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DEPARTMENT OF PUBLIC WORKS.

Report for the Quarter ending December 31, 1878.

DEPARTMENT OF PUBLIC WORKS,
COMMISSIONER'S OFFICE, ROOM 19, CITY HALL,
NEW YORK, February 25, 1879.

Hon. EDWARD COOPER, Mayor of the City of New York :

SIR—In accordance with section 27 of the Charter I have the honor to submit herewith a report of the transactions of this Department for quarter ending December 31, 1878 :

EXPENDITURES.

On account of appropriations raised by taxation.....	\$440,725 65
On account of assessment fund for street improvements.....	207,956 30
On account of funded debt, for improvement and extension of water supply.....	222,330 52
Total.....	\$871,012 47

EXPENDITURES FOR THE CORRESPONDING QUARTER IN 1874, 1875, 1876, and 1877.

Fourth quarter, 1874.....	\$2,031,695 26
" 1875.....	1,651,926 28
" 1876.....	997,663 37
" 1877.....	902,005 90

BUREAU OF CHIEF ENGINEER OF THE CROTON AQUEDUCT.

In October last the construction of the Storage Reservoir on the middle branch of the Croton river was finally completed, and the work accepted.

From October 1 to December 10 the water in the reservoir rose 19 feet 4½ inches. The dam and appurtenances have stood this severe test, and are in good order. The entire cost to date, including land, damages, labor, and materials, engineering and supervision, and legal expenses, is \$656,063.89.

The sudden rise of water following the severe storms of December 9th and 10th, caused some damage at the outlet of Lake Gleneida, which has been repaired. It has also developed the necessity of making some alterations at the overfall of the Boyd's Corner Reservoir, to prevent injury from heavy freshets.

At the request of the Commissioners of appraisal in the matter of water rights and damages, Lakes Mahopac and Kirk were drawn to the proposed low water-mark, to enable them to view the lakes in that state, and arrive at a just estimate of the awards to be made.

The rainfall at Boyd's Corners during the quarter was 16 88-100 inches.

Excepting six days in October, the natural flow of the Croton river was sufficient to fill the aqueduct.

The Croton Aqueduct has been subjected to severe tests by the heavy storms which occurred during the quarter, and rendered necessary an extra amount of repairs to ditches, drains, culverts, fences, and roads.

By the construction of a new roadway over the embankment on the third division, access is given to the keeper's house and storage buildings, and the expense of keeping in order a private roadway heretofore used is abolished.

The Department had no means to prosecute the necessary work of strengthening the aqueduct in accordance with the plans heretofore adopted and pursued.

In extending and improving the water supply 32,855 lineal feet of water-pipe were laid, and 260 fire-hydrants set during the quarter.

Since the 24th of December, when extreme cold weather set in, the excess of consumption of water over the quantity delivered by the aqueduct has averaged six to eight million gallons per day, causing a steady decrease in the reservoirs and in the pressure.

The amount collected for water supplied to shipping and for building purpose during the quarter is \$25,874.16.

The Inspectors of the Department visited 16,341 buildings and detected 3,723 leaks in fixtures, and 373 cases of willful waste through neglect to keep faucets closed.

BUREAU OF WATER PURVEYOR.

Nine contracts for paving streets, including two for repaving, under the law of 1875, were completed, embracing 89,020 square yards of pavement.

The repaving of Second avenue, from Twenty-third to Forty-second street, had progressed from Forty-second to Thirty-fourth street, when the advent of frost compelled a suspension of the work.

Up to the close of the season, the repairs of pavements were continued to the full extent that the appropriation would admit.

BUREAU OF STREET IMPROVEMENTS.

Seven contracts for regulating and grading streets and four contracts for flagging sidewalks were completed during the quarter, and ten contracts for regulating and grading remained uncompleted at the end of the quarter. On five of these the work has been suspended until spring.

BUREAU OF SEWERS.

During the quarter the sewerage system has been extended and improved by the construction of 10,736 lineal feet of sewers, 743 lineal feet of culverts, 39 receiving basins, and 154 lineal feet of house drains.

The following sewers were completed :

In One Hundred and Fourth street, between Fourth and Eighth avenues.

In Fourth avenue, between One Hundred and Twenty-third and One Hundred and Twenty-fifth streets.

In Sixty-sixth street, between the Boulevard and Eleventh avenue.

In Greenwich street, between Houston and Clarkson streets.

In Chatham square, between Oliver and Catharine streets.
In Tenth avenue, between Seventy-seventh and Eighty-first streets.
In Goerck street, between Houston and Third streets.
In Seventieth street, between First and Second avenues.
In Fifty-seventh street, at East river.

The work of cleaning and repairing sewers and basins is much increased by frost, snowfall, and the accumulation of street filth during cold weather, as much of the solid material finds its way into the basins and sewers, and has to be removed at the cost of much time and labor.

The following statement of the principal quantities of work done during the quarter by the force employed in cleaning and repairing sewers and basins will give an idea of the magnitude of this work, the appropriation for which was only \$60,000 for the year 1878 :

5,200 receiving basins have been cleaned.
11,400 lineal feet of sewers cleaned.
2,683 lineal feet of sewers rebuilt.
521 lineal feet of culverts rebuilt.
360 lineal feet spur-pipe laid.
7 receiving basins rebuilt.
244 receiving basins repaired.
22 new manholes built.
484 manholes repaired.
68 new granite basin-heads put in.
3,186 cubic yards earth excavated.
3,823 cubic yards earth filled in.
240 cubic feet stone walls built.
81 cubic feet brick masonry built.
2,980 square yards pavement relaid.
9,922 cartloads dirt removed.

BUREAU OF STREETS.

Necessary repairs have been made on the country roads and unpaved streets in the upper part of the city. Kingsbridge road was resurfaced with broken stone.

The roadway of McComb's Dam road, from One Hundred and Fiftieth street to Central Bridge, was graded and widened. The roadway of Eighty-seventh street, from Second avenue to East river, was filled in to grade, and the curb and gutter reset. The other repairs made under the direction of this Bureau extend over upwards of 20 miles of streets and roads.

BUREAU OF LAMPS AND GAS.

The total number of public lamps in use in the city was increased during the quarter from 21,453 to 21,539.

Seventy-two new lamps were erected, 53 old lamps relighted, and 39 lamps discontinued.

The photometrical tests of the quality of the gas furnished by the gas companies (excepting the Municipal Gaslight Co., whose mains are not yet connected with the photometrical rooms) show that the standard required by the contracts with the city is maintained.

Further information on the subject of lighting the city will be found in the review of the transactions of the Department for the year 1878, included in this report.

BUREAU OF REPAIRS AND SUPPLIES.

The care of public buildings and offices, and the furnishing of fuel, office furniture, and other necessary supplies to the various offices, departments, and courts, have received prompt attention.

The renovation of the exterior of the old City Hall was continued by scraping the marble work on the south or main front, repairing the marble steps, and restoring the brown stone trimming.

The entire exterior of Tompkins Market has been painted.

Considerable repairs were made at the Armory of the Twenty-second Regiment, National Guard.

The public baths were closed early in October, and towed to Gowanus Bay for storage until next season.

BUREAU OF INCUMBRANCES.

During the quarter this Bureau received 705 complaints of obstructions on streets or sidewalks, 59 of which were remedied by seizure of the obstructions, and the remainder by compliance with the notices sent by the Bureau.

The Bureau also removed 670 cart loads of stone and dirt from the streets; and issued 178 notices to repair sidewalks; and 1805 permits to temporarily place building materials on streets.

BUREAU OF WATER REGISTER.

The amount of revenue from Croton water, collected by the Bureau during the quarter is as follows :

For Croton water rent.....	\$294,853 91
For penalties on Croton water rent.....	7,261 05
For permits to tap Croton pipes.....	1,997 00
Total.....	\$304,111 96

Other Revenue Collected by the Department.

For vault permits.....	\$6,017 64
For sewer permits.....	5,717 73
For removing obstructions.....	32 00
For sewer pipe sold to contractors.....	342 45
For services of Inspectors on work of Elevated Railroads and Gas Companies.....	525 50
For miscellaneous items.....	357 31
Total.....	\$12,992 63

It seems appropriate to give in this report a brief review of the business of the Department for the year 1878, and of such matters under its control as may prove most interesting.

EXPENDITURES FOR THE YEAR 1878.

On account of appropriations raised by taxation.....	\$1,623,220 83
On account of assessment fund for street improvement.....	629,387 79
On account of funded debt for extension and improvement of water supply.....	607,692 98
Total.....	\$2,860,301 60

Expenditures of the Department for the past eight years were as follows :

1871.....	\$11,761,091 78
1872.....	5,826,112 67
1873.....	7,647,836 34
1874.....	7,609,131 80
1875.....	5,919,752 16
1876.....	4,358,095 40
1877.....	3,088,763 30
1878.....	2,860,301 60

In considering the subject of expenditures, it should be remembered that the city is steadily growing in population, extent, and improvements, and that, after the level of sound economy has been reached, a moderate increase must occur from year to year in the current expense of conducting the city's affairs, irrespective of special work of improvement that may from time to time be undertaken.

During a period yet recent, and which, for obvious reasons, will long be remembered by the people, it was the policy of those who then controlled the city government to saddle the largest share of their lavish expenditure upon the city debt, in order to blind the people as long as possible to their nefarious transactions by keeping annual taxation within ordinary bounds. Although the greatest frauds were perpetrated outside of the business of any regular department, the burden of debt that has been imposed upon the people through the works carried on by this Department is very large, and even after open fraud was stopped, the pernicious policy of borrowing large sums of money for premature improvements, conducted on a false and extravagant system, was continued for some years.

It has been my endeavor to aid in abating this as much as possible.

The following is a statement of the expenditures of the Department from the proceeds of bonds for the past eight years:

1871.....	\$8,585,898 99
1872.....	4,021,645 21
1873.....	6,155,205 30
1874.....	5,981,966 14
1875.....	4,155,801 14
1876.....	2,907,071 41
1877.....	1,472,727 96
1878.....	1,237,080 77

THE WATER SUPPLY.

During the past year the rainfall was so abundant in the Croton Valley, and so well distributed throughout the year, that no difficulty was experienced in getting sufficient water to keep the aqueduct filled to its utmost capacity, and for short periods only in July, August, and October, was it necessary to draw upon the stored water, when 724,700,000 gallons were drawn from the Reservoir at Boyd's Corners, and 526,300,000 from Lake Mahopac.

The new Storage Reservoir on the middle branch of the Croton river, completed in October last, was commenced in 1874. Its area is 430 acres; greatest depth 62 feet, and capacity four thousand million gallons. The dam is 515 feet long, 94 feet high from bottom of foundation to top, 660 feet wide at the bottom, and 50 feet on top. The whole work includes 377,269 cubic yards of earth and rip-rap embankment; 54,318 cubic yards of rock excavation; 62,463 cubic yards of earth excavation; 17,393 cubic yards of rubble masonry; 62,080 lineal feet of fence walls; 98,167 square feet of timber; 36,472 pounds of iron work, and many other minor items. The cost, including land, construction, superintendence, legal expenses, damages, etc., is \$656,063.89, with one claim for damages—that of the Tilly Foster Iron Mine—yet under adjudication by legal process.

With this new Reservoir, the one at Boyd's Corners, and the natural lakes, our storage capacity in the Croton Valley is 9,500,000,000 gallons, sufficient to insure a full supply at all times for the present Aqueduct.

As already stated in previous reports, the unusual strain to which the Aqueduct has for some time been subjected, in order to convey the increased volume of water required for daily consumption, rendered it necessary to strengthen the masonry of the Aqueduct, and protection walls and embankments where the structure is built upon stone walls laid dry across intersecting ravines. These walls have settled in several places, causing cracks and leaks in the Aqueduct. The only available means to pay for this additional work was in the usual annual appropriation for maintenance of the Aqueduct, and the progress made in it is therefore necessarily slow. The general plan of improvement consists in raising and strengthening the spandrels, increasing the thickness of the arch by an additional course of brick masonry, raising the protection and retaining walls, and placing additional earth on the side embankments, taken from the covering over the arch. In pursuance of this plan, the following quantities of work were done last year:

- 2,151 lineal feet of roof arch built.
- 5,098 cubic yards of earth taken from the top and placed on the sides.
- 812 cubic yards protection walls built.
- 600 cubic yards stone quarried.

