per cent.

It will not be correct to assume that the whole of this difference is due to leakage by and through the pump, and in order to ascertain as nearly as possible the amount due to that cause, it

may be observed that during the whole test some portion of the injection water for the condenser was taken from the pump main, the suction injection at the high temperature of the river not furnishing sufficient. This quantity was not less than one hundred gallons per minute, which would make the loss by leakage through the pump not exceeding 1½ per cent.

The test, both of capacity and duty, have been made with great care, and every precaution taken to ensure a correct result.

The conclusion from the facts and figures given is that the engines are fairly and easily performing considerably beyond the guarantee.

The engines worked during the whole test with remarkable smoothness and precision, with scarcely a perceptible variation of speed or length of stroke, and the character of workmanship throughout appears unexceptionable.

JACOB G. NEAFIE,
HENRY L. HOFF,
W. BARNET LE VAN,
GEO. H. BAILEY,
ISAAC S. CASSIN.

May 31, 1872.

The boilers used at these works and at this trial are not of the kind usually employed and preferred by Mr. Worthington. They are what are technically termed French mud leg variety. The boilers being fifty-four inches diameter, thirty feet long, having two heaters, each twenty-eight inches diameter, twenty-two feet long, running under and parallel with the boilers and connected thereto by five legs of ten inches diameter. These are, of course, back of the bridge wall and surrounded by the heat from the fires. They are set two boilers and four heaters in one furnace. They are not as economical a boiler as those of the tubular variety, but are much more easily kept in order and considered more reliable for water works' purposes where it is essential to have the boilers always in working order.

The following table gives the contents of the several reservoirs in use, their height above datum, and their area.

Name of Reservoir.	Contents of Reservoir when entirely full—United States gallons.	Height of water level above City datum.	Area ground covered by the Reservoir.	Water area of Reservoir.
Fairmount	26,996,636	94 feet.	20 acres, 139 perches.	7 acres, 58 perches.
Corinthian avenue	37,312,000	120 "	12 " 106 "	4 " 50 "
Schuylkill	9,800,000	120 "	18 " 19 "	2 " 108 "
Delaware	25,657,720	114 "	8 " 158 "	6 " 32 "
Belmont	40,000,000	212 "	9 " 44 "	6 " 46 "
Roxborough	11,377,157	365 "	3 " 126 "	2 " 47 "
Germantown	2,083,875	357 "	2 " 24 "	1 " 22 "
Total	153,227,388			

The Fairmount and Corinthian avenue Reservoirs are supplied mainly by the Water-power Works at Fairmount, and they furnish water to all that portion of the City south of Vine street.

The Schuylkill Works supplies the Eleventh, Twelfth, Thirteenth, Fourteenth, Fifteenth, and parts of Twentieth and Twenty-ninth Wards.

The Delaware Works supplies the Sixteenth, Seventeenth, Eighteenth, Nineteenth, Twenty-third, and Twenty-fifth Wards.

The Belmont Works supplies the Twenty-fourth, Twenty-seventh, and parts of Twenty-eighth and Twenty-ninth Wards.

The Roxborough Works supplies Roxborough, Manayunk, and Germantown.

Operations of Fairmount Works for the year 1872.

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.	Average temperature.
	Days.					Tons.	Cwts.	Qrs.	Lbs.	Pounds.	Quarts.	Inches.	
January	31	2,309,809	635,799,257	20,509,653	84,999,901	.....	.....	.....	.....	40	168	1.27	30.97
February	29	1,865,177	604,959,349	20 860,667	80,876,918	.....	.....	.....	.....	43	176	1.19	32.62
March	31	1,905,739	601.452,192	19,401,684	80,408,047	.....	.....	.....	.....	25	170	3.38	34.27
April	30	2,523,613	716,457,140	23,881,905	95,783,040	.....	.....	.....	.....	.....	230	2.56	63.64
May	31	2,021 235	663,063,998	21,389,161	88,644,919	.....	.....	.....	.....	37	197	5.62	76.62
June	30	1,593,342	506,457,050	16,881.902	67,708,162	.....	.....	.....	.....	10	115	4 22	82.31
July	31	1,460,735	456,734,065	14,733,257	61,060,704	.....	.....	.....	.....	20	130	11.22	80.04
August	31	2,090,187	644,785,788	20.799,541	86,201,309	.....	.....	.....	.....	8	155	8.32	70.03
September	30	1,953,043	586,954,203	19,565,140	78,469,813	.....	.....	.....	.....	30	130	3 82	55.48
October	31	1,914,300	613,639,140	19,794,811	82,037,318	.....	.....	.....	.....	10	134	5.36	41.26
November	30	1,953,543	637,177,275	21,205,909	85,184,128	.....	.....	.....	.....	28	120	3.38	28.64
December	31	1,906,400	612,612,228	19,761,685	81,900,030	97	.....	.....	.....	.....	153	3.60	54.69
Totals	366	23,503,123	7,220,031,685	19,898,776	973,274,289	97	.....	.....	.....	251	1,878	53.94	

Operations of the Worthington Pump, at Fairmount, during the months of June, July, and August, 1872.

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	6	139,200	14,476,800	2,412,800	1,935,401	19	.....	.....	.....	12	4
July	31	840,272	87,388,288	2,818,977	11,682,926	91	.....	.....	.....	43½	8
August	16	429,575	44,675,800	2,792,237	5,972,701	45	.....	.....	.....	21	4
Totals	53	1,409,047	146,540,888	2,674,671	19,591,028	155	.....	.....	.....	76½	16

FAIRMOUNT WORKS.

Supplies purchased during year 1872.

Gas and oil for lighting works,	$1,543 96
90 tons of coal for warming works,	597 50
451 gallons of oil, (lubricating),	338 25
640 pounds of tallow,	65 00
Packing and small stores,	1,045 56
Repairs,	4,996 02
	$8,586 29

Running Expenses for year 1872.

Salaries of engineers and labor,	$5,272 67
Gas and oil for lighting works,	1,543 96
97 tons coal for warming works, at average price above - - - $6.64	644 08
469½ gallons (lub.) oil, at average price above .75	352 13
251 pounds of tallow, - - $10 15/100	25 48
Packing and small stores,	1,045 56
Repairs,	4,996 02
	$13,879 90
Cost of raising water into reservoir, per million gallons,	$1.92 2/10
Cost of raising water, per million gallons, one foot high,	.01 92/100

Operations of the Schuylkill Works for the year 1872.

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.	Lbs.	Lbs.	Qts.
January	14	112,785	39,664,160	2,833,154	5,302,695	48	17	.....	.....	67	33
February	24	216,580	92,383,200	3,849,300	12,350,695	95	.....	.....	.....	135	47
March	29	259,121	102,659,610	3,539,987	13,724,547	132	02	.....	.....	122	36
April	29	183,541	69,242,400	2,387,324	9,257,005	108	15	.....	.....	62	40
May	30	584,316	250,690,730	8,356,358	33,514,803	257	14	.....	.....	269	89
June	29	739,171	334,724,950	11,542,240	44,749,325	349	10	.....	.....	491	185
July	31	819,363	371,544,900	11,985,320	49,671,778	454	13	.....	.....	482	166
August	31	632,196	230,092,140	7,422,327	30,760,981	329	19	.....	.....	222	104
September	30	529,358	231,934,846	7,731,161	31,007,332	260	17	.....	.....	267	68
October	31	625,018	261,148,444	8,424,143	34,912,894	259	11	.....	.....	345	114
November	30	288,528	146,615,840	4,888,195	19,605,059	190	19	.....	.....	140	34
December	31	187,825	92 555,850	2,986,673	12,373,777	149	13	.....	.....	115	36
Totals	339	5,177,802	2,223,287,070	6,328,765	297,230,891	2,637	10	.....	.....	2.717	952

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

SCHUYLKILL WORKS.

Supplies purchased during year 1872.

Gas for lighting works, - - -	$1,031 72
2,547 1/10 tons of coal, - - -	10,417 63
223 gallons of oil, - - -	167 25
2,929 pounds of tallow, - - -	297 90
Packing and small stores, - - -	653 56
Repairs, - - - - -	3,897 36
	$16,465 42

Running Expenses for year 1872.

Salaries of engineers, firemen, &c., -	$11,850 00
Gas for lighting works, - - -	1,031 72
2,637½ tons of coal consumed, at average price above $4.09, - - - -	10,787 38
238 gallons of oil consumed, at average price above .75, - - - -	178 50
2,717 pounds of tallow consumed, at average price above .10 17/100, - - -	276 32
Packing and small stores, - - -	653 56
Repairs, - - - - -	3,897 36
	$28,674 84

Cost of raising water into reservoir, per million gallons, - - - -	$12 89 7/10
Cost of raising water, per million gallons, one foot high, - - - - -	.11 2/10

Operations of the Delaware Works for the year 1872.

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.	Lbs.	Lbs.	Qts
January	27	494,607	79,137,120	2,931,004	10,579,829	159	.....	.....	.....	42	19
February	26	481,100	76,976,000	2,960,615	10,290,909	145	.....	.....	.....	20	13
March	26	471,360	75,417,600	2,900,677	10,082,567	142	.....	.....	.....	28	14
April	26	330,627	74,991,264	2,884,279	10,025,570	111	4	3	4	34	12
May	27	483,786	151,101,888	5,596,366	20,200,787	167	17	2	25	40	13
June	27	507,032	142,237,184	5,268,044	19,015,666	182	.....	3	26	38	18
July	28	695,457	178,423,776	6,372,278	23,853,446	236	1	2	12	42	19
August	30	897,244	222,793,600	7,426,453	29,785,241	269	19	1	3	40	21
September	26	685,846	177,976,768	6,845,260	23,793,686	223	8	3	24	38	15
October	27	380,966	134,100,032	4,966,668	17,927,812	145	9	2	20	30	9
November	22	266,762	93,900,224	4,268,192	12,553,506	111	19	3	7	24	9
December	19	191,692	67,475,584	3,551,347	9,020,800	93	7	3	10	28	6
Totals	311	5,886,479	1,474,531,040	4,664,265	197,129,819	1,987	10	2	19	404	168

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

DELAWARE WORKS.

Supplies purchased during year 1872.

Gas for lighting works, - - -	$522 23
2,962 tons of coal, - - - -	14,637 48
44½ gallons of oil, - - - -	33 37
660 pounds of tallow, - - -	67 00
Packing and small stores, - - -	415 17
Repairs, - - - - - -	2,992 15
	$18,667 40

Running Expenses for year 1872.

Salaries of engineers, firemen, &c., -	$7,925 00
Gas for lighting works, - - -	522 23
1,987 11/20 tons of coal consumed, at average price above $4.94, - - -	9,818 50
42 gallons of oil consumed, at average price above .75, - - - -	31 50
404 pounds of tallow consumed, at average price above .10 15/100, - - -	41 01
Packing and small stores, - - -	415 17
Repairs, - - - - -	2,992 15
	$21,745 56

Cost of raising water into reservoir, per million gallons, - - - - -	$14 74 7/10
Cost of raising water, per million gallons, one foot high, - - - -	.13 2/10

Operations of the Belmont Works for the year 1872.