Since the fall of 1876, when this work was commenced, 3,090 lineal feet of the Aqueduct has thus been improved, and many cracks and leaks stopped.

There are still about 19,000 lineal feet requiring strengthening, 9,000 feet of which are in such condition as to need immediate attention. For three years past, in presenting my estimates for the maintenance of the Aqueduct to the Board of Estimate and Apportionment, I asked for a moderate increase beyond the usual appropriation, in order that more rapid progress might be made in the absolutely necessary repairs of the only artery by which the city receives its water supply, and both in writing and orally I earnestly urged the allowance. But I regret to say that for 1877 and 1878, when I asked \$25,000 and \$15,000 respectively, over the appropriation for 1876, no allowance was made; and for 1879 the Board allowed only \$5,000 of the \$15,000 asked. By transfers of \$3,000 in 1877, and \$12,000 in 1878, from available balances of other appropriations of this Department, the deficiency was in part supplied, but such transfers are too uncertain to be relied upon. Every available dollar of the sum appropriated will be devoted during the coming season to these extraordinary repairs, and perhaps no breach may occur, but the matter is too serious to allow the consideration of a few thousand dollars to stand in the way of such repairs as shall insure the safety of this structure. The responsibility of the Department is very serious in maintaining the water supply, and it seems to me that the moderate and reasonable sums deemed necessary by the Engineers should be granted.

I may be compelled to ask additional means from some other fund or appropriation.

DISTRIBUTION OF WATER.

There has been no interruption in the high service supply which is pumped from the Aqueduct at High Bridge into the reservoir and tank at the top of the tower by steam-engines in constant operation, but in consequence of the extension of the service beyond its intended limits, and of the increased consumption, the pressure is not as great as the comfort and convenience of the people demand.

In December last the Common Council finally adopted, and the Mayor approved, the necessary resolution to enable the Department to build the additional high service works contemplated by an act of the Legislature of 1878, chapter 386, and long ago recommended by me. The works will be located on the ground lately occupied by the Masonry Aqueduct, between Ninety-seventh and Ninety-eighth streets, 100 feet west of Ninth avenue, owned by the city, and will consist of two pumping engines, stand pipe and tank, with necessary fixtures and buildings, and the pipes to effect the proper distribution of the water. The cost is limited to \$220,000, to be paid out of the moneys heretofore appropriated by the legislature for laying pipes, and for other works necessary to improve and extend the distribution of Croton water. A contract for the excavations and foundations has already been made, and the remainder of the work will be contracted for at an early day. The completion of the works will require about one year. They will be of ample capacity to furnish, in conjunction with the present high service works, a full supply at all those points in the upper part of the city, at which the pressure from the ordinary service is now deficient.

The work of laying Croton water-pipes continues very rapidly, as will be seen by the statement of the Engineer in charge of the Bureau: 23 1/3 miles of pipes were laid in 1878; 57 2/3 miles during the past three years; 145 miles during the past ten years; and 235 miles since January 1, 1860.

The total length of pipes now in use is 463 63-100 miles.

In 1878 the following fire-hydrants were set:

- 429 5-inch barrel hydrants.
- 324 3 1/2-inch barrel hydrants.
- 118 3-inch barrel hydrants.

Total..... 871 fire-hydrants.

The total number of fire-hydrants now in use is 5,024.

Since the cold weather set in we have the most palpable proof that the pernicious practice of wasting water to prevent its freezing in the pipes has been resumed to the fullest extent. The city reservoirs have been reduced at the rate of six to eight million gallons per day over and above the quantity delivered by the aqueduct, and the loss in pressure in the pipes is so great as to cause actual discomfort in many localities. Our winters are not so severe that the service pipes leading from the mains to and through the houses could not be made safe from frost by a little more care and expense. Unfortunately, however, the placing of these pipes is under no official control, and the practice of letting water run day and night to prevent freezing is so cheap and convenient that it is preferred, and is carried on for days and weeks when the temperature is not so low as to cause freezing even in ill-protected pipes.

Other cities provided with similar water systems are subject to the same experiences. In Brooklyn the waste of water and inadequacy of supply are subjects of complaint as often as the mercury indicates freezing temperature. In Boston, during the coldest weather in January, the increase in the consumption of water was thirty per cent. over the daily average, and the Water Board has issued a notice to the citizens, stating that the effect of such waste is to deprive the higher grounds and upper stories of high buildings on low ground of the necessary supply; urging upon all the importance of preventing waste, and threatening strict execution of the city ordinances if the matter complained of be not remedied at once.

Against such general waste as is herein referred to the house inspections are but a partial remedy, as the greatest waste occurs at night, and after houses are closed, when no inspection can take place.

Meters have been placed along the river fronts, in stables, and in many places where the consumption of water is great, and this method of suppressing waste should be further continued and extended. It is not to be denied, however, that an immense waste of water occurs in dwelling-houses, where, on account of the great number, it has been considered objectionable to apply meters; indeed, such application is not authorized by law.

For the suppression of waste, a stringent law should, in my opinion, be passed, as an amendment to the Building laws, requiring that all service pipes shall be placed, protected against frost, in such manner as the Superintendent of Buildings may direct. A small outlay in each house might thus be the means of saving to the city a vast sum, for procuring an additional supply of water, and at the same time save the householder from the inconvenience and damage of frozen and bursting pipes. For all buildings hereafter to be erected, there is no reason why such regulation should not be enforced, and, considering the great importance and exigency of the case, the law should be made to apply to existing buildings; indeed, such application is essential, if the desired result is to be attained.

During the year 55,386 buildings were inspected, in which were found 10,249 leaks in fixtures, and 881 cases of waste by leaving faucets open.

Aside from the effect of waste, the growth of the city in population, and the increase in size and extent of water pipes, without a corresponding increase in the capacity of the only supply conduit—the Aqueduct—have necessarily greatly diminished the pressure.

The area of the interior of the Aqueduct is 53 34-100 square feet. In 1850 the population of New York was 515,000; the area of the pipes leading from the distributing reservoir was 19 5-100 square feet, and the daily supply 40,000,000 gallons. In that year the Croton Aqueduct Board reported "that the last drop of water which the works in their present state can supply is now delivered in the city."

In 1860 the population was 805,658, and in 1863 the daily consumption of water was 54,400,000 gallons, and the Croton Aqueduct Board reported it unsafe to increase the flow of water in the Aqueduct.

In 1870 the population was 942,000, the area of supply pipes 38 71-100 square feet, and the daily consumption 77,000,000 gallons. The summer season was very dry, and led to the purchase of rights to draw from natural lakes in the Croton basin.

In 1875 the population was 1,042,000, the area of supply pipes 59 19-100 square feet, and the daily consumption 95,000,000 gallons.

The area of pipes is now increased to 74 square feet. The average consumption last year was 93,400,000 gallons per day. To keep the consumption within the capacity of the Aqueduct, the gates through which the water passes into the distributing mains can only be partially opened. A twenty-inch main now leads from the Aqueduct at Fordham to supply portions of the Twenty-third and Twenty-fourth Wards.

To the regular population of the city must be added a floating population of at least 50,000, and about 200,000 more from neighboring towns, who carry on business here during the day.

The question of additional conduit capacity thus suggests itself more forcibly from day to day.

THE BRONX RIVER.

The project for obtaining an additional supply from the Bronx river and the Rye ponds, as presented in my report for the quarter ending June 30, 1878, appears the most feasible, advantageous, and economical at this time. At an estimated expense of \$1,250,000 it will furnish a supply of 10,000,000 gallons per day, with the additional advantage of having the water delivered at an elevation of 50 feet above the level of the present aqueduct.

The city is growing, and the demand for additional mains and a full supply of water must be answered. But this is not a time to undertake any work for this purpose, involving an expense of many millions, if it can possibly be avoided. The Bronx project will add one-ninth to the present supply. The cost is comparatively small, and the work can be completed in a short time. My opinion is, that it should be carried into execution, and that the additional supply thus secured, together with continued measures to suppress waste, will meet the wants of the city for some years to come, and until the time when a greater work may be undertaken. The conduit from the Bronx will forever remain a valuable part of our water system, and will particularly be of great service to the upper wards, which may be expected to increase rapidly in population during the next five or ten years.

THE HOUSATONIC RIVER.

The engineers engaged during the past season in making surveys of the Housatonic river having completed their examinations in the field, and made good progress in the plans and estimates, I am enabled at this time to present to you some definite information as to the practicability and probable expense of diverting the water of that river into the Croton, with the view of supplying, at a future day, when necessary, a new aqueduct of large capacity from the Croton basin.

Three separate lines have been surveyed, by which it is practicable to draw one hundred million gallons of water daily from the Housatonic to the head of the Croton. By two of these routes the water will flow by gravity, and by the third it requires to be pumped to a considerable elevation.

First.—The initial point is a little north of Falls Village, and just below the dam of the Housatonic Railroad Company, at an elevation of 622 feet above tide, where the water is to enter an open canal following the valley of the Housatonic to Salmon Brook; thence along the valley of Salmon Brook to a ridge dividing the watersheds of the Housatonic and the Ten-mile river, which has to be pierced by a tunnel 2 1/2 miles long, after which natural water-courses can be used for a distance of more than eight miles, crossing from Connecticut into the State of New York and continuing to Leedsville, where the elevation is 460 feet above tide. From this point an artificial canal again becomes necessary, following the hillsides, on a descent of one foot per mile, to a point near South Amenia, where, bearing to the westward, it crosses the confluence of the Wassaic and Weebatuck creeks (which form the Ten-mile river) at an elevation of 38 feet, and the Harlem railroad at an elevation of 15 feet; thence the canal runs down the valley of the Ten-mile river and along the valley of the Swamp river to Pawling, where it enters the headwaters of the Croton.

The whole distance is 41 13-100 miles, including 30 19-100 miles of open canal, 2 1/2 miles of tunnel, and 8 44-100 miles of natural water-courses.

Second.—The other two routes are identical from the headwater of the Croton to a point opposite Bull's bridge, on the Housatonic. Above Bull's bridge, the second route follows the valley of the Housatonic to a point near West Cornwall, where it receives the waters of the Housatonic. From the point of coincidence of the two routes to the head of the Croton, a ridge is crossed by a deep cut, two ravines are crossed, being respectively 850 and 700 feet between grades, and 37 1/2 feet and 98 feet in depth.

The Ten-mile river is crossed a distance of 1,500 feet between grades, at an extreme elevation of 126 feet; and the Harlem railroad is crossed 7 feet below the track. The West Cornwall route is 26.8-10 miles long, consisting entirely of canal, and delivers the water into the Croton by gravity alone. To turn the water of the Housatonic into it, a dam 10 feet high will have to be constructed.

Third.—The third route, starting from Bull's Falls on the Housatonic, is the shortest, being only 14.77 miles long. But the water will have to be raised by pumping a height of 106 feet to the head of the canal, whence it will flow by gravity in an open channel to the Croton river.

It was at first supposed that the pumps might be operated exclusively by water-power; but, at low water, the power would not be adequate to raise 100,000,000 gallons per day 106 feet. Steam power would therefore have to be used altogether, or as auxiliary to the water power.

The area drained by the Housatonic river, according to the data at command, is as follows:

Above Falls Village, 631 square miles.
Above West Cornwall, 709 square miles.
Above Bull's Bridge, 790 square miles.

The rainfall from May 22 to November 1, a period of a little more than five months, was 17.96-100 inches.

The average daily flow of the Housatonic river for the season was 300,000,000 gallons; the maximum 470,000,000 gallons, and the minimum 170,000,000 gallons.