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.	Lbs.	Lbs.	Qts.
January	30	326,926	101,347,060	3,378,235	13,549,072	207	10	3	16	100	9
February	29	304,732	94,466,920	3,257,480	12,629,267	188	6	.....	8	90	8
March	31	295,420	91,580,200	2,954,200	12,243,342	195	19	2	16	75	9
April	30	309,746	97,944,116	3,264,804	13,094,133	199	13	3	.....	90	10
May	31	375,257	120,199,370	3,877,399	16,069,434	205	16	.....	8	115	12
June	30	421,164	130,123,208	4,337,440	17,396,151	236	5	.....	.....	110	11
July	31	454,073	141,280,914	4,557,449	18,887,764	266	11	1	.....	125	13
August	31	482,019	150,783,414	4,863,981	20,158,210	296	13	.....	4	120	13
September	30	446,780	140,954,760	4,698,492	18,844,219	276	1	1	20	125	11
October	31	441,749	138,526,730	4,468,604	18,519,616	272	16	3	20	120	9
November	30	378,654	121,200,348	4,040,012	16,203,255	245	13	1	16	125	9
December	30	404,752	128,349,688	4,278,323	17,159,049	255	19	2	16	125	10
Totals	364	4,641,272	1,456,756,728	3,998,035	194,753,512	2,847	9	.....	12	1,320	124

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

BELMONT WORKS.

Supplies purchased during year 1872.

Coal oil for lighting works,	$137 67
Gas machine for lighting works,	604 00
2,782 1/10 tons of coal,	12,983 30
1,350 pounds of tallow,	137 25
Packing and small stores,	376 78
Repairs,	2,241 26
	$16,480 26

Running Expenses for year 1872.

Salaries of engineers, firemen, &c.,	$5,300 00
Coal oil for lighting works,	137 67
2,847 9/20 tons of coal consumed, at average price above $4.66 2/3,	13,284 31
31 gallons of oil consumed, at average price 1871, $1 55/100,	48 05
1,320 pounds of tallow consumed, at average price above .10 16/100,	134 11
Packing and small stores,	376 78
Repairs,	2,241 26
	$21,522 18

Cost of raising water into reservoir, per million gallons,	$14 77 4/10
Cost of raising water, per million gallons, one foot high,	.07

No part of the repairs named above were put upon the engines, but were made principally upon the boilers, steam and feed pipes, and others fixtures.

Operations of the Roxborough Works for the year 1872.

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.	Lbs.	Lbs.	Qts.
January	16	177,421	25,726,045	1,607,878	3,439,311	84	02	.....	.....	112	23
February	24	212,289	30,781,905	1,282,579	4,115,228	103	02	1	.....	139	28
March	26	220,179	31,925,955	1,227,921	4,268,176	104	13	1	.....	137	31
April	25	234,289	33,971,905	1,358,876	4,541,698	111	.....	1	.....	152	34
May	27	312,781	45,353,245	1,679,750	6,063,268	149	14	3	.....	203	49
June	26	283,215	41,066,175	1,579,468	5,490,130	142	11	3	.....	183	38
July	21	256,776	37,232,420	1,772,973	4,977,596	129	07	.....	.....	154	36
August	24	318,036	46,115,220	1,921,467	6,165,136	181	01	3	.....	201	47
September	23	220,447	41,290,015	1,360,435	5,520,056	160	12	3	.....	163	34
October	19	136,776	40,348,920	2,123,627	5,394,241	161	16	3	.....	151	18
November	22	156,318	39,870,060	1,812,275	5,330,222	158	06	3	.....	106	33
December	18	155,983	46,014,985	2,556,388	6,151,736	193	.....	.....	.....	72	20
Totals	271	2,684,510	459,696,850	1,690,303	61,456,798	1,679	09	1	.....	1,773	391

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

ROXBOROUGH WORKS.

Supplies purchased during year 1872.

Oil for lighting works,	$50 94
1,329 $\frac{1}{2}\frac{1}{0}$ tons of coal,	5,493 68
93 $\frac{1}{2}$ gallons of oil (lard),	96 40
1,942 pounds of tallow,	199 72
Packing and small stores,	276 78
Repairs,	2,469 22
	$8,586 74

Running Expenses for year 1872.

Salaries of engineers and firemen,	$5,195 83
Oil for lighting works,	50 94
1,679 $\frac{9}{2}\frac{9}{6}$ tons of coal consumed, at average price above $4.13,	6,936 13
97 $\frac{3}{4}$ gallons of oil consumed, at average price above $1.03,	100 68
1,773 pounds of tallow consumed, at average price above .10 $\frac{2}{1}\frac{8}{0}\frac{8}{0}$,	182 27
Packing and small stores,	276 78
Repairs,	2,4 9 22
	$15,211 85

Cost of raising water into reservoir, per million gallons,	$33 09 $\frac{1}{1}\frac{1}{0}$
Cost of raising water, per million gallons, one foot high,	.09 $\frac{9}{1}\frac{9}{0}$

Operations of the Germantown Works for the year 1872.

MONTHS.	Running time. Days.	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.* Tons.	Cwts.	Qrs.	Lbs.	Tallow consumed. Lbs.	Oil consumed. Qts.
January	31	1,800,000	16,422,000	529,742	2,195,455	61	.....	.....	.....	34	15
February	27	649,000	5,891,400	218,200	787,620	25	.....	.....	.....	15	9
March	26	834,000	7,512,400	288,938	1,004,331	30	.....	.....	.....	20	8
April	22	785,000	7,187,800	326,718	960,936	29	.....	.....	.....	20	5
May—did not run	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June	7	507,000	4,607,200	658,171	615,936	16	.....	.....	.....	12	3
July	8	618,000	5,621,800	702,725	751,578	25	.....	.....	.....	20	7
August	7	561,000	5,098,600	728,371	681,631	19	.....	.....	.....	15	5
September	12	745,000	6,773,000	564,417	905,481	29	.....	.....	.....	20	7
Totals	140	6,499,000	59,114,200	334,773	7,902,968	234	.....	.....	.....	156	59

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

GERMANTOWN WORKS.

Supplies purchased during (9 mos.) 1872.

Coal oil for lighting works, - - -	$10 00
137 tons of coal, - - - -	804 00
Packing and small stores, - - -	9 00
Repairs, - - - - -	250 00
	$1,073 00

Running Expenses for (9 mos.) 1872.

Salaries of engineers, firemen, &c., -	$3,249 94
Coal oil for lighting works, - -	10 00
234 tons coal consumed, at average price above 5\frac{87}{100}$, - - - -	1,373 58
14$\frac{3}{4}$ gallons of oil consumed, at average price, 1871, .77, - - - -	11 36
156 pounds of tallow consumed, at average price 1871, .15$\frac{1}{2}$, - - -	24 18
Packing and small stores, - -	9 00
Repairs, - - - -	250 00
	$4,928 06

Cost of raising water into reservoir, per million gallons, - - - - -	$83 36$\frac{1}{2}$
Cost of raising water, per million gallons, one foot high, - - - -	.36$\frac{2}{10}$

Amount of Water pumped by all the Works during the year 1872.

MONTHS.	Gallons of water pumped during the month.	Average number of gallons pumped per day.
January, . .	898,095,642	31,789,666
February, . .	905,458,774	32,428,841
March, . .	910,547,957	30,313,407
April, . .	999,794,625	34,103,906
May, . .	1,230,409,231	40,899,034
June, . .	1,173,692,567	42,680,065
July, . .	1,278,226,163	42,943,079
August, . .	1,344,344,562	45,954,377
September, .	1,185,883,592	40,764,905
October, . .	1,187,763,266	39,777,853
November, .	1,038,793,747	36,214,583
December, .	947,008,335	33,133,416
Totals, . .	13,100,018,461	37,583,594

Amount of Water pumped by all the Works during the years 1867, 1868, 1869, 1870, 1871, & 1872.

MONTHS.	1867.		1868.		1869.		1870.		1871.		1872.	
	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.....	618,287,074	20,005,379	730,464,667	24,851,786	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
Feb.....	711,152,228	28,187,718	825,584,566	30,914,237	857,235,551	30,850,764	816,808,722	29,377,975	907,177,896	33,644,729	905,458,774	32,428,841
March..	716,694,210	24,058,725	849,225,424	28,142,180	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
April...	875,050,766	29,259,539	860,197,073	29,632,897	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
May....	886,321,354	29,384,172	968,861,910	31,719,122	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	40,899,034
June ...	1,023,294,108	34,706,857	1,124,258,325	37,916,924	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	42 680,065
July....	1,115,559,299	37,639,532	1,225,455,237	39,573,452	1,294,468,963	41,757,063	1,397,614,410	46,008,735	1,266,880,762	41,506,545	1,278,226,163	42,943,079
Aug.....	1,065,853,766	36,446,543	1,257,133,188	40,555,908	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
Sept....	1,043,957,549	39,041,156	1,113,085,190	37,186,021	1,111,435,089	37,047,836	1,201,946,583	41,105,307	1,226,827,488	41,156,843	1,185,883,592	40,764,905
Oct.....	1 071,726,037	35,396,907	1,169,605,506	37,907,082	1,098,648,339	35,440,337	1,264,416,410	40,845,543	1,219,210,376	40,125,119	1,187,763,266	39,777,853
Nov.....	880,945,353	30,976,368	973,190,979	32,833 488	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
Dec.....	854,579,754	28,615,319	888,116,818	29,310,439	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
Totals..	10,863,421,498	29,771,018	11,985,178,883	33,378,628	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

Statement of the Operations of Shops from January 1, 1872, to December 31, 1872.

DR.

To stock on hand January 1, 1872,	- -	$4,209 04
396,882 lbs. iron castings,	- - -	11,576 04
32,890 " wrought iron,	- -	1,686 02
1,180 " steel, - - - -		249 69
17,069 " brass castings,	- - -	4,432 50
10,503 " lead, - - - -		787 73
495 " leather, - - - -		221 00
250 " gasket, - - - -		42 50
18 " listing, - - - -		3 60
20 " tallow, - - - -		3 60
39,444 feet lumber (assorted),	- -	1,820 01
102 tons coal, - - - -		675 00
504 galvanized spindles for stops,	-	178 00
Bolts, washers, nuts, &c.,	- -	1,118 07
Hardware, - - - -		1,209 87
Wrought-iron tubings, &c.,	- -	160 60
Paints, oils, &c., - - - -		451 95
Files bought and recut,	- - -	102 45
Wages paid hands, and incidentals,	-	16,727 63
		$45,655 30

CR.

By 15 stop-cocks,	3-inch,	at $25 00,	$375 00		
120 "	4 "	at 25 00,	3,000 00		
226 "	6 "	at 30 00,	6,780 00		
8 "	8 "	at 45 00,	360 00		
15 "	10 "	at 85 00,	1,275 00		
6 "	12 "	at 120 00,	720 00		
4 "	30 "	at 520 00,	2,080 00		
3 "	36 "	at 750 00,	2,250 00		
Amounts carried forward,			$16,840 00	$45,655 30	

Amounts brought forward,	$16,840 00	$45,655 30
620 stop-cock boxes, at 4 00,	2,480 00	
226 fire plugs, at 36 00,	8,136 00	
324 plug casings, at 18 00,	5,832 00	
409 frames and covers, at 8 00,	3,672 00	
5,200 ½-inch ferrules, at 55,	2,860 00	
100 ⅝-inch " at 55,	55 00	
50 ¾-inch " at 55,	27 50	
36 1-inch " at 55,	19 80	
Repairs for First District, -	1,102 43	
" Second " -	2,443 26	
" Third " -	2,110 79	
" Fourth " -	2,046 23	
" Germantown District,	1,392 40	
" Manayunk "	330 48	
" Fairmount Works,	2,123 67	
" Delaware "	688 82	
" Schuylkill "	2,346 62	
" Belmont "	977 83	
" Roxborough "	561 89	
" Germantown "	52 06	
" Fairmount " Extension,	751 92	
" Auxiliary engine, Roxboro' Works, - -	174 22	
" New engine, No. 3, Schuylkill Works, - -	33 18	
" New engine and inlet Roxborough Works, -	930 52	
" Steam pumps, Fairmount,	185 56	
" Testing pumps, Belmont,	168 70	
" Fairmount dam,	1,213 20	
" Belmont Reservoir, -	562 51	
" Delaware " -	61 65	
" Storage "	3,573 53	
Amounts carried forward,	$63,753 77	$45,655 30

Amounts brought forward,	$63,753 77	$45,655 30
Repairs for 36-inch main, Delaware Works, - -	154 25	
" 36-inch main, Schuylkill Works, - -	34 46	
" 30-inch main, Belmont Works, - -	112 44	
" Buildings and grounds,	910 08	
" Iron railing, Fairmount,	76 66	
" Coal shed, Belmont, -	139 37	
" " Roxborough, -	73 44	
" " Delaware, -	247 47	
" 48-inch main, Fairmount,	63 01	
" Public Building Commission,	111 18	
Fixtures, stock (shop account), -	255 97	
New patterns made and repaired, -	267 36	
Repairs for Fifth and Chestnut Streets (office), - - - -	205 54	
Water meters (fitting and setting), -	30 37	
Sign for pipe bridge at Wissahickon, -	64 34	
Stock on hand, viz.:		
8 sharp thread screws, at $2 50,	$20 00	
4 square " 3-inch, at $5 00,	20 00	
3 " " 4 " at 5 00,	15 00	
12 " " 6 " at 5 00,	60 00	
3 " " 10 " at 8 00,	24 00	
3 " " 12 " at 10 00,	30 00	
5 " " 16 " at 12 00,	60 00	
5 " " 20 " at 14 00,	70 00	
1 " " 30 " at 20 00,	20 00	
2 socket screws, 4 " at 5 00,	10 00	
34 " 6 " at 5 00,	170 00	
8 " 8 " at 6 00,	48 00	
8 " 10 " at 7 00,	56 00	
Amounts carried forward,	$67,102 71	$45,655 30

	Amounts brought forward,			$67,102 71	$45,655 30
8	spindles,	3-inch	at 5 00,	40 00	
177	"	4 "	at 5 00,	885 00	
171	"	6 "	at 5 00,	755 00	
5	"	8 "	at 6 00,	30 00	
8	"	10 "	at 8 00,	64 00	
8	"	12 "	at 10 00,	80 00	
1,031	lbs. bolts, nuts, and washers,		at 15,	154 65	
21,626	" wrought iron,		at 5¾,	1,243 49	
1,444	" wrought iron forgings (part finished),		at 15,	215 60	
517	" wrought iron forgings,		at 36,	186 12	
860	" cast steel,		at 20,	172 00	
20,346	" iron castings,		at 4¾,	966 43	
693	" finished brasses,		at 40,	277 20	
2,580	" unfinished brasses,		at 33,	851 40	
1,474	feet assorted lumber,		at 9,	132 66	
36	plug monkeys,		at 7 00,	252 00	
44	plug nuts,		at 1 25,	55 00	
28	heavy steel hammers and D. H. pipe cutters,		at 2 50,	70 00	
28	steel chisels,		at 1 00,	28 00	
125	⅞-inch long eye bolts,		at 50,	62 50	
247	wooden plugs,		at 50,	123 50	
2	kegs of nails,		at 6 00,	12 00	
89	assorted handles,			22 00	
27	lbs. leather,		at 45,	12 15	
20	quires of emery cloth and paper,			5 50	
	Hardware, shovels, &c.,			140 00	
	Paints, oils, &c.,			145 00	
To Balance, nominal profit of shop,					$28,419 61
4				$74,074 91	$74,074 91

DISTRIBUTION.

Service mains have been laid in the following streets in 1872.

First District.

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

Street.	Location.	Size. Inches.	Feet.
Dickinson,	From Bancroft to Seventeenth,	6	300
Twenty-fourth,	" Alter to South of Ellsworth,	6	300
Dickinson,	" terminus west of Passyunk Road to Twelfth,	6	300
Seventeenth,	" Reed to Dickinson,	6	500
Twelfth,	" Wharton to 300 feet south of Reed,	6	775
Twenty-fourth,	" Catharine to Christian,	6	283
Catharine,	" Twenty-fourth to Gray's Ferry Road,	6	250
A certain Twelve feet wide street North of Madison Square, from Twenty-second to Twenty-fourth.		6	940
A certain Twelve feet wide street, south of Madison square, from Twenty-second to Twenty-fourth.		6	940
Eighteenth,	From Wharton to Reed,	6	450
Hermon,	" Wharton south,	4	325
Salter,	" Seventh to Eighth,	4	450
Twelfth,	" Mifflin to McKean,	6	450
Bond,	" do do	4	450
Dean,	" do do	4	450
McKean,	" Twelfth to Thirteenth,	6	450
Lancaster,	" Marion to Keefe,	4	180
Godfrey,	" Second west,	4	300

Street.	Location.	Size. Inches.	Feet.
Thirty-first,	From Gray's Ferry Road north,	6	296
Sixth,	" McKean to Snyder,	6	450
Celeste,	" Eighth to Ninth,	4	450
Mercy,	" Fifth to Sixth,	4	450
Hoffman,	" Seventh to Eighth,	4	450
Emily,	" Fifth to Sixth,	4	450
McKean,	" East of Sixth to East of Ninth,	6	1,284
Ninth,	" Tasker to Morris,	6	450
Newport,	" Gray's Ferry Road to Tasker,	6	1,815
Kansas,	" Southerland avenue to Dodid Place.	4	628
Morris,	" Thirteenth to Broad,	6	584
Castle Avenue,	" do to Fifteenth,	6	1,066
Verner,	" Christian to Kansas,	6	287
Bancroft,	" Wharton to Reed,	4	450
Titan,	" Eighteenth to Nineteenth,	4	450
Wilder,	" Sixth to Seventh,	4	461
Bancroft Ave.,	" Mifflin to McKean,	4	450
Pierce,	" terminus east of Eighth to Ninth,	4	600
Gray's Ferry R.,	" Patton to Newport,	6	363
Aman,	" Dickinson to Twelfth,	4	600
Sixth,	" Washington Ave. to Federal,	6	772
Ellsworth,	" Gray's Ferry Road to Twenty-ninth,	6	505
Farrell,	" Mifflin south,	4	240
Watkins,	" Eighth to Ninth,	4	450
Nineteenth,	" Ellsworth to Federal,	12	336
Moore,	" Broad to Fifteenth,	6	484
Fifteenth,	" Morris to Moore,	6	450
Broad,	" Jackson to Wolfe,	6	450
Jackson,	" Thirteenth to Broad,	6	570
Annin,	" Nineteenth to Twentieth,	4	450
Clarion,	" Jackson to Wolfe,	4	450
Latonia,	" Twentieth to Long Lane,	4	160

Street.	Location.	Size. Inches.	Feet.
Chadwick	From Reed to Dickinson,	4	450
Connecting	Ellsworth with Twenty-fourth	6	27
Connecting	Guirey with Twelfth,	4	50
Connecting	Fernon with Ninth,	4	69
Connection for sugar house,	Swanson Street,	4	45
Connection for fire plugs,		4	579
Total number of feet of pipe laid,			26,664
Number of feet of new pipe laid,		4	10,537
" " " "		6	15,791
" " " "		12	336
Total number of feet, or 5 miles 264 feet,			26,664
Relaid, Christian and intersection of Third Street,		10	150
" Swanson from Bainbridge to Almond,		6	150

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.
Haverford Ave.	From Fiftieth to Fifty-second,	6	1,230
Atlanta	" Thirty-sixth to Thirty-seventh,	4	425
Ashburton	" Twenty-fifth to Twenty-sixth,	4	348
State	" Filbert to Baring,	6	1,000
Preston	" Aspen to Story,	6	490
Story	" Preston to Forty-first,	4	712
Sloan	" Warren to Filbert,	4	1,433
Antionette	" Market to Haverford,	6	1,985

Street.		Location.	Size. Inches.	Feet.
Powelton Avenue	From	Thirty-ninth to Sanderson,	6	346
Thirty-ninth	"	Chestnut to Sansom,	6	300
Orion	"	Elm to Sycamore,	4	385
Bell	"	Powelton Ave. to Baring,	4	450
Bridge	"	Lancaster Ave. to Forty-first,	6	1,485
Transcript	"	Brooklyn to Forty-fourth	6	767
Pine	"	Forty-fifth west,	6	206
Osage Avenue	"	Forty-third to 300 feet west of Forty-fifth,	6	900
Thirty-fourth	"	Woodland to Spruce	6	900
Arch	"	Thirty-second to Thirty-fourth,	6	880
Locust	"	Forty-first East to connect dead end,	6	384
Sansom	"	Fortieth to Forty-first	6	680
Tremont	"	Aspen N. to rear of Wm. D. Kelly School-house,	4	250
Sansom	"	Thirty sixth to Thirty-eighth	6	1,009
Lex	"	Transcript north,	4	394
Elm	"	Thirty-eighth west,	6	96
Storey	"	Thirty-seventh west,	4	150
Thirty-eighth	"	Irvine to Locust,	6	257
"	"	Market to Locust,	12	1,500
Market	"	East of Thirtieth to Bridge	4	530
Plug connections,			4	560
		Total number of feet of pipe laid,		20,052
Number of feet of new pipe laid,			4	5,637
"	"	" "	6	12,915
"	"	" "	12	1,500
		Total number of feet,		20,052

Or 3 miles 5,212 feet.

Street.	Location.	Size. Inches.	Feet.
Relaid, Thirty-fourth	from Lancaster Avenue to Race,	6	550
Relaid, Broad	from Filbert to Olive	6	682
Relaid Main,	from Broad and Filbert to Olive and Broad,	20	1,146
Relaid Main,	from Olive and Broad to 100 feet north of Market,	30	720

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.
Berks	From Second to Howard,	6	888
Ann	" Kensington Avenue to 106 feet southeast of Jasper,	4	576
Indiana	" Fifth to Sixth,	6	576
Venango	" Third to Ninth,	6	2,484
Sixth	" Dead end south of Allegheny Avenue to Rising Sun Lane,	10	4,584
Adams	" Almond to Commerce,	6	450
Tuscullum	" Cambria to C,	6	1,536
Fourth	" Oxford to Cadwalader,	6	492
Cabot	" Lehigh Avenue, north,	4	359
"	" " " south,	4	350
Palethorp	" Berks to Norris,	4	558
Fifth	" York to Clearfield	6	3,924
Chatham	" Somerset, north, to Fremont,	6	540
Auburn	" Frankford Avenue to Trenton Avenue,	4	1,134

Street.	Location.	Size. Inches.	Feet
Rush,	From Frankford Avenue to Trenton Avenue,	4	1,125
Ruth,	" Hart Lane to Cambria,	4	450
Amber,	" Somerset to Cambria,	6	786
C,	" " to Kensington Avenue,	6	516
Somerset,	" Tuscullum to Ormes,	6	108
Belgrade,	" Lehigh Ave. north-east,	6	306
Venango,	" Almond to Myrtle,	6	2,424
Pepper,	" Martha to Cedar,	4	1,472
Fourth,	" Dauphin to York,	6	564
Lawrence,	" Berks to Hackley,	6	204
Fox,	" Collins to Memphis,	4	1,323
Third,	" Dauphin to Cumberland,	6	1,188
Waterloo,	" Columbia to Montgomery,	4	639
Orianna,	" Dauphin to Huntington,	4	1,719
Brown,	" Bockius to Ash,	4	522
Harriett,	" Ross southward,	4	207
Reese,	" Cambria to Indiana,	4	567
Ball,	" Dead end to Beach,	4	25
Beach,	" Ball north,	4	50
Monmouth,	" Edgemont to Belgrade,	4	945
Connection at Indiana and Fairhill Street,		4	33
Waste Pipe at Delaware Works,		3	123
Pumping Main, From America and Huntington Streets to Delaware Reservoir,		36	2,352
Connection at Cramp's Ship Yard,		4	126
" " Reading Railroad Memphis and Lehigh Avenue,		4	27
" " Dead End, Adams, and Penn,		4	22
" " Delaware Works,		8	24
" " " "		4	24
Plug Connections,		4	524
Total number of feet of pipe laid,			36,846