In seasons of great drought the flow would be much reduced.

The line of canal above briefly described is located in part through a broken country, and for several miles at a considerable elevation above the level of the streams, along steep hillsides, and the work of construction would be very expensive. The detailed estimate is not yet completed; but, from the information at command, the cost of either plan may be stated in round numbers at two and a half millions of dollars, including water-rights on the Housatonic.

It must be understood that this estimate merely provides for leading the Housatonic waters to the Croton basin, whence they must be conducted to the city by a new and large aqueduct, probably on the route surveyed during the administration of my predecessor, General Porter.

When the maps, plans, and estimates are completed, and the detailed report of the engineers presented, I shall make a final report upon this subject. These documents being placed upon record in the Department, will prove interesting and useful, when, at some future day the question of the best means of obtaining a large additional supply of water for this great city must be definitely considered and decided.

REMOVING OBSTRUCTIONS IN THE CROTON RIVER.

The same party of engineers which surveyed the Housatonic also examined the east branch of the Croton in Putnam and Dutchess Counties, with the view of removing certain obstructions in the stream which dam the water, and cause it to flow very sluggishly through large swamps in the towns of Patterson and Pawling. A more rapid current would be maintained, and the purity of the water improved by removing these obstructions, which consist of rocks, hard pan and fallen trees.

The whole cost would not exceed fifteen thousand dollars. This work, or part of it, can be done during the coming season, and paid for out of the fund already authorized.

PAVEMENTS.

The appropriations made for the maintenance and improvement of the pavements for 1878, were \$300,000 for "Repaving," under the Law of 1875, and \$150,000 for "Repairs." In pursuance of the views repeatedly expressed in my reports and official communications, that the improvement of the pavements should be prosecuted as vigorously as possible, I requested the Board of Estimate and Apportionment to transfer \$55,000 to the appropriation for "Repaving," and \$22,000 to the appropriation for "Repairs," from available balances of other appropriations of this Department, which requests were granted. The Department was thus enabled to do a considerable amount of work in repaving and repairing streets.

The following streets were repaved during the year:

Seventh avenue, from Fourteenth to Forty-third street.
Irving place, from Fourteenth to Twentieth street.
Fifteenth street, from Third to Fifth avenues.
Fourteenth street, from University place to Ninth avenue.
Washington square, roadways between Waverley place and Fourth street.
Mercer street, from Canal to Bleecker street.
Barclay street, from Broadway to College place.
Morris street, from Broadway to Greenwich street.
Barrow street, from Washington place to West street.
White street, from Broadway to Centre street.
Madison street, from Pearl to Market street.
Market street, from Division street to East river.
Clinton street, from Division street to East river.
Pearl street, from Broadway to New Bowery.
Water street, from Whitehall to Fulton street.
Twenty-third street, from Third avenue to East river.
Forty-second street, from Third to Fourth avenue.
Waverley place, from Broadway to Christopher street.
Fifth avenue, from Fifty-ninth to Sixty-third street, macadam pavement.
Fifth avenue, from One Hundred and Twenty-fourth to One Hundred and Thirtieth streets, macadam pavement.
Second avenue, from Forty-second to Thirty-fourth street.

Covering 160,550 square yards of stone block pavement, and 13,656 square yards of macadam pavement.

The contract for Fifth avenue, from Fifty-ninth to Seventy-second street, is completed only from Fifty-ninth to Sixty-third street, having been abandoned by the original contractor; it has been relet, and will be finished early in the spring.

The contract for Second avenue, from Twenty-third to Forty-second street, was made late last summer, and had progressed from Forty-second to Thirty-fourth street, when frost compelled suspension of the work. It will be resumed and completed as soon as the weather permits.

A contract was also awarded for repaving Vesey street, from Broadway to West street, to be paid out of the appropriation for 1878, but the sureties have not yet been approved by the comptroller.

The ordinary repairs of pavements have been prosecuted with all possible energy. A large quantity of Belgian blocks was obtained from streets where wooden and concrete pavements had in past years been patched with stone blocks, and which were entirely repaved in 1877 and 1878. These blocks were used in repairs in other locations. In many blocks, where the pavement presented a succession of holes and hillocks, it was entirely renewed or relaid from curb to curb.

The appropriations for 1879 are the same as for 1878, viz., \$300,000 for "Repaving," and \$150,000 for "Repairs," and will enable the Department to replace this year the last vestige of the wooden pavements with stone blocks, as well as some of the worst cobble pavements.

The street railways interfere seriously with the good condition of the pavements, especially where the streets are narrow, or where there are three or four tracks in the wider streets and avenues. These tracks either originally, or when undergoing repairs, have been raised above the true grade of the street, in order to shed the water more effectually, by which the slope of the pavement between the rail and the curb becomes too steep. I have endeavored to remedy this wherever practicable, but the tracks seem to have been laid without much regard to the convenience of ordinary traffic.

I have long been of the opinion that not more than two tracks should be allowed in any street (except in case of sidings), and that the cars of all companies, where they run in the same street, should be confined to the same rails. This is perfectly feasible, and would improve the pavements and facilitate general traffic. Trucks and carriages now shun the streets which are thus occupied by railways. The fine granite pavement laid last year in Fourteenth street is impaired by duplicate rails, laid almost side by side, because two companies, both of limited traffic, could not, or would not, arrange to run upon the same tracks.

The surface railroads have been, and will continue to be, of great value to the city, but they should be so operated as to impede other traffic as little as possible, and all companies should be required to keep the pavements "in and about their tracks" in good condition. This they often fail to do. I have caused a suit to be instituted against the Second Avenue Railroad Company, to recover about two thousand dollars expended by the city in repairing the pavement "in and about the rails" of their road, which that company refused to do, according to the order of the Department. The decision of this case will define the obligations of several railroad companies.

SEWERAGE.

The sewerage and drainage of large cities is a subject which engages the constant attention of professional and practical men, and is of the most vital importance. Yet, the period since sewerage has been reduced to a regular science and system is comparatively recent, and in our own city no comprehensive system of sewerage was undertaken until the year 1865, when the Legislature of the State passed the "Sewerage Act."

Of the 370 miles of sewers now in use on Manhattan Island, two hundred and five miles were built prior to the passage of that act. They were built at random, by private individuals as well as by the city authorities, of improper size, form, materials, and workmanship, and are in no way adapted to the requirements of modern sewerage. The records as to their location and grades were incomplete and unreliable, and the work of getting proper data in relation to them by surveys and examinations was one of much difficulty, labor, and expense. Most of the old sewers are of sizes disproportioned to the required service, some being too large and others too small. They were extended from time to time until some were required to pass a volume of sewage beyond their capacity, while others were practically useless until sufficient area had been added to their respective drainage districts to create a steady flow towards the outlet. Hundreds of acres of ground have been added to the city along the river fronts, and the sewers constructed through this made ground were often built on insufficient foundation, and have in parts sunk below the level of their outlets, which are held in place by the solid bulkhead, thus impeding the discharge of sewage, and cutting off the escape of foul gases, which are forced back into houses by rising tides or the accumulation of rain water. There are many sewers in the older parts of the city built of stone laid dry, or brick laid in common mortar, allowing the liquid to filter through the bottom into the adjacent ground, and the solids to accumulate. These answered well enough before the introduction of Croton water, when all solid matter was deposited in vaults, and periodically removed, but since the general use of Croton water and closets, they are required to perform all the services of modern sewers, and are a source of heavy expense for the removal of accumulations of solid matter. Many improper substances are passed into the sewers from factories, as well as from dwellings, and were it not that the city is topographically so well situated for drainage, and enjoys so large a supply of water, the difficulties from this cause would be very great. Obstructions are frequently left in sewers by plumbers, in making house connections, and in violation of law. Steam is frequently discharged into sewers, causing the mortar or cement to soften and disintegrate, and it is difficult to detect the offenders. The old sewer manholes were badly constructed, easily deranged, and access to the sewers was difficult. More than 2,500 manholes have been reconstructed and furnished with new iron frames and covers.

Many of the old sewers have been rebuilt within the past four years, with vast improvement to their respective localities. Of the works completed during the past year the large outlet sewer from Third avenue through Forty-second street to the East river deserves especial notice. This sewer drains an area of 436 acres, extending west to Fifth avenue, and from Thirty-eighth to Forty-sixth street. It is mainly tunneled through rock, being sixty feet below the pavement at Second avenue, and is six feet in diameter. The cellars along Third avenue and adjoining streets had been subject to overflow at heavy rainfalls for more than twenty-five years. During the severe storms of August 6th (when the rainfall was 2.66-100 inches in 1 hour and 20 minutes), and December 11th and 12th, the new sewer successfully passed all the drainage, preventing the damage formerly occurring at such times. This district may now be considered permanently relieved.

The districts between Sixth and Eighth avenues, Forty-second and Forty-eighth streets, was also relieved of similar evils, by the construction of overflow sewers and alterations at several points.

The surface drainage from the streets passes into the sewers through 4,490 receiving basins. All constructed since 1849, are designed to retain the street dirt, and to prevent the escape of sewer gas. Many of the basins built previous to 1849, permit the escape of gas, and are poorly constructed in other respects, letting street dirt pass into the sewers. Over one thousand basins have been reconstructed, with great benefit to the old sewers.

Surveys and examinations of all the sewers built prior to 1865 have to be completed before comprehensive and definite plans for their improvement can be carried into execution. Many or most of them are located in crowded thoroughfares, rendering work tedious and difficult. Rapid and efficient work on the part of contractors is required to avoid unnecessary obstruction to public travel, but under our present contract system the works too often have to be awarded to parties who are not qualified either by experience or financial resources to carry them to a satisfactory completion.

With all these faults in the old sewerage system, the remedy is not so expensive as in many other large cities. The authorities of Boston call for \$3,500,000, to reconstruct and improve their sewerage system. Brooklyn, with its comparatively recent improvements, is about to expend \$1,000,000 to alter and improve the sewers; and European cities expend annually enormous sums on works of this kind.

Under the direction of the late Croton Aqueduct Board, plans were made and filed, in pursuance of the Sewerage Act of 1865, for the sewerage of the city south of One Hundred and Fifty-fifth street, contemplating a system of pipe sewers. Though pipe sewers are the cheapest, and least liable to obstruction, they have many disadvantages. They are more liable to breakage from imperfections and improper laying than brick sewers. In the upper part of the city the ground is so varied in contour and character that the material, shape, and size of the sewer must be varied according to circumstances, and the original plans modified as the best judgment of the engineer directs. The plans have also been altered to provide for subsoil drainage, which had not been taken into consideration in the former plans. Where the construction of sewers has progressed too far to make a change desirable, the original plans are carried out, and the pipe sewers strengthened, where necessary, by a brick or concrete arch over the pipe. In branch sewers the egg shape, with the small end downward, is found most advantageous, insuring a sufficient depth of flow in dry weather, when there is little liquid, and leaving sufficient room for heavy drainage from rains. The new plans contemplate the construction of large collective sewers along the river fronts, with few outlets, which will discharge into open water, and thus avoid stagnation of foul water in slips and basins, and deposit, which have to be removed by dredging. The construction of the collective sewers can only progress, however, as the improvements in progress and contemplation by the Dock Department are carried out. From the Battery to Twenty-third street, along the North river, this work has sufficiently progressed to admit of the construction of collective sewers, which will be commenced the coming season.

The system under which the repairing and cleaning of sewers and basins was formerly carried on was expensive and ineffective. Up to 1871 the cleaning of sewers was paid for by the cart-load of dirt removed, and the contractor found it more profitable to place obstructions in the sewers, so as to increase the deposits, than to report or remove them.

From 1871 to 1876 the contractors were paid fixed rates per day for men and carts employed, and though this plan was more advantageous and effective than the other, it did not present the valuable advantages of the present system.

The cleaning and minor repairing of sewers are now done by men employed by the Department, selected for their experience, skill, and industry in the performance of the work, and under the direct supervision and control of the Engineer in charge of Sewers. Through their reports and co-operation defects are easily located and promptly remedied at small cost, where delay would cause damage and heavy expense. They have also furnished valuable information in regard to the old sewers, enabling the Engineers to take the proper steps to correct defects in plan and construction.