	Size. Inches.	Feet.
Number of feet of new pipe laid,	3	123
" " "	4	12,777
" " "	6	16,986
" " "	8	24
" " "	10	4,584
" " "	36	2,352
Total number of feet,		36,846
Or 6 miles, 5,166 feet		
Relaid Laurel, From Haydock to Beach,	6	168
" " " "	10	78
" Beaver from Canal Street east,	4	75
" Front Street and Canal Street, over Bridge,	4	45
" " " "	6	108
Lowered Silver Street from Front east,	4	225
" Seltzer " " "	4	150

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
Berks	From Twenty-second to Twenty-third,	6	456
Jefferson	" Twenty-fourth to 100 ft. east 27th	6	1,104
Seventeenth	" Montgomery to Diamond	6	1,656
Dauphin	" Tenth to Twelfth	6	900
Berks	" Ninth to Tenth,	6	468
Marshal	" Norris to Germantown ave,	6	1,752
Columbia avenue	" Twenty-fourth to Twenty-eighth,	6	1,872
Brandywine	" Broad to Fifteenth,	4	540
West College ave.	" Poplar to Girard avenue,	6	504

Street.	Location.	Size. Inches.	Feet.
Warnock	From Huntingdon to Cumberl'nd,	6	540
Alder	" Germantown road do	6	480
Cumberland	" Tenth to Eleventh,	6	432
Norris	" Sixth to Ninth,	6	924
Beechwood	" Columbia to Montgomery,	6	564
Norwood	" " "	6	564
Montgomery	" Twentieth to Twenty-second,	6	1,128
Turner	" Nineteenth to Twentieth,	6	480
Arizona	" Tenth to Eleventh,	6	468
Park avenue	" Montgomery to Berks,	6	564
" "	" Norris to Diamond,	6	540
Somerset	" Germantown avenue to Eleventh,	6	444
Sharswood	" Nineteenth to Twentieth,	6	468
Twenty-fourth	" Ridge avenue to Montgomery,	6	288
Darien	" Norris to Berks,	6	564
Jefferson	" West of Twenty-sixth to Twenty-seventh,	6	276
Garside	" Ridge avenue to Twenty-third,	6	324
Huntingdon	" Germantown avenue to Eleventh,	6	408
Lambert	" Montgomery to Berks,	6	588
Bouvier	" Oxford to Columbia,	6	564
Norris	" Eleventh to Mervine,	6	264
Eleventh	" Norris to Diamond,	6	456
B	" Twenty-fourth to Twenty-fifth,	6	432
Nicholas	" Twenty-first to Twenty-second,	6	480
Norris	" Germantown Road east	6	168
Thirty-third	" Thompson to Storage Reservoir,	3	4,050

Street.	Location.	Size. Inches.	Feet.
Pumping Main	From Master and 27th to Thompson and Twenty-sixth,	30	660
Connection	Spring Garden Reservoir,	30	168
"	Belmont Reservoir,	30	216
"	" "	36	12
"	" Engine House,	36	12
".	Storage Reservoir,	12	144
"	at Lincoln Market House,	4	27
Plug connections,		4	369
Connections with Mains,		6	96
"	"	48	12
Total number of feet of pipe laid,			27,426
Number of feet of new pipe laid,		3	4,050
"	" " "	4	936
"	" " "	6	21,216
"	" " "	12	144
"	" " "	30	1,044
"	" " "	36	24
"	" " "	48	12
Total number of feet,			27,426
Or 5 miles 1,026 feet.			
Lowered—Croskey	from Columbia to Montgomery,	6	360

FRANKFORD.

Account of Iron Pipe laid in Frankford.

Street.	Location.	Size. Inches.	Feet.
Adams,	From Kensington avenue to 135 feet west of Lieper street,	6	1,104
Elizabeth,	" Pine to 405 feet northeast of Unity,	6	1,068

Street.	Location.	Size. Inches.	Feet.
Hedge, "	Oxford to Meadow,	6	1,020
Melrose, "	Orthodox north to end of new row of houses,	6	396
Orthodox, "	Jefferson to Melrose,	6	1,968
Plug connections,		4	92
Total number of feet of pipe laid,			5,648
Number of feet of new pipe laid,		4	92
" " " "		6	5,556
Total number of feet,			5,648

Or 1 mile 368 feet.

GERMANTOWN.

Account of Iron Pipes laid in Germantown.

Street.	Location.	Size. Inches.	Feet.
Maplewood avenue,	From Green to Wayne,	6	1,040
Germantown "	" Wyoming to Stenton avenue,	6	1,213
Connecting dead ends on Wister or Stenton avenue, near Germantown Railroad,		6	1,372
Berkley,	From Germantown avenue to Green St.,	6	271
Green, "	Berkley to Apsley,	6	403
Apsley "	Germantown Ave. to Wayne St.,	6	1,181
Chelton Ave., "	Germantown avenue east to Germantown Railroad,	6	620
West Walnut Lane,	From Germantown avenue southwest to Adams street,	6	618
West Washington Lane,	From east of Adams street,	4	162
Duval,	From Germantown avenue to Adams,	6	1,289
Rubican Lane, "	Wister to Wisteria avenue,	6	825
Boynton " "	End of pipe at Wister street, south eastward 280 feet,	4	344

Street.	Location.	Size. Inches.	Feet.
Clarkson avenue,	From Wister street eastward,	4	473
Cottage Lane,	" Wister street south,	4	317
Germantown avenue,	From Johnson to Tulpohocken,	16	1,573
" "	" Tulpohocken to Wister,	10	6,225
Connections for main,		6	95
" plugs,		4	383
" on Manheim street,		4	132
Drain from 16-inch main on West Washington Lane,		4	185
Total number of feet of pipe laid,			18,721
Number of feet of new pipe laid,		4	1,996
" " "	"	6	8,927
" " "	"	10	6,225
" " "	"	16	1,573
Total number of feet,			18,721
Or 3 miles 2,881 feet.			
Relaid, Manheim, from Germantown avenue to Wissahickon avenue,		6	4,648
" Wissahickon avenue, from Manheim street southwest,		6	1,519
" at reservoir on Allen's Lane,		10	285

MANAYUNK.

Account of Iron Pipes laid in Manayunk.

Street.	Location.	Size Inches.	Feet.
Washington	From Main to fountain,	6	1,668
Lyceum Ave.	" Ridge Ave. to Manayunk Avenue,	6	1,496
Oak	" Baker to Wood,	4	774
Cotton	" Wood to Tower,	6	289
Tower	" Cotton to Mechanic,	6	216

Street.	Location.	Size. Inches.	Feet.
Mechanic	From Tower to Leibert,	6	312
Green Lane	" Ridge Avenue to Manayunk Avenue,	6	1,650
Ridge Avenue	" Kram's Ave. to 100 feet north of Leverington Ave.	6	696
Markle	" Cresson, eastward,	4	333
Cresson	" Cotton to Grape,	6	276
Ridge Avenue,	" Green Lane to Lyceum Ave.,	6	538
"	" Reading R. R. Bridge north,	6	1,284
"	" Falls Bridge, south,	6	1,092
Connection at Winpenny's Mill,		4	9
"	" Mill, Main Street above Shur's Lane,	4	27
"	" Mill, Main and Shur's Lane,	4	27
Plug connections,		4	177
	Total number of feet of pipe laid,		10,864
Number of feet of new pipe laid,		4	1,347
" "	" "	6	9,517
	Total number of feet,		10,864

Or 2 miles 304 feet.

Recapitulation of pipe laid in the several districts during the year 1872.

WARDS.	3-inch.	4-inch.	6-inch.	8-inch.	10 inch.	12-inch.	16-inch.	30 inch.	36-inch.	48-inch.	TOTAL.
1st District, 1, 2, 3, 4, 26	.....	10,537	15,791	.....	.....	336	.....	.....	.....	.....	26,664
2d " 5, 6, 7, 8, 9, 10, 24, 27	.....	5,637	12,915	.....	.....	1,500	.....	.....	.....	.....	20,052
3d " 11, 12, 16, 17, 18, 19, 23, 25	123	12,777	16,986	24	4,584	.....	.....	.....	2,352	.....	36,846
4th " 13, 14, 15, 20, 21, 28, 29	4,050	936	21,216	.....	.....	144	.....	1,044	24	12	27,426
Frankford	.....	92	5,556	.....	.....	.....	.....	.....	.....	.....	5,648
Germantown	.....	1,996	8,927	.....	6,225	.....	1,573	.....	.....	.....	18,721
Manayunk	.....	1,347	9,517	.....	.....	.....	.....	.....	.....	.....	10,864
Totals	4,173	33,322	90,908	24	10,809	1,980	1,573	1,044	2,376	12	146,221

Being a total of 27 miles 3,661 feet.

Total number of feet of pipe, as per last report.....2,738,119
" " " " laid during the year..... 146,221

Feet.....2,884,340

Or 546 miles 2,160 feet.

SERVICE MAINS ORDERED.

Councils have ordered pipes laid in the following Streets.

First District.

Pipe ordered to be laid in the First District.

Street.	Location.
Tenth,	From Winton to Jackson.
Moore,	" Tenth to Broad.
Otsego,	" Mifflin to McKean.
Mifflin,	" Eighth to Ninth.
Catherine,	" Twenty-second to Twenty-third.
Two certain twelve feet wide streets, north and south of St. Albans Place, from Twenty-second to Twenty-third.	
Kater,	From Seventeenth to Eighteenth.
Twenty-sixth,	" Federal to Galloway.
Bancroft,	" Mifflin to McKean.
Godfrey,	" 300 feet west of Second Street to Moyamensing Avenue.
Sixth,	" Snyder to Jackson.
Dudley,	" Seventh to Eighth.
Emily,	" Sixth to Seventh.
Newport,	" Tasker to Mifflin.
Morris,	" Broad to Fifteenth.
Ellsworth,	" Twenty-fourth to Twenty-sixth.
Nineteenth,	" Federal to Wharton.
Briggs,	" Muller to Sutherland Avenue.
Bond,	" Morris to Tasker.
Griffith,	" " "

Second District.

Pipe ordered to be laid in the Second District.

Street.	Location.
Lex,	From Huron South to dead end.
Aspen,	" Thirty-sixth to Thirty-Seventh.
Fortieth,	" Lancaster Ave. to Elm.
Walnut,	" Forty-third to Forty-seventh.
Woodland,	" Railroad Bridge to Forty-ninth.
Silverton Ave.,	" Forty-eighth to Fiftieth.
Thirty-first,	" Bridge to Hamilton.
Powelton Ave.,	" Sanderson to Fortieth.
Lombard,	" Forty-third to Forty-fifth.
Locust,	" Thirty-fourth to Woodlands.
Spruce,	" " "
Thirty-eighth,	" Locust to Darby Road.
Hutton,	" Fortieth to Lancaster Ave.
Fifty-second,	" Girard Ave. to "
Monroe Ave.,	" Fifty-second to "
Markoe,	" Seneca to "
Elm,	" Thirty-third to Thirty-fourth.
Paschall,	" Lancaster Ave. to Fifty-sixth.
Grape,	" Thirty-seventh to Thirty-eighth.

Relay Bread Street.

Third District.

Pipe ordered to be laid in the Third District.

Street.	Location.
Berks,	From Second to Germantown Ave.
Ann,	" Emerald N. W. to dead end.
Wellington,	" Thompson to Cedar.
Ormes,	" Somerset to Cambria.
Montgomery,	" Second to Bodine.
Dauphin,	" Gaul to Thompson.

Adams,	From	Cedar to Gaul.
Tuscullum,	"	Cambria to Front.
Harrowgate Lane,	"	Kensington Ave. to Frankford Road.
E.	"	" to Indiana.
Auburn,	"	Trenton Ave. to Frankford Road.
Garret,	"	Hart Lane to Reading Railroad
Boudinot,	"	Cambria to Somerset.
Humboldt,	"	Eleventh to Reading Railroad.
Venango,	"	Kensington Avenue to Old Harrowgate Lane.
Jasper,	"	Cambria to Reading Railroad.
Tulip,	"	Montgomery Ave. to Palmer.
Fourth,	"	York to Lehigh.
Kirkbride,	"	Thompson to Guyre.
Third,	"	Cumberland to Lehigh.
William,	"	Thompson to Walker.
Tioga,	"	Richmond to Almond.
Clementine,	"	Frankford Ave. to Emerald.
Clearfield,	"	Frankford Road to Jasper.
Lark,	"	Auburn to Wayne.
Bright,	"	" "
Wayne,	"	Trenton Avenue to Tulip.
Tulip,	"	Cambria to Somerset.
Hewston,	"	Gaul to Belgrade.
Cambria,	"	Front to Kensington Ave.
Chatham,	"	Fremont to William.
Cumberland,	"	Second to Fourth.
Emerald,	"	Cemetery Avenue to Allegheny Ave.

Fourth District.

Pipe ordered to be laid in the Fourth District.

Street.		Location.
Master,	From	Twenty-seventh to Twenty-eighth.
Lehigh Ave.	"	Sydenham to Eighteenth.
Thirteenth,	"	Berks to Susquehanna.
Tancy,	"	Brown to Poplar.
Franklin,	"	Berks to Norris.

Eighth,	From	Diamond to Dauphin.
Stewart,	"	Twenty-first to Twenty-second.
Institute,	"	Montgomery to Berks.
Fifteenth,	"	Monument Cemetery to Susquehanna.
Carlisle	"	" "
Sixteenth,	"	Norris to "
Montgomery,	"	Broad to Sixteenth.
Norris,	"	Twentieth to Twenty-first.
Dauphin,	"	Twelfth to Broad.
Brown,	"	Twenty-seventh to Twenty-ninth.
Shamokin,	"	Twenty-first to Twenty-second.
Berks,	"	Sixth to Seventh.
Norris,	"	Sixteenth to Nineteenth.
"	"	Carlisle to Broad.
Parrish,	"	Twenty-fourth to Taney.
Eighteenth,	"	Berks to Susquehanna.
Twentieth,	"	Norris to "
Norris,	"	Ninth to Tenth.
Montgomery,	"	Twenty-second to Ridge Ave.
Ralston,	"	Twenty-third to Twenty-fourth.
Eleventh,	"	Cumberland to Huntingdon.
Twenty-second,	"	Ontario to Tioga.
Tioga,	"	Twenty-second to Township Line
Township Line,	"	" to Venango.
Twenty-third,	"	Ridge Avenue to Montgomery.
Park Ave.,	"	Diamond to Susquehanna.
Poplar,	"	West College Ave. to Twenty-ninth.
Wellington,	"	Jefferson to Oxford.
Jefferson,	"	Twenty-seventh to Twenty-eighth.
Bouvier,	"	Jefferson to Oxford.
Twenty-fourth,	"	Thompson to North College Ave.
Gross,	"	Twenty-eighth to Twenty-ninth.
Taney,	"	Girard Ave. to Mount Pleasant.
Meredith,	"	Twenty-fourth to Twenty-fifth.
Dacota,	"	Tenth to Eleventh.

Eleventh,	From	Diamond to York.
Fountain,	"	Sixteenth to Seventeenth.
Page,	"	" "
Twenty-sixth,	"	Jefferson to Ridge Avenue.

FRANKFORD.

Pipe ordered to be laid in Frankford.

Street.		Location.
Adams,	From	West of Lieper to Sellers.
Penn,	"	Unity to Pine.

GERMANTOWN.

Pipe ordered to be laid in Germantown.

Street.		Location.
Township Line Road, to connect with pipe now laid in the Twenty-eighth Ward.		
Stenton Ave.,	From	terminus to Germantown Ave.
Germantown Ave.,	"	Westmoreland to Cayuga.
Chelton Ave.,	"	Morris to Rexley.
Mill,	"	end of pipe N. E. about 1,000 feet.
East Walnut Lane,	"	" " 165 feet.

MANAYUNK.

Pipe ordered to be laid in Manayunk.

Street.		Location.
Ridge Ave.,	From	Bridge to Queen.
Spencer,	"	Ridge Ave.
River Road,	"	Main and Washington Streets to American Pulp Works.
Chestnut,	"	Church to Walnut.
Ritchie,	"	Green Lane to Centre,
Cedar,	"	Apple to Tower.

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
Totals, . .	280	2,656

Account of the number of holes drilled for making new attachments to public mains during the year 1872.

Months.	½ inch diameter.	⅝ inch diameter.	¾ inch diameter.	1-inch diameter.	Total holes drilled and attachments made.	Shut-offs.
January	111	7	1	2	121	21
February	123	8	3	.....	134	22
March	239	6	.....	2	247	28
April	601	10	6	5	622	44
May	648	12	5	14	679	23
June	529	14	6	2	551	22
July	421	8	7	10	446	26
August	436	12	1	6	455	38
September	500	19	4	3	526	33
October	557	12	7	4	580	40
November	499	21	7	5	532	31
December	295	4	3	2	304	30
Totals	4,959	133	50	55	5,197	358

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 attachments made.	Shut-offs.
First District, 1, 2, 3, 4, 26...	1,274	5	1	10	1,290	50
Second District, 5, 6, 7, 8, 9, 10, 24, 27	660	51	27	23	761	119
Third District, 11, 12, 16, 17, 18, 19, 23, 25	1,494	31	10	8	1,543	77
Fourth District, 13, 14, 15, 20, 21, 28, 29	1,126	40	12	12	1,190	91
Germantown	244	4	.....	1	249	13
Manayunk	161	2	.....	1	164	8
Totals	4,959	133	50	55	5,197	358

The following Table exhibits the number of repairs to mains, stops, and plugs, by different districts, during the year 1872.

Districts.	Repairs to mains.	Repairs to stops.	Repairs to plugs.
First, . . .	53	238	253
Second, . .	302	273	302
Third, . . .	129	431	407
Fourth, . .	79	333	361
Germantown.	28	76	62
Manayunk, .	30	9	19
Totals, . .	621	1,360	1,404

Account of new stops and fire-plugs for 1872.

Districts.	No. of stops.	No. of fire-plugs.
First, ...	52	46
Second, ...	52	39
Third, ...	97	65
Fourth, ...	37	23
Germantown, . . .	69	27
Manayunk, ...	19	15
Totals, . . .	326	215

Statement of the number of Fire Plugs in the different Wards.

FIRST DISTRICT.

Number of plugs, as per last report,			780
First Ward,	17		
Second "	3		
Third "	—		
Fourth "	—		
Twenty-sixth "	26		46
			826

SECOND DISTRICT.

Number of plugs, as per last report,			1,164
Fifth Ward,	—		
Sixth "	—		
Seventh "	—		
Eighth "	—		
Ninth "	2		
Tenth "	—		
Twenty-fourth "	20		
Twenty-seventh "	12		34
			1,198

THIRD DISTRICT.

Number of plugs, as per last report,			1,310
Eleventh Ward,	—		
Twelfth "	—		
Sixteenth "	—		
Seventeenth "	—		
Eighteenth "	3		
Nineteenth "	17		
Twenty-third " (Frankford),	9		
Twenty-fifth "	35		64
			1,374

FOURTH DISTRICT.

Number of plugs, as per last report,							793
Thirteenth	Ward	-	-	-	-	—	
Fourteenth	"	-	-	-	-	—	
Fifteenth	"	-	-	-	-	—	
Twentieth	"	-	-	-	-	5	
Twenty-eighth	"	-	-	-	-	9	
Twenty-ninth	"	-	-	-	-	7	21
							814

GERMANTOWN.

Number of plugs, as per last report,							163
"	"	during year,	-	-	-	-	26
							189

MANAYUNK.

Number of plugs, as per last report,							80
"	"	during year,	-	-	-		15
							95
		Total fire plugs in all the wards,					4,496

The following shows the number of attachments made in the different Districts during the year 1872, for fire purposes only, in places of public amusement, hotels, manufactories, &c.

Total, as per last report,						113
First	District,	-	-	-	1	
Second	"	-	-	-	—	
Third	"	-	-	-	1	
Fourth	"	-	-	-	1	
Germantown,		-	-	-	—	
Manayunk,		-	-	-	3	6
			Total,	-	-	119

There are now 54 public drinking fountains supplied by the department free of charge, as follows:

Erected by the Fountain Society, as per last report,	43	
Added during the year, - - -	5	
	—	48
Erected by the Society for Prevention of Cruelty to Animals, as per last report, - - -		6
Total, - - -		54

RECEIPTS AND EXPENDITURES.

Receipts for Year 1872.

The gross receipts for the year have been $1,054,281 51. The sources from which this amount has been received will be exhibited by the statement of the Register, George F. Keyser, Esq.

Of the above sum, $10,668 40 has been received at the Engineer's office.

The following amounts have been received at the Chief Engineer's office, and paid over to the City Treasurer:

For Rents,	$1,385 00
Old iron, &c.,	1,224 35
Cement barrels, lumber and stone,	118 00
From R. F. Simpson, for 4-inch attachment,	148 98
United States Government, for 4-inch attachment, U. S. Appraiser's stores,	187 97
D. Wallace, for 4 inch attachment,	149 75
Heft & Ogle, for 4-inch attachment,	143 75
Parker & McPhilimy, for 4-inch attachment,	121 50
Central Market Co., for 4-inch attachment,	182 00
Robt. Fox, for 4-inch attachment,	107 57
Jno. Brown & Sons, 4-inch attachment,	115 75
D. Buck & Bro., for 4-inch attachment,	228 07
Amount carried forward,	$4,112 69

Amount brought forward,	$4,112 69
Campbell & Pollock, for 4-inch attachment,	130 50
Jno. W. Murphy & Bro., for 4-inch attachment,	110 00
Managers House of Refuge, for 4-inch attachment,	223 64
R. N. Buckley, for 4-inch attachment,	123 85
Lincoln Market Co., for 4-inch attachment,	143 68
Harrison, Havermyer & Co., for labor and material furnished,	214 00
Commissioners Fairmount Park, for labor and material furnished,	820 65
Girard Estate, for labor and materials furnished,	67 45
Philadelphia and Reading Railroad Company, for labor and material furnished,	365 18
Managers House of Refuge, for labor and material furnished,	87 30
Chas. Ritmyer, for labor and material furnished,	33 69
E. K. Kortright, for removing fire plug,	79 01
F. W. Bartruff, for removing fire plug,	12 00
Bergdoll & Psotta, for labor and material furnished,	15 50
Bergner & Engel, for labor and material furnished,	9 50
Wood & McGill, for labor and material furnished,	14 76
M. Thomas & Sons, for proceeds of sale of old works, Twenty-fourth Ward,	3,922 00
Emile Geyelin, for use of engine, &c., (Fairmount),	183 00
	$10,668 40

DEPARTMENT FOR SUPPLYING THE CITY WITH WATER,
Register's Office, No. 104 South Fifth Street,
PHILADELPHIA, *January*, 1872.