When the repair is extensive and urgent, and the amount of work to be done can be estimated and specified, and does not exceed \$1,000, it is found advantageous to contract for it with responsible and experienced sewer builders, provided with all the machinery and appliances to complete the work with the least possible delay or inconvenience to the public. If, however, the work should be likely to exceed \$1,000, the contract has to be advertised and awarded to the lowest bidder, with the disadvantages before mentioned.

From 1871 to 1876 the receiving-basins were cleaned by special contract (one of the Ring jobs) at a cost of \$48,000 per annum. Since they have been cleaned by our men the cost has been reduced to \$15,000 in 1877 and \$17,000 in 1878.

A table annexed to the report of the Engineer in charge of Sewers shows the following facts in regard to the cost of cleaning and repairing sewers and basins since 1868 :

From 1868 to 1870, average cost per annum.....	\$127,000 00
In 1871, annual cost	237,000 00
From 1872 to 1875, average cost per annum.....	152,900 00
In 1876, annual cost	74,488 00
In 1877.....	51,085 00
In 1878.....	60,000 00

The average annual cost of cleaning sewers was—

From 1868 to 1871.....per mile	\$169 00
From 1872 to 1875.....“	40 00
From 1876 to 1878.....“	12 00

The average annual cost of cleaning basins was—

From 1868 to 1870.....each	\$7 50
From 1871 to 1876.....“	11 85
In 1877 and 1878.....“	3 72

In the streets where the new stone-block pavement has been laid in place of the old wooden, concrete, and cobble pavements, the amount of street dirt carried into the basins has been much diminished, and the improvement in surface drainage from smooth pavements has rendered the sewers more effective.

Nine-tenths of the complaints of defective sewerage are traced to the house connections, which are improperly constructed by plumbers and builders, who lay the blame on the sewers to conceal their own faults. Greater care should be used in providing perfect house connections, with ventilation through the roofs of houses to permit the dissemination of sewer gas.

To provide for the partial ventilation of sewers, the Department has recently introduced perforated manhole covers, through which sewer gas may escape into the open streets, where it is diffused so as to be imperceptible and harmless, but in receiving-basins, and sewers under the sidewalks, this method of ventilation is objectionable, and the Department has not sufficient appropriation to apply this improvement as rapidly as desirable to the 20,000 manholes in the streets of the city. The most unobjectionable and efficient way of ventilating sewers is through open pipes in houses, running through the roof.

The defects in the old sewerage system, in totally ignoring subsoil drainage, have been partially remedied within the past few years. The want of such drainage rendered large portions of the city unfit for habitation, including some places already populated, where old water-courses, ponds, and marshy ground had been improperly filled in. In 1871, the Legislature passed an act authorizing the Department to construct underground drains wherever they might be deemed necessary by the Health Department. Under this law about 13 miles of drains have been constructed, reclaiming a large area from an absolutely dangerous condition as regards public health. These drains have all been laid in the upper and newer portions of the city, where the sewerage plans could be altered to become auxiliary to the drains. The success of these drains is complete, and alterations can and will be made in the sewerage of the older portions of the city, where necessary and practicable, to provide complete subsoil drainage.

Mr. Stevenson Towle, the Engineer in charge of Sewers, has made a very full report upon the subject of sewerage and the work of his Bureau, to which I respectfully call your attention.

OTHER STREET IMPROVEMENTS.

Fourteen contracts for “regulating and grading” were completed in 1878, covering 33¼ miles of streets. The aggregate quantities of work done are as follows:

5,786 cubic yards earth excavated.
28,864 cubic yards rock excavated.
390,809 cubic yards filling put in embankments.
38,653 lineal feet curb and gutter set.
250,499 square feet flagging laid.

Expressions of satisfaction have been received by the Department from property owners on the fact that assessments for street improvement work have come down to reasonable figures, and complaints of imperfect work are comparatively few.

The loose manner in which contracts were carried out in former years, the expensive system of making large improvements by days' work, and the readiness with which legal authority was perverted for the purpose of giving special contracts at exorbitant prices to favorites, created such distrust and dissatisfaction among property owners that resistance to assessments became chronic, in too many cases, no doubt, well grounded.

For the improvements comprised in the so-called Boulevard system alone, all of which were done by day's work or special contract, the enormous sum of \$9,126,836.89 has been assessed since 1872. The advances made by the city for these works have been out of the City Treasury, on an average of five years, and I believe that but a very small portion of the assessments has yet been paid. The city is thus subjected to a large annual expense for interest on the Assessment Fund Debt. It is my endeavor to conduct the street improvements in such manner that assessments will be paid more promptly and cheerfully, and the city quickly reimbursed for its advances.

LIGHTING THE CITY.

The total length of gas mains in the city on the 31st of December, 1878, was 812 miles, of which there were laid during the year 1878, 85½ miles.

The average number of lamps burning and the total expenditures of all kinds by the Bureau of Lamps and Gas for the past five years were as follows :

Year.	Average number of lamps burning.	Total expenditures of Bureau.
1874.....	20,047	\$757,009 60
1875.....	20,028	741,150 52
1876.....	20,159	679,349 10
1877.....	21,203	632,576 24
1878.....	21,419	498,801 56

The cost of lighting the city and public buildings during the year 1878 was less than for any year since 1863, although there has been an increase since that time of about 6,000 lamps, and some additional expenditures during the past year for lighting armories and drill-rooms heretofore borne by the regiments.

At the letting of contracts for lighting street-lamps, on May 1, 1878, the gas companies south of Harlem river reduced their rates about 30 per cent. In the wards north of the Harlem river the prices cannot be reduced until the expiration of existing contracts, January 1, 1881, when a considerable saving will be effected.

The appropriation asked for by this Department, and authorized by the Board of Estimate and Apportionment for lighting the city during the year 1879, is based upon the bids accepted by the Gas Commission at the award of contracts in April last, and upon the use of burners consuming three cubic feet of gas per hour, which standard was adopted for street-lamps when gas was first introduced in the city, and has been continued, without variation, to the present day. The advantages of a well and even brilliantly-lighted city, in respect both to safety and ornament, are so manifest that I would respectfully suggest the consideration of an increase of 33⅓ per cent. in the size of burners from and after the first of May, 1880. It cannot be done before that time, as the appropriations are already made for the year 1879. The cost of lighting the city is much less than for many years past, and, considering the number of lamps in use, far less than at any time since the introduction of gas; yet, in view of the heavy burden of taxation, I am reluctant to propose any increase of expenditure except for useful and necessary purposes. I believe, however, that the advantages to be

derived from well-lighted streets will warrant the additional outlay, and that the change will meet with general approval. Burners consuming four cubic feet of gas per hour, instead of three feet, as at present, will add more than 33⅓ per cent. to the amount of light, as the illuminating power increases with enlarged burners in a greater ratio than the consumption.

From actual measurement made at our Photometrical rooms, it is found that a four feet burner gives 43 36-100 per cent. more light than one of three feet, and that one four foot burner gives nearly 25 per cent. more light than two of two feet each.

In comparison with many cities of this country and Europe, New York must be pronounced a poorly lighted city.

Chicago has four feet burners—lamps 125 feet apart.

Boston has four feet burners.

Philadelphia has six feet burners—variable.

Baltimore has five feet burners.

Washington has six feet burners—lamps 150 feet apart.

Buffalo has four feet burners—lamps 125 feet apart.

St. Louis has five feet burners—lamps 150 feet apart.

Liverpool has four feet burners—lamps 180 feet apart.

Manchester has four feet burners—lamps 150 feet apart.

Paris has three and a half to seven feet burners—lamps 117 feet apart.

New York has three feet burners—lamps 100 feet apart.

There are certain expenses, such as lightning, extinguishing, cleaning, glazing, painting, etc., etc., which will not be affected by enlarging the burners, so that the increase of cost will only be what is due to the additional amount of gas consumed.

On the basis of the present number of lamps and existing rates, the following is the estimated cost of substituting four feet burners for those of three feet, increasing the consumption of gas 33⅓ per cent., and adding 43⅓ per cent. to the amount of light.

For all that part of the city south of Seventy-ninth street, in which there are 14,416 lamps, the additional cost would be \$49,827.

For all that part of the city south of Harlem river, in which there are 18,786 lamps, the additional cost would be \$74,420.

And for the whole city (21,539 lamps), the additional cost would be \$112,670.

Two years hence, when existing contracts in the Twenty-third and Twenty-fourth Wards expire, this additional sum of 112,670 for substituting four feet burners throughout the whole city, will be materially reduced.

Until the population increases in the upper part of the city, the change of burners might be confined to the district below Seventy-ninth street.

If five feet burners were adopted south of Seventy-ninth street, the present amount of light in the street lamps would be doubled, at an additional cost of only \$100,000 per annum.

At a time when the subject of improving the lighting of cities is so much discussed, I venture to suggest that the simple method by which the light in the most densely populated part of New York may be doubled, at a cost so comparatively small, is not unworthy of consideration.

I have brought this subject thus early to your notice, in order that it may be duly considered before the appropriations for the year 1880 are adopted.

My attention has been called within the past year to the necessity of rearranging the time table for lighting and extinguishing the street lamps, so that as nearly as possible all shall be lighted before the darkness of night sets in, and that they shall not be extinguished before the full dawn of day. The contracts for lighting the city for the past twenty-five years, have required that each lamp shall be kept burning 3,833⅓ hours in the aggregate during the year, an average of 10½ hours for each night, the actual number of hours being increased or diminished according to the season, as established by a time table, and varying from 13½ hours in the longest nights of winter to 7½ hours in summer.

It seems that the aggregate number of hours (3,833⅓) in which each lamp is to be lighted per annum, was not arrived at by any astronomical calculation, as might perhaps be inferred from the preciseness of the figures, even to a fraction, but by the more simple process of the rule of three direct, and in this wise.

In 1848 the contract for lighting with gas required that the public lamps should be lighted at the rate of fifteen dollars each per annum, according to a time-table which then aggregated 2,300 hours for the year, the lighting having been omitted on moonlight nights, or when, according to the almanac, the moon should shine.

The contracts, however, contained a provision that if the number of hours should be increased, a pro rata increase of price should be allowed.

In January, 1854, the Common Council directed the Commissioner of Streets and Lamps “to cause all the public lamps throughout the city to be lighted from dark until daylight every night throughout the year.”

The Commissioner having determined that the price for lighting each lamp must be limited to \$25 per annum, the calculation was made that if fifteen dollars would light a lamp 2,300 hours per annum, then \$25 would light it 3,833⅓ hours, and that number was adopted for the time-table, and has been continued to the present day, “All the lamps to be lighted within one hour from the time of beginning to light.” The time occupied in lighting and extinguishing leaves some lamps unlighted until after dark, and causes some to be extinguished before daylight, though the total number of hours of burning is maintained at 3,833 per annum. If all the lamps could be simultaneously lighted and extinguished by electricity, it is evident that the whole city might be lighted from dark until daylight in a minimum number of hours; but as this is not practicable (at least at present) the desired result may be approximately obtained by requiring the lighting and extinguishing to be done in thirty minutes instead of one hour, as at present. This may slightly increase the cost of lighting.

Though the number of hours in which the lamps are lighted yearly seems to have been arbitrarily arrived at, yet it probably covers pretty nearly the period from dark until daylight, provided no time, or at least only a brief time, be consumed in the lighting and extinguishing.

The hours of burning per annum in some of the larger cities are as follows :

Brooklyn.....	3,536 hours.
Boston.....	3,828 “
Philadelphia.....	3,939 “
Glasgow.....	3,711 “
Liverpool.....	3,620 “
Manchester.....	3,666 “
Paris.....	3,749 “
New York.....	3,833⅓ “

Local conditions of the atmosphere will, of course, to some extent, govern the number of hours in which artificial light may be required. Mr. Stephen McCormick, the Superintendent of Lamps and Gas, who has given the subject careful consideration, estimates the time in which the lamps should be lighted in this city at four thousand hours per annum. His report, to which I would respectfully refer, contains interesting views and statistics on this and other matters connected with the lighting of the city.

Mr. McCormick's report, and that of Mr. E. G. Love, Gas Examiner, in charge of the city's photometrical rooms, contain interesting statements on the subject of the electric light, to which I invite your attention.

The objections at present to this light for street illumination may be briefly stated, as follows :

First.—Its intensity is not necessary, nor desirable for this purpose. This method, until some practicable mode of subdivision is devised would necessitate one great centre of light, where now the light is more thoroughly diffused by many smaller ones. The intensity of the sun's rays is not observed, because they are parallel and greatly diffused, but in the case of the electric light, emanating from a single point not very distant, the strain upon the eye would be injurious.

Second.—The liability to sudden extinction by injury to the machines, and interruption of the electric current. This objection in street lighting is more serious than in any other application of the

electric light. In buildings, oil and candles might be temporarily and quickly substituted, but sudden and continued darkness in the streets of a great city cannot, under any circumstances, be hazarded. Extra plant might be supplied, but, as many machines would be required, an entire duplication would be out of the question. This objection does not apply to gas, a supply being stored up for an emergency.

Third.—The cost.—At present the electric current cannot be conducted to any great distance without considerable loss. This would necessitate a great many generating machines, and suitable places to locate them could only be obtained at great cost. From extensive experiments made in Paris, it has been found that the electric light costs much more than an equal amount of gas light. It would be unwise to say that these obstacles may not be overcome, but whatever may be accomplished in future by the discoveries of electricians and the genius of inventors in respect to this method of illumination at present it does not seem to be applicable, in a practicable and economical sense, to the lighting of the streets of the city.

MISCELLANEOUS BUSINESS.

This Department is charged with the care of public market buildings, court-houses and rooms, armories, and all other city and county buildings not specially placed under the control of other Departments. Some of these buildings are old and dilapidated, requiring frequent repairs. During the past year the roofs of Washington, Jefferson and Essex markets were thoroughly repaired; the Dispensary building at Centre and White streets was fitted up for the use of the Board of Assessors, the Second District Civil Court, and the Attorney for the Collection of Arrears of Personal Taxes; the exterior of Tompkins market was newly painted; improvements were made in several armories, to strengthen them for defensive purposes; the exteriors of the City Hall and Hall of Records were renovated; and other minor repairs received prompt attention.

Fuel, office furniture, and other necessary supplies were furnished to the various public offices and courts, and the rooms were cleaned daily by persons in the employ of the Department.

The six public baths were open from June 1 to October 12, and the total number of bathers for the season was 2,457,557.

Every effort has been made to faithfully discharge the duty of removing obstructions from streets and sidewalks, but this subject is surrounded with so much difficulty and embarrassment in consequence of conflicting legislation and diversity of opinions as to the authority of the Department, that its measures and intentions are often frustrated.

The Counsel to the Corporation is clear in his opinion that there is no authority in law for the occupation of any part of the public streets for private purposes (except the temporary deposit of materials for building operations). Yet the Common Council, from time to time, authorizes the placing of signs, booths, and other articles on streets and sidewalks, and when an attempt was made to clear the streets around Washington Market of the stands, booths, platforms, and merchandise which occupied nearly all the space, obstructing public travel and access to adjoining stores and houses, the Department was resisted by the Clerk of the Market, and was enjoined by the court from further proceedings, on the ground that the Clerk of Washington Market had authority to give permits for the almost unlimited occupation of these streets.

It is very desirable that the question of authority in this matter be definitely settled by judicial interpretation or by legislation. Notwithstanding these obstacles to a prompt discharge of what I understand and am advised to be my duty in this respect, many obstructions have been removed, to the benefit of public travel and the appearance of the streets.

REVENUE.

The amount collected by the Department for Croton Water Rent, penalties on arrears of water rents, and permits to tap Croton pipes in 1878 is \$1,606,509.29, an increase of \$136,179.69 over the amount collected in 1877. The revenue for the last five years was as follows:

1874.....	\$1,477,277 06
1875.....	1,444,256 71
1876.....	1,478,281 00
1877.....	1,470,329 60
1878.....	1,606,509 29

Considering the continued depression in business, in consequence of which factories and other establishments that usually pay large amounts for extra water are partially or wholly suspended, the result may be regarded as favorable.

The modifications made in the rates, in charging for extra families in tenements in place of extra persons, and charging for street washers from \$5.00 upwards, according to the frontage of the premises, have worked satisfactorily, the latter measure having been successful in its principal object—the suppression of waste of water by unauthorized and unnecessary washing of sidewalks, stoops, and areas.

The Department also collected the following amounts from other sources:

For Vault Permits.....	\$35,798 78
For Sewer Permits.....	18,112 59
For Sewer Pipe sold contractors.....	1,929 74
For services of Inspectors on Elevated Railroad and Gas Companies.....	1,298 77
For miscellaneous items.....	1,574 75

Total.....\$58,714 63

In view of the large amount of money collected in the Bureau of the Water Register, over \$1,600,000 per annum, principally in small sums, and on charges which may vary from time to time according to the quantity of water used for various purposes, I have deemed it proper to establish this year an additional check on these accounts by causing a duplicate set of books to be kept in my office, by which errors, omissions, or alterations will be readily detected.

Very respectfully,

ALLAN CAMPBELL,
Commissioner of Public Works.

Appendix "A."

Showing Titles of Appropriations; Appropriations and Transfers of 1878; Requisitions, First Nine Months, 1878; Requisitions, Fourth Quarter, 1878; Total Requisitions for 1878; Balances of 1878, on December 31; and the Titles and Conditions of the "Trust Accounts."

TITLES OF APPROPRIATIONS.	Appropriations and Transfers, 1878.	Requisitions, First Nine Months, 1878.	Requisitions, Fourth Quarter, 1878.	Total Requisitions for 1878.	Balances, December 31, 1878.
Aqueduct—Repairs and Maintenance.....	\$112,000 00	\$82,870 46	\$27,476 43	\$110,346 89	\$1,653 11
Boulevard, Roads, and Avenues, Maintenance.....	41,000 00	28,515 80	10,213 87	38,729 67	2,270 33
Contingencies—Department of Public Works.....	2,500 00	1,808 14	560 19	2,368 33	131 67
Flagging Sidewalks and Fencing Vacant Lots, etc.....	1,100 00	496 56	585 43	1,081 99	18 01
Free Floating Baths.....	5,880 00	5,202 26	509 02	5,711 28	168 72
Free Floating Baths, Additional (Special).....	16,559 27	10,297 36	1,975 09	12,272 45	4,286 82
Lamps and Gas.....	498,809 59	341,992 52	121,734 36	463,726 88	35,082 71
Public Buildings—Construction and Repairs, etc.....	31,250 00	23,140 40	7,728 03	30,868 43	381 57
Public Drinking Hydrants.....	3,000 00	1,742 86	977 53	2,720 39	279 61
Removing Obstructions in Streets and Avenues.....	4,250 00	2,760 28	1,447 25	4,216 53	33 47
Repairing and Renewal of Pipes, Stopcocks, etc.....	90,000 00	62,078 48	23,460 99	85,539 47	4,460 53
Repaving, under chapter 476, Laws of 1875.....	355,000 00	164,951 09	114,651 44	279,603 53	75,396 47
Repairs and Renewal of Pavements.....	172,000 00	122,118 95	46,646 55	168,765 50	3,234 50
Roads and Avenues, and Sprinkling.....	20,000 00	12,500 91	6,094 88	18,595 79	1,404 21
Salaries—Department of Public Works.....	94,250 00	70,453 30	23,711 13	94,164 43	85 57
Sewers—Repairing and Cleaning.....	60,000 00	36,704 92	20,287 08	56,992 00	3,008 00
Street Improvements—For Street Signs, etc.....	620 00	518 00	30 00	548 00	72 00
Supplies for and Cleaning Public Offices, etc.....	92,250 00	66,930 88	24,068 03	90,998 91	1,251 09
Supplying Water to Shipping and for Building Purposes.....	8,000 00	6,009 00	1,981 00	7,990 00	10 00
Wells and Pumps—Repairing and Cleaning.....	500 00	146 13	54 75	200 88	299 12
Totals.....	\$1,608,968 86	\$1,041,248 20	\$434,193 05	\$1,475,441 25	\$133,527 61
Sewers, Repairing and Cleaning, of 1877.....			\$327 40		
Repaving, under chapter 476, Laws of 1875, of 1877.....			6,205 20		

TRUST ACCOUNTS.	Amount authorized by Board of Estimate and Apportionment.	Amount called for by Commissioner of Public Works.	Amount of Requisitions, First Nine Months, 1878.	Amount of Requisitions, Fourth Quarter, 1878.	Amount of Requisitions for 1878.	Amount Available on January 1, 1879.
Additional Alterations of Aqueduct, Ninety-third to One Hundred and Thirtieth street.....	\$3,550,000 00	\$3,600,000 00	.....	\$2,059 35	\$2,059 35	\$3,259 91
Additional Alterations of Aqueduct, One Hundred and Eighteenth to One Hundred and Forty-second street.....	65,165 57	100,000 00	.....	.....	.....	42,484 07
Boulevards, Roads, etc.—Assessment Fund.....	.....	.....	\$9,889 91	6,376 21	16,266 12	.....
Croton Water Works Extension—High Service, Carmansville.....	.....	185,990 84	.....	.....	.....	20,004 33
Croton Water Works Extension—Storage Reservoir.....	.....	127,729 29	.....	.....	.....	311 27
Croton Water Fund.....	1,310,000 00	1,310,000 00	79,023 25	77,770 01	156,793 26	30,934 21
Croton Water-main Fund.....	3,625,000 00	3,750,000 00	.....	.....	.....	47,042 20
Croton Water-main Fund, No. 2.....	1,238,000 00	1,238,000 00	302,952 83	141,981 02	444,933 85	97,615 03
Meter Stock.....	61,500 00	*1,025,000 00	6,260 01	494 14	6,754 15	14,893 02
Street Improvement Fund.....	.....	.....	408,667 93	201,580 09	610,248 02	.....
Water Stock of 1870.....	500,000 00	500,000 00	.....	.....	.....	85 63

* In litigation under Navarro Meter Contract, \$700,000.

C. T. McCLENACHAN,
First Bookkeeper, D. P. W.

Appendix "B."

A Statement in detail of Expenditures incurred, for which requisitions were drawn by the Department of Public Works, on the Comptroller, during the quarter ending December 31, 1878.

APPROPRIATIONS.