FREDERICK GRAFF, Esq.,
Chief Engineer Water Department.

DEAR SIR:—In compliance with the usual custom, the following report of the operations of my office for the past year is respectfully submitted.

It is with pleasure I can direct your attention to the enormous increase in the receipts from all sources since my appointment as Registrar. The amount collected for the year 1872, was $1,043,613,11 against $666,294.95 in 1866, which is an increase of 37 per cent. for the term. The excess of penalties collected for the same period amounts to nearly 70 per cent.

In the statements of the aggregate amounts charged in duplicates for the years 1872 and 1873, you will find an unusually large increase, which is due to the vigilance of new and efficient inspectors in the growing wards, especially the Nineteenth, Twentieth, Twenty-sixth, and Twenty-ninth.

The permits issued during the year will be found in the carefully prepared list which is submitted, also the statement of the increase of dwellings, &c., &c., which are supplied by us with water, and charged upon the registers in this office, also a concise statement of the collections from all sources for the year 1872.

I also desire to communicate the fact that there appears to be a growing desire on the part of many large consumers of water to have meters attached, believing it to be the only fair means of determining the quantity used.

The total amount of pipe bills returned to the Survey Department for lien during the year 1872 was $77,467.36.

Yours, very respectfully,

GEO. F. KEYSER,
Registrar.

List of Dwellings, Factories, Horse power, &c., as charged on Registers of 1872.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	29 & 20	21 & 28	22	23	27 & 24	25	26	Total.
Dwellings	6484	3782	2007	1858	2756	2774	3576	2765	2470	2873	2360	1914	2574	3124	5882	2032	2137	3622	8810	9702	1509	1320	537	3269	1359	6652	88,239
" ½ and ¾	484	1578	1396	1576	543	325	1325	575	513	1066	967	753	619	809	1381	1377	685	1080	1113	784	14	7	6	133	312	560	19,981
Baths	1665	913	657	409	816	508	1974	2054	1219	1742	415	803	1675	1601	3457	444	301	687	2146	6624	913	976	140	1673	327	2076	34,232
Wash-paves	516	366	296	125	553	324	1037	1136	911	1125	189	450	935	1091	2510	307	232	444	1182	4728	875	405	218	940	185	966	21,987
Water closets, urinals, and biddets	65	45	62	67	1340	1642	1074	2147	1452	1092	149	146	371	314	1646	80	26	28	167	1628	404	682	22	949	22	284	15,913
Basins, sinks, & wash tubs	55	44	61	68	1327	1613	1111	2219	1437	1120	148	135	370	294	1650	81	25	20	169	1663	420	670	22	911	24	184	15,841
Horse-power	627	598	89	211	702	1289	352	278	896	296	461	256	255	185	2006	1175	437	640	1651	648	88	486	172	591	45	139	14,573
" stalls	470	859	302	241	520	400	643	1504	1355	1721	1695	1643	615	682	1848	656	201	472	1059	1818	88	60	116	1071	146	691	20,888
Bars	95	142	76	191	254	167	85	107	164	66	266	108	79	46	203	128	160	80	228	216	17	14	16	104	66	163	3,243
Watering horses	24	8	9	9	19	2	11	.....	20	4	4	1	1	5	12	2	10	67	15	6	1	3	9	30	10	48	330
Factories	11	8	1	2	4	30	22	.....	37	9	2	13	11	29	3	31	36	6	102	16	4	8	2	37	.....	2	426
Fountains	3	1	2	1	15	15	2	23	28	19	1	6	6	12	30	4	.....	5	2	22	3	18	3	51	2	8	282
Bakeries	27	38	29	21	14	19	10	9	26	9	13	16	12	16	42	13	17	14	88	46	5	9	5	26	6	27	557
Dye-tubs	.....	7	.....	.....	6	35	1	.....	.....	14	....	.....	3	.....	61	41	42	24	64	5	5	20	.....	.....	19	15	362
Meat packers	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
Foundries	6	.....	.....	.....	.....	.....	.....	.....	1	1	....	.....	.....	5	2	1	.....	.....	2	4	.....	.....	.....	.....	1	.....	24
Breweries	1	2	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	3	.....	4	7	18	.....	.....	36	.....	3	.....	.....	5	.....	80
Sugar houses	.....	2	.....	1	1	2	.....	.....	.....	2	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	11
Hot and green-houses	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	11	2	4	2	.....	.....	26
Distilleries	.....	.....	.....	1	.....	1	3	.....	.....	.....	.....	.....	.....	.....	.....	3	2	.....	.....	.....	.....	.....	.....	.....	.....	1	11
Slaughter-houses	11	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	5	13	1	2	2	....	13	36	3	.....	.....	2	2	6	97
Malt-houses	.....	.....	.....	.....	.....	1	.....	1	.....	1	2	.....	1	.....	.....	1	.....	1	.....	4	.....	.....	.....	.....	.....	.....	12
Brick yards	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	9	.....	1	2	3	5	8	30
Barber shops	19	29	15	13	30	28	8	7	38	10	13	13	15	23	23	17	24	10	54	14	6	5	3	19	4	7	447
Photographers	.....	.....	1	.....	6	11	1	9	21	2	5	2	6	2	1	.....	1	.....	18	2	.....	1	.....	5	.....	.....	94
Miscellaneous	6	5	7	4	2	5	3	2	3	4	2	3	5	3	6	2	3	2	3	4	3	1	.....	3	2	3	86

Permits issued for the year 1872.

	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	528	66	6	12	1	3	37	27	7	41	3	6	8	16	64	13	12	143	1103	187	396	203	95	384	271	552	75	492	4,751
" ½ and ¾	.....	3	...	...	.....	.....	.....	.....	.....	1	...	...	.....	.....	4	2	6	.....	2	.....	.....	.....	.....	.....	.....	10	4	.....	32
Baths	261	19	29	12	8	1	44	54	14	60	5	9	20	17	67	21	11	82	652	175	215	114	20	242	114	300	69	391	3,026
Wash paves	104	20	10	7	7	2	26	36	15	29	8	10	15	29	47	16	10	39	300	131	156	56	24	95	24	160	51	306	1,743
Water-closets, urinals, and biddetts	15	1	1	1	22	97	40	145	39	95	8	18	22	43	110	26	4	13	14	70	56	102	4	113	3	108	60	135	1,365
Basins, sinks, and wash-tubs	5	.....	...	2	9	68	77	217	24	123	7	7	21	23	114	27	3	5	16	78	72	90	4	52	5	8	74	162	1,293
Building permits	28	6	...	2	1	4	6	7	8	7	1	2	.....	.....	22	.....	2	7	99	34	51	50	15	50	41	27	28	45	543
Bakeries	1	1	...	...	.....	.....	.....	.....	1	.....	...	...	.....	1	...	.....	...	.....	2	.....	1	1	1	.....	1	1	.....	1	12
Steam engines	7	2	1	...	8	13	3	1	2	1	1	4	2	4	1	3	2	4	6	3	2	5	1	2	2	2	1	.....	83
Horse powers	57	20	2	...	85	154	28	50	17	15	1	16	16	92	40	34	9	70	18	19	21	43	16	11	8	10	20	.....	872
Fountains	1	...	...	...	3	.....	.....	2	2	.....	1	...	.....	1	2	.....	...	.....	.....	.....	1	4	1	4	1	1	3	2	29
" public	1	.....	...	1	.....	.....	2	.....	.....	.....	...	...	.....	.....	.....	.....	...	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Stables	7	5	1	1	1	.....	1	5	4	1	1	1	.....	12	.....	3	6	13	16	5	5	.....	5	4	6	4	6	114
Drug stores	1	.....	...	...	1	.....	.....	2	.....	.....	...	1	.....	.....	.....	1	...	1	.....	1	1	.....	.....	.....	1	.....	.....	1	11
Hotels and bars	6	2	...	4	3	5	1	5	5	6	3	6	3	2	3	4	6	4	11	8	6	1	4	3	5	6	2	4	118
Stores, shops, and offices	4	.....	...	2	4	11	1	1	.....	.....	1	4	.....	2	5	4	9	.....	6	6	1	.....	1	3	1	2	1	1	70
Watering horses	2	.....	...	...	.....	.....	.....	.....	1	1	1	1	.....	.....	2	1	...	.....	3	2	.....	3	.....	2	4	1	.....	1	25
" streets	.....	.....	...	...	6	.....	2	6	.....	.....	2	.....	.....	6	2	.....	...	.....	.....	.....	6	.....	.....	6	.....	.....	.....	.....	36
" ships	.....	10	...	17	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28
Slaughter houses	6	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	2	...	.....	4	.....	2	.....	.....	1	2	.....	.....	1	18
Factories	4	.....	1	...	2	.....	1	.....	1	.....	2	...	.....	1	.....	.....	2	4	1	1	3	3	1	1	.....	2	2	.....	32
Foundries	.....	.....	...	...	.....	.....	.....	.....	.....	1	...	...	.....	.....	1	1	...	.....	1	4	.....	.....	.....	.....	.....	.....	.....	.....	8
Skating parks	1	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2
Laundries	.....	.....	...	...	.....	1	.....	.....	.....	.....	...	...	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Barber-shops	1	3	2	1	.....	.....	.....	.....	.....	.....	1	1	.....	2	.....	2	1	1	1	.....	1	.....	.....	1	.....	.....	.....	2	20
Photograph galleries	.....	.....	...	...	.....	.....	.....	1	.....	.....	...	...	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Market houses	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	1	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	4
Bottling establishments	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	1	.....	.....	.....	...	...	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Breweries	.....	.....	...	...	.....	.....	.....	.....	.....	.....	1	...	.....	.....	.....	2	...	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	5
Hot and green houses	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	...	...	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Public halls	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	...	...	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Distilleries	.....	.....	...	...	.....	1	.....	.....	.....	.....	...	...	.....	.....	.....	1	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Laboratory	.....	.....	...	...	.....	.....	.....	.....	.....	.....	1	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Malt-house	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	1	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Brick yards	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	...	...	.....	1	.....	2	.....	.....	.....	1	1	.....	1	6
Churches	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	2
Dye houses	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
Passenger railroad depots	.....	.....	...	...	.....	.....	.....	.....	.....	.....	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1
	1040	158	53	61	162	300	267	561	140	391	48	88	108	239	497	160	82	379	2255	736	998	682	187	975	491	1198	395	1554	14,265

Amount of Duplicates for the years 1872 and 1873.