Aqueduct—Repairs and Maintenance—

Building sand.....	\$100 00
" stone.....	210 00
Coal.....	3,693 50
Flagging.....	51 00
Hardware.....	274 41
Horsekeeping.....	28 00
Incidental expenses.....	456 58
Oil.....	786 19
Painting roof.....	23 85
Pay-rolls.....	21,083 95
Repairing dock.....	204 96
" tools.....	265 65
Supplies.....	101 92
Taxes.....	196 42

Total.....\$27,476 43

Boulevard, Roads, and Avenues, Maintenance of—

Curbing.....	\$7 35
Flagging.....	154 46
Gravel.....	150 10
Horsekeeping.....	45 15
Lumber.....	36 79
Oil.....	30 00
Pay-rolls.....	9,183 34
Rent of office.....	81 25
Repairing monitors.....	12 76
Sand and clay.....	441 48
Supplies.....	65 19

Total.....\$10,213 87

Contingencies—Department of Public Works—

Fencing.....	\$38 70
Inspecting.....	84 00
Postage, etc.....	200 00
Traveling expenses.....	237 49

Total.....\$560 19

Flagging and Fencing in front of City Property—

Clinton Market, flagging.....	\$168 17
Twenty-third street, between Avenue A and East river, flagging.....	403 65
No. 9 Franklin street, fencing.....	13 61

Total.....\$585 43

Free Floating Baths—

Pay-rolls.....	\$397 50
Supplies.....	23 52
Towing baths.....	88 00

Total.....\$509 02

Additional Free Floating Baths—

Dockage.....	\$337 50
Pay-rolls.....	1,401 50
Skiff and oars.....	17 70
Supplies.....	32 29
Towing baths.....	176 00
Traveling expenses.....	10 10

Total.....\$1,975 09

Lamps and Gas—

Base and foundation.....	\$62 50
Crossheads.....	280 00
Glass street-signs.....	437 50
Iron fenders.....	137 50
Lamp-brackets.....	37 50
Lamp-globes.....	260 00
Lamp-irons.....	90 00
Lamp-posts.....	1,108 50
Lamps.....	1,722 50
" Painting.....	98 00
" Repairing.....	99 75
Lighting Armory, 3d Regiment.....	42 75
" " 5th ".....	97 85
" " 7th ".....	326 42
" " 8th ".....	27 64
" " 9th ".....	387 60
" " 11th ".....	82 84
" " 12th ".....	187 22
" " 22d ".....	398 05
" " 27th ".....	30 00
" " 69th ".....	67 45
" " 71st ".....	267 30

Lamps and Gas—

Lighting Armory, Battery B.	\$6 08
“ “ “ K.	9 50
“ “ “ Separate Troop A, Cavalry.	42 18
“ “ “ “ B.	41 48
“ Bath, Bethune street.	5 70
“ “ Gouverneur street.	12 73
“ “ Fifth street.	5 32
“ “ Thirty-fifth street.	4 69
“ “ Thirty-seventh street.	9 03
“ “ One Hundred and Fourteenth street.	10 17
“ Brown Stone Building.	42 37
“ City Hall.	589 81
“ Court, 2d District Civil.	22 61
“ “ 4th “	3 80
“ “ 5th “	3 61
“ “ 6th “	1 33
“ “ 8th “	4 70
“ “ 9th “	55
“ “ 1st District Police.	237 69
“ “ 2d “	68 97
“ “ 3d “	80 18
“ “ 4th “	70 00
“ “ 5th “	26 94
“ “ Marine.	9 88
“ “ Special Sessions.	1 90
“ County Jail.	460 94
“ Department of Buildings.	2 09
“ Engine-house at High Bridge.	185 07
“ Market, Catharine.	75 05
“ “ Centre.	307 04
“ “ Clinton.	247 00
“ “ Essex.	117 61
“ “ Fulton.	518 66
“ “ Jefferson.	130 15
“ “ Tompkins.	240 73
“ “ Union.	50 35
“ “ Washington.	579 88
“ New Court-house.	876 85
“ Office of Corporation Attorney.	39 71
“ “ Engineers—Boulevard.	4 12
“ “ Receiver of Taxes.	349 41
“ Rivington Street Yard.	5 89
“ Rooms, Photometrical.	13 28
“ South Gate-house.	7 42
“ Streets, Central Gas-light Co.	18,316 83
“ “ Harlem.	20,608 16
“ “ Manhattan.	20,846 82
“ “ Metropolitan.	19,710 28
“ “ New York.	10,344 63
“ “ N. Y. Mutual.	2,469 35
“ “ N. Y. & N. J. Globe Gas-light Co.	2,544 73
“ “ Northern Gas-light Co.	12,299 81
“ “ Yonkers.	594 00
Pay-rolls.	1,803 00
Rent of Photometrical Rooms.	325 00
Supplies.	12 15
Traveling expenses.	88 26
Total.	\$121,734 26

Public Buildings—Construction and Repairs—

Armory, Twenty-second Regiment.	\$445 00
Brown Stone Building.	670 76
Bureau of Repairs and Supplies.	392 75
City Hall.	1,354 99
City Prison.	66 56
County Jail.	481 63
Court-house, 3d District.	329 53
“ “ 7th “	291 37
“ “ 9th “	27 19
“ “ 10th “	4 08
“ “ New.	749 35
“ “ 5th District Civil.	8 20
“ “ 6th “	20 50
“ “ 8th “	4 75
“ “ 3d District Police.	49 97
Dispensary Building.	41 07
Market, Centre.	87 01
“ “ Clinton.	319 89
“ “ Essex.	210 59
“ “ Fulton.	369 40
“ “ Gouverneur.	41 64
“ “ Jefferson.	59 47
“ “ Tompkins.	684 80
“ “ Union.	146 67
“ “ Washington.	47 33
No. 128 West Broadway.	7 52
No. 202 West Thirty-first street.	127 80
Pay-rolls.	468 00
Register's Office.	220 21
Total.	\$7,728 03

Public Drinking Hydrants—

Drinking fountain.	\$100 00
Repairing hydrants.	877 53
Total.	\$977 53

Removing Obstructions in Streets and Avenues—

Pay-rolls.	\$822 50
Traveling expenses.	125 00
Trucking and labor.	499 75
Total.	\$1,447 25

Repairing and Renewal of Pipes, Stop-cocks, etc.—

Coal.	\$46 00
Horsekeeping.	176 27
Hydrants.	862 00
Hydrant boxes.	500 00
“ caps, etc.	210 53
“ handles, screws, etc.	200 00
“ repairing.	375 00
Lumber.	227 55
Oil.	79 68
Pay-rolls.	19,532 37
Repairing meters.	469 21
Stopcocks, etc.	687 07
Supplies.	60 06
Tools.	35 25
Total.	\$23,460 99

Repairs and Renewal of Pavements—

Belgian blocks.	\$3,677 75
Broken stone.	88 12
Carting stone.	242 61
Laying crosswalk.	205 57
Pay-rolls.	37,621 02
Relaying pavement.	751 68
Repairing flagging.	10 45
“ pavement.	210 00
“ tools.	1,014 35
Sand.	2,825 00
Total.	\$46,646 55

Repaving under Chap. 476, Laws 1875—

Pay-rolls.	\$2,570 80
Repaving Second avenue, between Twenty-third and Forty-second streets.	7,087 50
“ Fifth avenue, between Fifty-ninth and Seventy-second streets.	4,067 70
Repaving Fifth avenue, between One Hundred and Twenty-fourth and One Hundred and Thirtieth streets.	10,674 50
Repaving Seventh avenue, between Fourteenth and Forty-third streets.	61,532 10
Repaving Twenty-third and Forty-second streets, between Third and Fourth avenues, etc.	12,230 19
Repaving Barrow and White streets.	814 40
“ Washington square and Mercer street.	1,217 81
“ Waverley place, between Broadway and Christopher street.	14,447 46
Traveling expenses.	8 98
Total.	\$114,651 44

Repaving under Chapter 476, Laws of 1875, for 1877—

Repaving Washington and Pearl streets.	\$1,250 86
“ Sixth avenue, between Forty-second and Fifty-ninth streets.	2,534 82
“ John and Dey streets.	936 64
“ Maiden lane, Liberty, etc., streets.	1,482 88
Total.	\$6,205 20

Roads and Avenues and Sprinkling—

Building stone.	\$80 00
Gravel.	800 00
Pay-rolls.	4,961 69
Powder and fuse.	20 75
Repairing tools.	169 94
Traveling expenses.	62 50
Total.	\$6,094 88

Salaries—Department of Public Works—

Pay-rolls Officers and Clerks.	\$23,711 13
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Sewers—Repairing and Cleaning—

Brick and cement.	\$120 75
Cleaning basins and culverts.	2,400 00
Lumber.	75 00
Manhole frames and covers.	1,260 23
Pay-rolls.	11,481 50
Rebuilding sewer.	671 00
Relaying pavement.	59 55
Repairing basins.	1,419 63
“ sewer.	2,584 53
Sand.	37 50
Sewer pipe.	56 25
Supplies.	34 50
Tools.	86 64
Total.	\$20,287 08

Sewers—Repairing and Cleaning, for 1877—

Extending sewer.	\$7 40
Gully trap in Third avenue.	10 80
Rebuilding sewer.	212 00
Repairing sewer.	97 20
Total.	\$327 40

Street Improvements for Street Signs, etc.—

Correcting maps.	\$30 00
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Supplies for and Cleaning Public Offices—

Armory 5th Regiment.	\$60 00
“ 7th “	37 50
“ 8th “	16 00
“ 9th “	9 50
“ 11th “	26 00
“ 12th “	32 50
“ 22d “	80 03
“ 69th “	49 00
“ 71st “	11 00
“ Battery K.	66 50
“ Troop A.	26 00
“ “ B.	47 00
Board of Assessors.	46 28
Brown Stone Building.	182 90
Bureau Repairs and Supplies.	434 25
City Hall.	763 20
“ Prison.	15 50
County Jail.	247 24
Court, 1st District Civil.	101 00
“ 2d “	32 93
“ 3d “	25 50
“ 4th “	32 61
“ 5th “	73 95
“ 6th “	68 88
“ 7th “	11 80
“ 8th “	53 28
“ 9th “	12 48
“ 10th “	60 00
“ 1st District Police.	50 62
“ 3d “	89 35
“ 4th “	11 50
“ 5th “	52 00
“ 6th “	46 50
“ Common Pleas.	52 46
“ General Sessions.	29 08
“ Marine.	112 68
“ Special Sessions.	66 87
“ Superior.	412 32
“ Supreme.	792 43
Court-house, 3d District.	379 77
“ 7th “	210 06
“ 9th “	30 24
“ 10th “	14 54

Supplies for and Cleaning Public Offices—		
Department of Buildings.....	\$57	40
“ Finance.....	138	85
“ Public Works.....	62	16
“ Taxes and Assessments.....	34	30
New Court-house.....	933	21
No. 49 Beekman street.....	23	64
No. 27 Chambers street.....	57	40
Office of Corporation Attorney.....	36	50
“ Counsel.....	38	30
“ District Attorney.....	28	20
“ Engineer, Boulevard.....	15	75
“ Mayor.....	6	75
“ Public Administrator.....	29	00
“ Register.....	56	21
“ Surrogate.....	12	46
Pay-rolls.....	17,536	90
Yard, Gansevoort Street.....	4	75
“ Rivington Street.....	23	00
Total.....	\$24,068	03

Supplying Water to Shipping and for Building Purposes—		
Pay-rolls.....	\$1,981	00
Wells and Pumps—Repairing and Cleaning—		
Repairing pump.....	\$54	75

RECAPITULATION OF APPROPRIATIONS.		
Aqueduct—Repairs and Maintenance.....	\$27,476	43
Boulevard, Roads and Avenues—Maintenance of.....	10,213	87
Contingencies—Department of Public Works.....	560	19
Flagging and Fencing in front of City Property.....	585	43
Free Floating Baths.....	509	02
“ Additional.....	1,975	09
Lamps and Gas.....	121,734	26
Public Buildings—Construction and Repairs.....	7,728	03
Public Drinking Hydrants.....	977	53
Removing Obstructions in Streets and Avenues.....	1,447	25
Repairing and Renewal of Pipes, Stopcocks, etc.....	23,460	99
Repairs and Renewal of Pavements.....	46,646	65
Repaving, under Chapter 476, Laws 1875.....	114,651	44
“ “ “ for 1877.....	6,205	20
Roads and Avenues, and Sprinkling.....	6,094	88
Salaries—Department of Public Works.....	23,711	13
Sewers—Repairing and Cleaning.....	20,287	08
“ “ “ for 1877.....	327	40
Street Improvement Fund—For Street Signs, etc.....	30	00
Supplies for and Cleaning Public Offices.....	24,068	03
Supplying Water to Shipping, etc.....	1,981	00
Wells and Pumps—Repairing and Cleaning.....	54	75
Total.....	\$440,725	65

FUNDS AND TRUST ACCOUNTS.		
ADDITIONAL ALTERATIONS OF AQUEDUCT, NINETY-THIRD TO ONE HUNDRED AND THIRTEENTH STREET.		
Fencing at gate-house.....	\$539	55
Inspecting gate-house.....	424	00
Masonry.....	1,000	80
Removing cut stone.....	95	00
Total.....	\$2,059	35

CROTON WATER FUND.		
Building storage reservoir at South-East.....	\$57,212	27
Damage to mill.....	400	00
Horsekeeping.....	200	00
Land purchased.....	50	00
Macadam roadway.....	4,637	80
Miscellaneous expenses.....	262	52
Painting bridge.....	197	00
Pay-rolls.....	7,087	80
Raising reservoir walls.....	119	50
Rebuilding bridge and wall.....	250	00
Rent of office.....	130	00
Rent of mill seat.....	375	00
Repairing house.....	200	00
Services of Attorney.....	2,884	84
“ Expert.....	1,286	50
“ Geologist.....	1,000	00
“ Witness.....	1,000	00
“ Reporter.....	126	49
Skiff and oars.....	18	00
Supplies.....	29	75
Taxes.....	114	46
Tools.....	150	00
Traveling expenses.....	38	08
Total.....	\$77,770	01

CROTON WATER MAIN FUND NO. 2.		
Cast iron water-pipe.....	\$63,822	38
Changing service tap.....	411	98
“ vault.....	912	37
Fuel.....	115	00
Horsekeeping.....	144	75
Hydrant boxes and covers.....	795	00
Hydrants.....	8,928	25
Iron.....	119	15
Laying mains in Avenues B and C.....	1,481	45
“ First avenue, Houston street, etc.....	6,566	83
“ First avenue, between Fourteenth and Thirty-seventh streets.....	7,588	71
“ First avenue, between Thirty-seventh and Forty-eighth streets.....	1,809	90
“ Third avenue, etc.....	1,006	62
“ Seventh avenue, etc.....	683	97
“ Pelham Avenue, etc.....	89	12
“ Chrystie street, etc.....	6,777	99
“ Sixty-eighth, Eighty-first streets, etc.....	868	04
Laying mains in One Hundred and Thirtieth, One Hundred and Thirty-fourth streets, etc.....	3,180	60
Laying mains in One Hundred and Forty-third street, etc.....	252	32
Pay-rolls.....	29,811	01
Pipe yarn and rope.....	188	40
Repairing mains.....	22	74
“ pavement.....	308	00
“ wagon.....	30	72
Sand.....	987	50
Stopcock boxes and covers.....	2,804	00
Stopcocks.....	2,130	50
Supplies.....	48	75
Traveling expenses.....	94	97
Total.....	\$141,981	02

METER STOCK.		
Connecting meters.....	\$494	14

STREET IMPROVEMENT FUND.		
Crosswalks—		
Fourth avenue, at One Hundred and Seventh and One Hundred and Ninth streets, P. J. Masterson.....		\$645 56
Fencing—		
South side Fifty-seventh street, between Fifth and Sixth avenues, R. A. Cunningham.....	\$7	84
Seventy-fourth street, between Fourth and Madison avenues, R. A. Cunningham.....	88	80
Eighty-fifth street, between First avenue and Avenue A, R. A. Cunningham.....	99	94
Flagging—		
East side Madison avenue, between Fifty-sixth and Fifty-seventh streets, R. A. Cunningham.....	\$312	34
Thirty-fourth street, opposite No. 411, East, P. J. Masterson.....	28	40
South side Fortieth street, between First and Second avenues, Patrick Burns.....	249	06
North side Fifty-seventh street, between Third and Lexington avenues, R. A. Cunningham.....	139	23
Eighty-fifth street, between First avenue and Avenue A, R. A. Cunningham.....	417	91
Miscellaneous expenditures.....		1,146 94 742 84

Paving—		
Eleventh avenue, between Fifty-ninth and Sixty-fifth streets, W. A. Cumming.....	\$3,731	78
Broadway, between Manhattan and One Hundred and Thirty-third streets, G. F. Doak.....	494	30
Fourth street, between Lewis and Mangin streets, C. P. Devlin.....	156	40
Fifty-sixth street, between Fourth and Madison avenues, John Slattery.....	138	80
Sixty-fifth street, between First and Third avenues, Thomas Gearty.....	4,892	88
Seventy-fifth street, between Fourth and Madison avenues, P. J. Masterson.....	1,640	48
Eighty-fourth street, between Boulevard and Riverside Drive, J. M. Shannon.....	3,966	92
One Hundred and Third street, between Fourth and Lexington avenues, Denis McGrath.....	253	10
One Hundred and Eighth street, between Fourth and Madison avenues, Denis McGrath.....	1,527	74
One Hundred and Twentieth street, between Second and Third avenues, Denis McGrath.....	2,241	65
One Hundred and Twenty-first street, between First avenue and Avenue A, Denis McGrath.....	209	00
Pay-rolls, Engineers on Sewers.....		19,253 05 10,220 79
“ Inspectors on Paving.....		987 00
“ “ Regulating, Grading, etc.....		2,211 00
“ “ Sewers and Basins.....		4,974 00

Regulating, Grading, etc.—		
Fourth avenue, between One Hundred and Second and One Hundred and Tenth streets, E. Bradburn.....	\$2,800	42
Eighth avenue, between One Hundred and Twenty-fifth street and Harlem river, Mills & Ambrose.....	60,013	61
Ninth avenue, between Seventy-second and Eighty-first streets, Terence Smith.....	2,057	51
Forty-second street, between Second avenue and East river, Thomas Connell.....	1,095	36
Seventy-eighth street, between Ninth avenue and Boulevard, P. Mulholland.....	4,479	00
Eighty-eighth street, between First avenue and Avenue A, J. B. Devlin.....	1,116	87
Ninety-sixth street, between Boulevard and Hudson river, A. Dowdney.....	7,703	39
Ninety-ninth street, between First and Third avenues, J. D. Crimmins.....	6,373	50
One Hundredth street, between Bloomingdale and Boulevard, Mat. Baird.....	625	13
One Hundred and Third street, between First and Fifth avenues, J. C. Dowling.....	1,596	00
Receiving-basins—		
Fifth avenue, west side, opposite One Hundred and Eighth and One Hundred and Ninth streets, Lawrence Rock.....	\$11	20
Madison street, northwest corner Birmingham, G. Palmer.....	137	80
Grand street, southwest corner Ridge street, Chris. Keyes.....	21	60
Fourth street, northwest corner Sixth avenue, Chris. Keyes.....	7	00
Fifty-seventh street, between Madison and Fourth avenues, G. Palmer.....	150	00
Fifty-ninth street, northeast corner Madison avenue, Chris. Keyes.....	6	00
Sixty-fifth street, northwest corner Fifth avenue, J. S. Masterson.....	119	80
Seventy-fourth street, northwest corner Avenue A, Lawrence Rock.....	5	00
One Hundred and Twenty-seventh street, southwest corner Lexington avenue, Lawrence Rock.....	5	40
Sewers—		
First avenue, between Ninety-second and One Hundred and Tenth streets, J. C. Dowling.....	\$14,210	83
Fourth avenue, between One Hundred and Twenty-third and One Hundred and Twenty-fifth streets, Devlin & McKim.....	2,334	76
Fifth avenue, between One Hundred and Twenty-second and One Hundred and Twenty-third streets, Lawrence Rock.....	61	00
Eighth avenue, between Ninety-second and One Hundred and Fifth streets, Alexander Lutz.....	942	80
Ninth avenue, between One Hundredth and One Hundred and First streets, Bart. Noonan.....	2,742	70
Tenth avenue, between Fifty-seventh and Fifty-ninth streets, John Bulger.....	81	40
Tenth avenue, between Seventy-seventh and Eighty-first streets, Bart. Noonan.....	8,246	55
New avenue, west of Morningside Park, James Everard.....	1,141	35
Eleventh avenue, between Sixty-sixth and Seventy-sixth streets, Crimmins, Dowdney, etc.....	11,049	50
East Broadway, between Oliver and Catharine streets, Lawrence Rock.....	450	25
Goerck street, between Houston and Third streets, Lawrence Rock.....	391	34
Greenwich street, between Houston and Clarkson streets, Lawrence Rock.....	445	50
Washington street, between Fulton and Vesey streets, Lawrence Rock.....	43	60
Fortieth street, between Tenth avenue and Hudson river, Devlin & McKim.....	363	60
Forty-second street, between Third avenue and East river, J. Mulholland.....	11,053	85
Forty-fourth and Forty-fifth streets, extension, Hudson river, Terence Smith.....	3,161	27
Fifty-first street, between First and Second avenues, Thomas H. Casey.....	70	20
Fifty-seventh street, between Eighth and Ninth avenues, Frank McCabe.....	9	40
Fifty-seventh street, extension, East river, P. T. Masterson.....	272	81
Seventieth street, between First and Second avenues, Devlin & McKim.....	2,482	70
Seventy-sixth street, between Boulevard and Eleventh avenue, G. A. Treacy.....	1,340	75
Ninety-fourth street, between Third and Fourth avenues, E. Bradburn.....	1,473	53

Sewers—

One Hundred and Fourth street, between Fourth and Fifth avenues, E. Bradburn	\$2,645 55
One Hundred and Tenth street, between Eighth and Ninth avenues, Michael Noonan	2,222 50
One Hundred and Twenty-seventh street, between Sixth avenue and summit west, G. Palmer	55 60
One Hundred and Twenty-seventh street, between Seventh avenue and summit east, G. Palmer	95 00
Surveying expenses	\$67,388 34
Total	5,489 40
	\$201,580 09

STREET IMPROVEMENT FUNDS ABOVE FIFTY-NINTH STREET.

Boulevard Planting— Pay-rolls	\$127 42
Sixth Avenue Planting— Pay-rolls	9 30
Seventh Avenue Planting— Pay-rolls	51 36
Morningside Avenue, West— Pay-rolls	352 21
Tenth Avenue, between One Hundred and Tenth and Manhattan streets— Pay-rolls	\$1,430 77
Surveyors' fees	1,098 30
Regulating, grading, etc.	3,110 69
	5,639 76
Eleventh Avenue, between One Hundred and Fifty-fifth street and Kingsbridge road— Pay-rolls	196 16
Total	\$6,376 21

RECAPITULATION OF TRUST ACCOUNTS.

Additional Alterations Aqueduct	\$2,059 35
Croton Water Fund	77,770 01
Croton Water-main Fund No. 2	141,981 02
Meter Stock	494 14
Street Improvement Fund	201,580 09
Street Improvement Fund above Fifty-ninth street	6,376 21
Total	\$430,260 82

GENERAL SUMMARY.

Appropriations	\$440,725 65
Funds and Trust Accounts	430,260 82
Grand Total	\$870,986 47

Contracts Made during the Three Months ending December 31, 1878.