WARDS.	1872.	1873.
First,	$37,148 75	$42,364 50
Second,	32,128 00	32,476 75
Third,	19,110 25	19,499 50
Fourth,	18,914 50	19,021 25
Fifth,	33,957 75	34,374 25
Sixth,	35,074 50	36,367 50
Seventh,	38,963 00	39,706 50
Eighth,	37,462 50	38,742 25
Ninth,	34,179 25	34,163 75
Tenth,	33,447 50	34,203 25
Eleventh,	18,085 00	18,098 00
Twelfth,	20,154 00	20,237 25
Thirteenth,	29,146 50	29,277 50
Fourteenth,	32,627 50	33,261 00
Fifteenth,	68,658 50	70,418 50
Sixteenth,	23,148 75	23,512 25
Seventeenth,	22,505 75	22,603 25
Eighteenth,	30,824 25	31,760 00
Nineteenth,	68,715 50	86,110 50
Twentieth,	64,498 50	67,197 50
Twenty-first, Twenty-eighth,	11,831 50	15,372 25
Twenty-second,	14,808 00	16,677 50
Twenty-third,	5,120 50	6,027 50
Twenty-fourth,	20,672 75	24,297 75
Twenty-fifth,	9,593 25	11,665 75
Twenty-sixth,	50,393 25	56,450 00
Twenty-seventh,	17,455 75	19,005 25
Twenty-ninth,	33,167 75	41,767 00
Totals,	$861,793 00	$924,658 25

Statement of Receipts at Registrar's Office, from January 1 to December 31, 1872.

MONTHS.	Delinquent Rents.	Penalties.	Rents, 1872.	Penalties.	Fractional Rents.	Water Pipe.	TOTALS.
January	$9,101 00	$903 27	$36,475 75	.....	$2,654 80	$9,834 03	$58,971 85
February	2,938 75	283 82	54,369 00	.....	2,157 97	10,234 15	69,983 69
March	1,866 00	151 29	130,096 75	.....	3,648 25	12,032 45	147,794 74
April	1,543 00	143 41	410,097 00	.....	6,822 25	11,840 21	430,445 87
May	996 25	99 29	41,580 75	2,056 68	8,900 45	7,197 77	60,831 19
June	800 75	81 23	41,922 25	1,971 07	5,756 50	4,969 32	55,501 12
July	391 25	39 57	10,492 75	1,393 42	4,636 00	12,258 13	29,211 12
August	549 50	74 46	17,645 50	2,387 14	4,371 25	12,334 60	37,362 45
September	1,484 75	137 98	26,829 00	3,598 17	4,023 50	12,497 30	48,570 70
October	1,077 75	125 88	23,629 00	2,872 28	4,506 54	15,034 21	47,245 66
November	606 00	63 32	12,239 50	1,441 12	4,781 50	10,120 63	29,252 07
December	780 00	85 07	10,605 25	1,294 17	2,208 00	13,470 16	28,442 65
Totals	$22,138 00	$2,188 59	$815,982 50	$17,014 05	$54,467 01	$131,822 96	$1,043,613 11

RECEIPTS AND EXPENDITURES SINCE CONSOLIDATION.

YEARS.	Received by Register 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	351,036 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 46
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

Expenditures of the Department for the year 1872.

Salaries of chief engineer, register, clerks, &c., -		$29,645 52
Office expenses, - - - - -		4,592 03
Salaries of engineers, firemen, &c., at works, -		38,793 44
Supplies to Works, viz.:		
Coal and wood, - - - - -		44,933 59
Tallow, oil, and gas, - - - -		5,311 66
Small stores, packing, &c., - - -		2,767 85
Repairs to works, viz.:		
Fairmount Works, - -	$4,996 02	
Delaware, " - -	2,992 15	
Schuylkill, " - -	3,897 38	
Belmont, " - -	2,241 26	
Germantown, " - -	250 00	
Roxborough, " - -	2,469 22	
		16,846 03
Keeping buildings, grounds, and reservoirs in good order:		
Lumber, - - -	$1,641 73	
Brickwork, - - -	887 64	
Hardware, - - -	359 52	
Iron castings, - - -	415 56	
Coal tubs, &c., - -	435 35	
Painting and glazing, - -	1,247 06	
White lead, &c., - -	256 38	
Hose, &c., - - -	274 75	
Hand rails, - - -	677 54	
Roofing tin, - - -	431 04	
Sash and frames, - -	127 74	
Repairing scales, - -	220 82	
Plumbing, - - -	655 75	
Rent of pool, &c., Germantown Water Company, - -	1,250 00	
Bronze figure, - - -	1,200 00	
Plastering, - - -	86 75	
Amounts carried forward, -	$10,167 63	$142,890 12

Amounts brought forward, -	$10,167 63	$142,890 12	
Bricks, - - - -	204 00		
Paper hanging, - -	54 35		
Uniforms for guards, - -	71 00		
Lime, - - - -	76 82		
Sundry bills, - - -	262 52		
Wages, - - -	8,660 09		
		19,496 41	

Iron pipes, fire plugs, and other fixtures, and materials for laying pipes, &c.:

Iron pipes, - - -	$140,814 18	
Iron castings, - - -	12,400 10	
Brass castings, - - -	4,631 33	
Lead, - - - -	10,689 18	
Gasket, - - -	1,432 47	
Wrought iron and steel, -	1,935 70	
Hardware, - - -	1,231 78	
Bolts, nuts, washers, &c., -	858 14	
Lumber, - - -	2,692 33	
Tubing, - - -	137 52	
Coal, - - - -	769 50	
Belting, - - -	15 45	
Rents of yards, &c., - -	378 00	
Galvanizing spindles, - -	176 05	
Water meters, - - -	151 00	
Leather, - - -	221 00	
Iron, varnish, paints, and oils, -	615 68	
Coke, - - - -	50 00	
Tool house, - - -	122 50	
Sponge Cloths, - -	225 00	
Listing, - - -	38 93	
Sundry bills, - - -	411 71	
		179,997 55
Amount carried forward, -		$342,384 08

Amount brought forward, -		$342,384 08
Labor laying pipe, setting plugs, &c., and for fitting up stop cocks, &c., viz.:		
First District, - - -	$6,730 13	
Second, " - - -	9,043 49	
Third, " - - -	20,537 18	
Fourth, " - - -	6,325 52	
Germantown, - - -	8,020 86	
Manayunk, - - -	5,624 91	
Shop, - - - -	17,447 78	
Surveyors for meas. pipes, &c. -	4,132 19	
Pipe plans, - - -	1,898 00	
Hauling pipes, - -	1,699 20	
Iron pipe, - - -	366 00	
Repaving around plugs, -	176 75	
Sundry bills, - - -	266 29	
		82,238 30
Keeping pipes, plugs, stops, and fixtures in good order:		
Wages, First District, - -	$3,613 75	
" Second " - -	5,560 97	
" Third " - -	8,008 00	
" Fourth " - -	7,004 87	
" Germantown, - -	1,283 97	
" Manayunk, - -	1,107 47	
Plumbing, - - -	202 40	
Repaving around fire plugs, -	1,130 94	
Sundry bills, - - -	78 43	
		$27,990 80
Drilling and making new attachments:		
Wages, First District, - -	$1,971 75	
" Second " - -	1,628 00	
" Third " - -	1,982 00	
" Fourth " - -	1,876 50	
" Germantown, - -	336 24	
Amounts carried forward, -	$7,794 49	$452,613 18

Amounts brought forward, -	$7,794 49	$452,613 18
" Manayunk, - -	695 25	8,489 74
Iron railing, Fairmount, - - -		249 11
Carriage hire and keep of horse for use of Chief Engineer, - - - - -		619 25
Rent of engines, &c., Germantown Water Co.,		3,750 00
For expenses of public fountains of the Philadelphia Fountain Society, - - -		998 52
For extension of railroad track and building coal sheds, Belmont Works:		
Railway track, - -	$2,000 00	
Railroad scales, - -	725 00	
Lumber, - - -	753 46	
Roofing, - - -	130 56	
Hardware, - - -	55 76	
Wages, - - - -	835 23	
		$4,500 00
(Special appropriations.)		
Assisting to keep up the supply of water:		
Boiler work, - - -	$875 50	
Lumber, - - -	161 29	
Hardware, - - -	45 21	
Brass cocks, &c., - -	122 37	
Felting boilers, - - -	63 85	
Painting, &c., - - -	289 99	
Bricks, - - - -	52 50	
Sash, &c., - - -	84 79	
Wages, - - -	1,670 88	
Sundry bills, - - -	84 62	
		$3,451 00
To pay expert or experts, &c., in suit of Schuylkill Navigation Co. *vs.* City, Wages, &c., - - - -		205 62
Surveys for a better supply of water to Frankford: Wages, - - - - - -		207 35
Amount carried forward, -		$475,083 77

Amount brought forward, - -		$475,083 77

(Appropriation May 4th, 1872.)

Item 1.

For materials and labor in constructing Weir at reservoir for the measurement of amount of water and pumping capacity of Worthington Steam Pumping Engine:		
Weir, &c., - - - -	$551 59	
Wages, - - - -	100 00	
Sundry bills, - - -	88 00	
		739 59

Item 2.

For the pay of Assistants:		
Wages, - - - - - -		500 00

Item 3.

For incidental apparatus and expenses in ascertaining the duty of engine and pumps and evaporative capacity of boilers:		
Carriage hire for use of Experts,	160 00	
Meals furnished experts, - -	165 00	
Sundry expenses, - - -	148 00	
		473 00

Item 4.

For pay of five Experts:		
Wages, - - - - -		1,250 00
Bills of twice paid and overpaid water rents and pipe laying bills:		225 09
Amount carried forward, - -		$478,271 45

Amount brought forward, - -		$478,271 45
(Appropriation June 29, 1867.)		
For substituting turbine wheel in place of old breast wheels, at Fairmount:		
Wages, - - - - - -		35 50
(Appropriation July 12, 1872.)		
For purpose of paying for the paving and resetting curb-stone on Lehigh Avenue from Sixth to Eighth Street, in front of Delaware River Reservoir:		
Holgate & Co., - - - -		3,131 20
		$481,438 15

EXTENSIONS OF WORKS.

Amounts Paid from Water Loans.

(Appropriation April 3, 1868.)

Item 2.

For the purchase and laying a 20-inch main to connect Roxborough Water Works with the Germantown Water Works:		
Iron castings, - - -	$57 00	
Brown zinc, - - - -	55 00	
Painting, - - - -	10 80	
Carpenter work (stop house), -	30 59	
Pattern work, - - -	144 00	
Wages, - - - -	87 25	
Sundry bills, - - -	8 50	
		363 14

Item 3.

For the purchase and laying a 36-inch ascending main from the Schuylkill Works to the Spring Garden Reservoir:		
Wages, - - - -		74 31

(Appropriation July 10, 1865.)

Item 8.

For Cornish pumping engine, boilers, and connections, Belmont:		
Steam pipe, - - - -	58 00	
Iron and steel, - - -	79 01	
		137 01
Amount carried forward, - - -		$574 46

Amount brought forward, - - -		$574 46

(Appropriation April 17, 1865.)

For the purpose of making and sinking a crib in front of Fairmount Dam, and placing an oak apron upon it:		
Lumber, - - - -	135 20	
Hardware, - - - -	18 10	
Gum boots, - - - -	32 00	
Wages, - - - -	446 25	
		631 55

(Appropriation February 13, 1869.)

Item 1.

For engine house, foundation stack, wharf tunnel, scales, boiler setting, &c.:		
Tubing, - - - -		2 67

Item 2.

For boilers and connections at the Belmont Works:		
Fire brick, - - - -	10 00	
Bricklaying, - - -	121 55	
		131 55

Item 3.

For Reservoir at Belmont Works:		
Hardware, - - - -	29 47	
Wages, - - - -	21 60	
		51 07
Amount carrried forward, - - -		$1,391 30

Amount brought forward, - - -		$1,391 39
Item 5.		
For the completion of the Cornish engine, boilers, and connections at Roxborough Water Works:		
Tubing, - - - - - -		$3 07
Item 6.		
For the completion of the engine house, grading, fences, scales, coal-sheds, &c., Roxborough Water Works:		
Plastering, - - - -	$940 07	
Brickwork, - - - -	617 17	
Lumber, - - - -	849 56	
Hardware, - - - -	39 85	
Wages, - - - -	2,494 64	
		4,941 29
Item 7.		
Repairs at Mt. Airy Reservoir:		
Wages, - - - - - -		35 72
Item 9.		
For substituting turbine wheel in place of old breast wheels Nos. 4 and 5, Fairmount Works:		
Tubing, - - - - - -		6 27
Item 10.		
For incidentals:		
Fire bricks, - - - -	$110 00	
Vault lights, - - -	90 00	
Brick-work, - - - -	168 06	
Freights, - - - -	36 50	
Lanterns, &c., - - -	61 07	
Wages, - - - -	673 32	
		1,127 88
Amount carried forward, - - -		$7,505 53

Amount brought forward, - - -		$7,505 53

(Appropriation April 7, 1870.)

Item 1.

For engine and foundations at the Schuylkill Water Works, in place of old engine No. 3:

Engine—final payment, - -	$5,850 00	
Extra work (engine contract), -	2,974 19	
Plastering, - - - -	351 00	
Painting, - - - -	144 80	
Lumber, - - - -	85 76	
Dredging, - - - -	52 86	
Hire of engine, - - -	240 00	
Felting, - - - -	240 80	
Machine work, - - -	63 75	
Boiler work, - - -	57 90	
Cement, - - - -	31 15	
Wages, - - - -	1,230 36	
Sundry bills, - - -	36 42	
	———	11,358 99

Item 2.

For additional duplex engine at Delaware Water Works:

Engine—final payment, - -	$4,400 00	
Lumber, - - - -	434 08	
Gauges, - - - -	50 00	
Lime, - - - -	5 25	
Wages, - - - -	382 49	
Sundry bills, - - -	9 43	
	———	5,281 25
Amount carried forward, - - -		$24,145 77

Amount brought forward, - - -		$24,145 77

Item 3.

For ascending Main Belmont Water Works:		
Mains, - - - -	$1,182 44	
Iron castings, - - -	130 00	
Lumber, - - - -	141 14	
Sundry expenses, - - -	12 74	
Wages, - - - -	3,933 20	
		5,399 52

Item 4.

For (on account) descending main from the Belmont Reservoir, and for crossing the Schuylkill River:		
Mains, - - - -	$855 16	
Iron castings, - - -	12 80	
Expenses crossing Belmont Bridge, -	1,590 32	
Gravel, - - - -	42 25	
Hardware, - - - -	92 65	
Lead, - - - -	798 57	
Repairing streets, - - -	577 70	
Wages, - - - -	2,983 66	
Sundry bills, - - -	6 90	
		6,960 01

Item 5.

For (account) pumping main from the Delaware Works to the Reservoir:		
Bricks, - - - -	$7 00	
Machine work, - - -	34 30	
Wages, - - - -	21 00	
		62 30
Amount carried forward, - - -		$36,567 60

Amount brought forward, - - -		$36,567 60

Item 6.

For pumping main from the Schuylkill Works to the Reservoir.		
Mains, - - - -	5,963 79	
Hardware, - - -	35 50	
Brickwork, - - -	30 75	
Hauling mains, - - -	180 00	
Granite, - - -	575 00	
Lead, - - -	385 00	
Lime and Cement, - -	189 55	
Wages, - - -	2,698 44	
Sundry bills, - -	25 22	
		10,083 25

Item 7.

For substituting turbine wheel in place of old breast wheels Nos. 6 and 7, at Fairmount Water Works:		
Turbine wheel (final payment),	5,239 97	
Brickwork, - - -	581 54	
Hardware, - - -	178 65	
Machine work, - - -	558 20	
Wrought iron beams, - -	712 93	
Plastering, - - -	1,745 60	
Lumber, - - -	869 15	
Iron castings, - - -	164 78	
Flagging, - - -	2,904 05	
Cement, &c., - - -	626 41	
Granite, - - -	486 83	
Coal, - - -	32 75	
Bolts, nuts, &c., - - -	279 65	
Hand rails, balusters, &c., - -	923 40	
Amounts carried forward, -	$15,303 91	$46,650 85

Amounts brought forward, -	$15,303 91	$46,650 85
Paints, - - - -	212 24	
Wood work, - - -	427 77	
Painting, - - - -	863 72	
Iron Railing, - - -	1,351 96	
Iron columns, - - -	137 40	
Vault lights, - - -	1,149 83	
Heating apparatus, - -	2,500 00	
White lead, - - -	125 40	
Wages, - - - -	6,372 43	
Sundry bills, - - -	289 33	
		28,733 99

Item 8.

For (on account) reservoir adjoining present reservoir of the Delaware Works.

Hardware, - - - -	21 00	
Wharfage on mains, - -	63 00	
Hauling " - - -	21 00	
Lumber, - - - -	249 50	
Wages, - - - -	606 63	
		961 13

Item 9.

For enlarging the reservoir now building at Belmont Water Works:

Wages, - - - -		46 30

Item 10.

For incidentals:

Sash, - - - -	$10 08	
Gas brackets, - - -	24 00	
Dredging, - - - -	75 00	
Painting, - - - -	389 55	
Slating, - - - -	24 19	
Lumber, - - - -	197 27	
Lime, - - - -	15 30	
Wages, - - - -	87 38	
Sundry bills, - - -	38 66	
		861 43
Amount carried forward, - - - -		$77,253 70

Amount brought forward, - - -		$77,253 70

(Appropriation July 7, 1870.)

Item 1.

For new engine and pump, with foundations and inlet thereto, Roxborough:		
Engine (balance on contract), -	$37,000 00	
Steam pump, - - -	200 00	
Iron castings, - - -	123 10	
Brick work, - - -	473 62	
Machine work, - -	2,058 81	
Check-valve, - - -	655 00	
Lumber, - - - -	186 88	
Hire of dredge, - - -	100 74	
Wire screens, - - -	171 29	
Mains, - - - -	4,288 42	
Rigging work, - - -	790 90	
Iron and steel, - - -	81 98	
Felting, - - - -	150 00	
Hardware, &c., - - -	285 06	
Wages, - - - -	2,042 79	
Sundry bills, - - -	162 26	
		48,770 85

Item 2.

For new engine and boiler-house, Roxborough:		
Lumber, - - - -	$745 01	
Painting, - - - -	545 29	
Hardware, - - - -	60 10	
Iron work, - - - -	112 20	
Plastering, &c., - - -	425 65	
Wages, - - - -	1,438 52	
		3,326 77
Amount carried forward, - - -		$129,351 32

Amount brought forward, - - -		$129,351 32

Item 3.

For necessary repairs to Reservoir, Roxborough:		
Mason work, - - -	$468 37	
Painting, - - - -	147 25	
Lime, - - - -	186 00	
Wages, - - - -	1,965 05	
		2,766 67

Item 4.

For small engine and stand-pipe to supply Germantown (at Roxborough Reservoir):		
Wire screens, - -	$10 00	
Wages, - - - -	105 99	
		115 99

Item 5.

For incidentals:		
Grate bars, - - -	$289 90	
Repairs to boilers, - - -	402 70	
Brass cocks, - - -	145 72	
Hardware, - - - -	38 14	
Painting - - - -	189 77	
Paints, - - - -	26 49	
Wages, - - - -	45 25	
Sundry bills, - - -	74 34	
		1,212 31

(Appropriation December 5, 1870.)

For laying a 16-inch main from Mount Airy Reservoir to Tulpehocken Street, and 12-inch main from Tulpehocken Street to Wister Street:		
Ropes, - - - - -	$4 00	
Amounts carried forward, - -	$4 00	$133,446 29

Amounts brought forward, -		$4 00	$133,446 29
Lumber, - - - -		54 33	
Brickwork, - - - -		23 37	
Powder, &c., - - -		13 30	
Wages, - - - -		6,155 25	
Sundry bills, - - -		7 50	
			6,257 75

(Appropriation November 6, 1871.)

Item 3.

For rebuilding Fairmount Dam:

Lumber, - - - -	35,945 29	
Hardware, - - - -	907 40	
Iron and steel, - - -	4,589 14	
Wharf bolts, - - -	1,188 09	
Cordage, - - - -	149 97	
Felt paper, - - - -	61 50	
Stone for filling cribs, - -	9,981 40	
" dressed for piers, - -	3,228 45	
Boats, - - - -	126 54	
Hire of dredge, - - -	12,990 00	
Wharf builders, - - -	4,334 25	
Divers (wages), - - -	2,744 80	
Cement, - - - -	2,138 50	
Hire of scows, - - -	816 00	
Towing, - - - -	54 00	
Marine pump, - - -	422 00	
Bolts, &c., - - - -	367 37	
Barrows, - - - -	291 00	
Iron work, &c., - - -	163 14	
Coal, - - - -	311 19	
Wages, - - - -	27,303 02	
Sundry bills, - - -	262 19	
		108,375 24
Amount carried forward, - - -		$248,079 28

Amount brought forward, - - -		$248,079 28

Item 4.

For completion of 36-inch ascending main from the Delaware Works to Reservoir:

Wages, - - - - -		8,990 09

Item 5.

For completion of Belmont Reservoir:

Bricks, - - - -	$5,577 00	
Brick work, - - -	256 50	
Hardware, - - - -	326 52	
Powder and fuse, - - -	894 00	
Iron and steel, - - -	147 35	
Lumber, - - - -	653 90	
Gravel, - - - -	747 20	
Lime, &c., - - - -	507 24	
Barrows, - - - -	48 00	
Iron castings, - - -	69 82	
Wages, - - - -	59,209 10	
Sundry bills, - - -	315 70	
		68,752 33

Item 6.

For the completion of Delaware Water Works Reservoir:

Mains, - - - -	$3,738 44	
Hauling mains, - - -	247 00	
Lumber, - - - -	1,701 88	
Sodding Reservoir banks, - -	707 28	
Fencing Reservoir, - - -	1,879 89	
Painting fence, - - -	447 40	
Lead, - - - -	577 50	
Bricks, - - - -	498 00	
Wages, - - - -	4,922 90	
Sundry bills, - - -	60 05	
		14,780 34
Amount carried forward, - - -		$340,602 04

Amount brought forward, - - -		$340,602 04

Item 7.

For large storage reservoir, East Fairmount Park:		
Portable railroad and cars, - -	$1,566 00	
Sprinkling wagons, - - -	1,625 00	
Lumber, - - - -	1,793 51	
Lead, - - - -	169 40	
Iron castings for stops, rollers, &c., -	5,647 79	
Hardware, - - -	1,472 29	
Granite, - - - -	4,966 76	
Bricks, - - - -	320 10	
Iron and steel, - - -	351 54	
Iron pipes, - - - -	628 01	
Cement, - - - -	408 00	
Tubing, &c., - - -	1,429 12	
Drain pipes, - - -	181 25	
Blacksmithing, - - -	298 99	
Tool-house, - - - -	347 38	
Roofing, - - - -	94 56	
Brass castings, - - -	475 00	
Stone, - - - -	6,317 43	
Sand and gravel, - - -	335 32	
Wages, - - - -	212,394 30	
Sundry bills, - - -	295 34	
		241,117 09

Item 9.

For incidentals:		
Surveyor's transit and level, -	$397 00	
Sundry bills, - - -	22 00	
		419 00
		$582,138 13