DATE.	NATURE AND LOCATION OF WORK.	CONTRACTOR.	SURETIES.	ESTIMATED AMOUNT.
Oct. 19	Sewer in One Hundred and Nineteenth street, from Fifth avenue to Summit, west of Fifth avenue	John H. McCabe, 788 Lexington avenue	E. C. Sheehy, 1453 Third avenue... M. B. Flynn, 622 E. 14th street...	\$2,135 50
Nov. 25	Sewer in Ninety-fifth street, between Third and Lexington avenues	John B. Healy, 246 E. 105th street	M. B. Flynn, 622 E. 14th street... Matthew Baird, 306 E. 57th street...	5,005 95
" 23	Sewer in One Hundred and Fourth street, between Ninth and Tenth avenues	James Reilly, 127th st. and B'dway.	Wm. Cowan, Manhattan street... Theo. F. Tone, Foot of W. 130th st.	3,195 00
				\$10,336 45
Oct. 24	Regulating, grading, etc., Eleventh avenue, from the northerly line of One Hundred and Fifty-fifth street to the westerly line of Kingsbridge road	Michael Noonan, 174 E. 79th street	Thomas Pearson, 10 E. 84th street... Charles Guidet, 237 Broadway	\$65,523 20
Nov. 14	Regulating, grading, etc., Madison avenue, from Ninety-ninth to One Hundred and Fifth street	John Slattery, 788 Fourth avenue	James Slattery, 207 W. 57th street... William Hullivan, 349 W. 53d street...	47,205 13
" 25	Regulating, grading, etc., Twelfth avenue, between One Hundred and Thirtieth and One Hundred and Thirty-third streets	Peter T. Masterson, 7th ave. and 127th st.	E. C. Sheehy, 1453 Third avenue... James Rogers, Foot of 132d street...	3,212 70
				\$115,941 03
Oct. 17	Paving One Hundred and Twentieth street, between Second and Third avenues, with Belgian pavement	Denis McGrath, Weehawken, N. J.	M. Baird, 306 E. 57th street... John Mulholland, 73d st. bet. 1st & 2d av	\$2,475 60
" 17	Paving One Hundred and Eighth street, between Fourth and Madison avenues, with Belgian pavement	Denis McGrath, Weehawken, N. J.	M. Baird, 306 E. 57th street... John Mulholland, 73d st. bet. 1st & 2d av	1,697 38
Nov. 23	Paving Fifth avenue, from Fifty-ninth to Seventy-second street, with Macadamized pavement	M. A. Kellogg, Alex. ave. and 130th st	R. Prior, 2389 Third avenue... H. H. Brown, 41 W. 12th street...	11,174 01
Dec. 9	Paving Eighty-first street, between Fourth and Fifth avenues, with Belgian pavement	Denis McGrath	M. Baird, 306 E. 57th street... P. H. McCullogh, 240 E. 32d street...	3,396 25
" 14	Paving Fifty-third street, between Broadway and Seventh avenue, with Belgian pavement	Thomas Gearty, 415 E. 83d street	John McGurrian, 301 E. 31st street	875 16
				\$19,618 40
Oct. 31	Laying Croton-mains in Boston avenue, One Hundred and Sixty-ninth, Sixty-eighth, and Eighty-first streets	Gilbert Palmer, 49 E. 78th street	Theodore Russell, 17 & 19 Rose street... Bernard Maloney, 123 E. 116th street...	\$3,735 20
Dec. 18	Furnishing and lighting with gas the public buildings, offices, etc. (mentioned in contract), for the term of one year	The New York Gas-light Co.	Moses Taylor, 122 Fifth avenue... Samuel Sloan, 21 W. 17th street...	\$15,000 00
" 19	Furnishing and lighting with gas the public buildings, offices, etc. (mentioned in contract), for the term of one year	The Manhattan Gas-light Co.	Moses Taylor, 122 Fifth avenue... Samuel Sloan, 21 W. 17th street...	8,500 00
" 19	Furnishing and lighting with gas the public buildings, offices, etc. (mentioned in contract), for the term of one year	The Municipal Gas-light Co.	Sam'l C. Thompson, 297 Girard avenue... Oswald Ottendorfer, 7 E. 17th street...	7,500 00
" 26	Furnishing and lighting with gas the public buildings, offices, etc. (mentioned in contract), for the term of one year	The Harlem Gas-light Co.	Burt Wakeman, 10 W. 36th street... R. W. Rodman, 40 E. 109th street...	1,200 00
				\$32,200 00
Oct. 3	Regulating, etc., One Hundredth street, from Bloomingdale road to the Boulevard	Matthew Baird, 306 E. 57th street		\$679 99
" 5	Flagging, east side, Madison avenue, from Fifty-sixth to Fifty-seventh street, and on west side Fifty-sixth street, from Madison to Fourth avenue	Rich. A. Cunningham, 343 E. 16th street		233 80

DATE.	NATURE AND LOCATION OF WORK.	CONTRACTOR.	SURETIES.	ESTIMATED AMOUNT.
Oct. 5	Flagging four feet wide, Eighty-fifth street, between First avenue and Avenue A	Rich. A. Cunningham, 343 E. 16th street		\$419 85
" 5	Flagging full width in front of No. 411 East Thirty-fourth street	Peter J. Masterson, 127th st. and 7th ave.		23 70
Nov. 15	Flagging Fifty-seventh street, north side, between Third and Lexington avenues	R. A. Cunningham, 343 E. 16th street		144 04
" 15	Flagging, north side, Fifty-ninth street, between Madison and Fifth avenues	Thomas J. Reilly		305 10
Oct. 5	Fencing vacant lots, south side, Fifty-seventh street, between Fifth and Sixth avenues	Rich. A. Cunningham, 343 E. 16th street		8 00
" 3	Fencing vacant lots, west side, Seventy-fourth street, between Fourth and Madison avenues	Rich. A. Cunningham, 343 E. 16th street		88 32
" 3	Fencing vacant lots on Eighty-fifth street, between First avenue and Avenue A, and on southwest corner Eighty-sixth street and Avenue A	Rich. A. Cunningham, 343 E. 16th street		100 80
" 3	Laying crosswalks across Fourth avenue, at northerly and southerly intersections of One Hundred and Seventh, One Hundred and Eighth and One Hundred and Ninth streets	Peter J. Masterson, 127th st. and 7th ave.		734 30
Nov. 12	Sewer in Greenwich avenue, between Thirteenth street and Eighth avenue, and in Bank street	Peter T. Masterson, 813 Seventh avenue		731 45
" 13	Extension of sewer at the foot of Fifty-seventh street, East river	Peter T. Masterson, 813 Seventh avenue		236 50
" 15	Sewer in West street, between Barclay street and Park place	Charles Devlin, 311 E. 57th street		772 50
" 12	Receiving-basins southwest corner Fifty-fourth street and Avenue A, and on northwest corner Fifty-fifth street and Avenue A	Peter T. Masterson, 813 Seventh ave.		394 50
" 15	Receiving-basin on northwest corner of Bloomfield street and Tenth avenue, and Little West Twelfth street and Tenth avenue	Charles Devlin, 311 E. 57th street		304 00
" 15	Receiving-basin on northwest corner of First street and Extra place	Charles Devlin, 311 E. 57th street		116 00
Dec. 30	Receiving-basin on northeast corner of Seventieth street and Fifth avenue	M. A. Kellogg, Alex. ave. & 130th st.		137 00
Nov. 23	Paving Sixty-eighth street, intersection of Fourth avenue, with granite pavement	J. D. Crimmins, 1037 Third ave.		942 90
				\$6,372 75

RECAPITULATION.

3 Sewer Contracts	\$10,336 45
3 Regulating and Grading Contracts	115,941 03
5 Paving Contracts	19,618 40
1 Crosswalk Contract	3,735 20
4 Gas Contracts	32,200 00
18 Miscellaneous Contracts	6,372 75
34 Contracts	\$188,203 83

Contracts, etc., Completed during the Three Months ending December 31, 1878.

DATE.	NATURE AND LOCATION OF WORK.	AMOUNT.	
Oct. 10	Paving	Eleventh avenue, from Fifty-ninth to Sixty-fifth street, with Belgian pavement.....	\$14,276 83
" 15	Sewer.....	One Hundred and Fourth street, between Fourth and Fifth avenues.....	3,271 55
" 15	Sewer.....	Sixty-sixth street, between Boulevard and Eleventh avenue.....	1,791 75
" 15	Sewer.....	Fourth avenue, north side, between One Hundred and Twenty-third and One Hundred and Twenty-fifth streets.....	2,809 56
" 17	Receiving-basin.....	North side of Fifty-seventh street, between Madison and Fourth avenues.....	230 00
" 17	Receiving-basin.....	Northwest corner of Sixty-fifth street and Fifth avenue.....	200 00
" 17	Sewer.....	Greenwich street, between West Houston and Clarkson streets.....	565 10
" 17	Regulating, grading, etc.	Seventy-eighth street, between Boulevard and Ninth avenue.....	19,068 29
" 25	Sewer.....	East Broadway or Chatham Square, east side, between Oliver and Catharine streets	604 25
" 25	Fencing vacant lots.....	South side of Fifty-seventh street, between Fifth and Sixth avenues.....	9 32
" 30	Fencing vacant lots.....	North side of Seventy-fourth street, between Fourth and Madison avenues.....	106 14
" 31	Paving	Seventy-fifth street, from Fourth to Madison avenue, with Belgian pavement.....	1,919 34
" 31	Sewer.....	Tenth avenue, between Seventy-seventh and Eighty-first streets, with branches in Seventy-seventh, Seventy-eighth, Seventy-ninth, and Eightieth streets.....	34,765 20
Nov. 2	Regulating, grading, etc.	Eighty avenue, from One Hundred and Twenty-eighth street to the Harlem river.....	180,499 45
" 7	Sewer.....	Goerck street, between Houston and Third streets.....	507 54
" 7	Flagging.....	Full width, in front of No. 411 East Thirty-fourth street.....	30 96
" 7	Fencing vacant lots.....	Eighty-fifth street, between First avenue and Avenue A; and also on southwest corner of Eighty-sixth street and Avenue A.....	118 30
" 9	Paving	Sixty-fifth street, from First to Third avenue, with Belgian pavement.....	5,731 82
" 9	Flagging.....	Four feet wide, Eighty-fifth street, between First avenue and Avenue A.....	465 53
" 9	Flagging.....	East side of Madison avenue, from Fifty-sixth to Fifty-seventh street, and on north side of Fifty-sixth street, from Madison to Fourth avenue.....	331 29
" 16	Laying crosswalks.....	Across Fourth avenue, at west side, intersections of One Hundred and Seventh, One Hundred and Eighth, and One Hundred and Ninth streets.....	874 48
" 12	Paving	Eighty-fourth street, from Boulevard to Riverside Drive, with Belgian pavement.....	4,563 89
Dec. 5	Regulating, grading, etc.	Fourth avenue, from One Hundred and Second to One Hundred and Tenth street.....	10,740 84
" 5	Flagging.....	Fifty-seventh street, north side, between Third and Lexington avenues.....	145 20
" 5	Planting elm trees.....	Sixth avenue, from One Hundred and Tenth to One Hundred and Forty-fifth street.....	4,353 75
" 19	Sewer.....	Seventieth street, between First and Second avenues.....	3,110 70
" 19	Regulating, grading, etc.	Eighty-eighth street, between First avenue and Avenue A.....	1,664 82
" 20	Regulating, grading, etc.	Ninth avenue, from Seventy-second to Eighty-first street.....	9,542 72
" 20	Regulating, grading, etc.	One Hundredth street, from Bloomingdale road to Boulevard	718 99
" 23	Extension of sewer.....	Foot of Fifty-seventh street, East river.....	383 21
" 26	Paving	One Hundred and Twentieth street, between Second and Third avenues, with Belgian pavement.....	2,631 68
" 26	Paving	One Hundred and Eighth street, between Fourth and Madison avenues, with Belgian pavement.....	1,796 31
" 26	Regulating, grading, etc.	Ninety-sixth street, from the Boulevard to the Hudson river	25,938 74
" 27	Regulating, grading, etc.	Tenth avenue, from One Hundred and Tenth to Manhattan street.....	124,618 72
" 31	Sewers in Sewerage District No. 12 E.	Boulevard, between One Hundred and Sixth and One Hundred and Fifty-third streets.....	630,517 80
Nov. 1	Paving	New Road on west side of New Reservoir, in Putnam Co., with Macadam pavement.....	9,304 30
" 8	Paving.....	Twenty-third street, between Third avenue and East river, and Forty-second street, between Third and Fourth avenues, with Belgian pavement.....	19,109 99
" 14	Laying Croton-mains.....	Avenue B, Fifty-first street, Tenth avenue, Ninety-sixth, Ninety-seventh, One Hundred and Seventh, One Hundred and Sixty-eighth streets, and Blackwell's Island.....	6,608 97
" 27	Paving.....	Fifth avenue, from One Hundred and Twenty-fourth to One Hundred and Thirtieth street, with Belgian pavement.....	10,674 50
Dec. 13	Laying Croton-mains.....	One Hundred and Thirtieth, One Hundred and Thirty-fourth, One Hundred and Twenty-sixth streets, Southern Boulevard, Sixty-ninth, Front, South, and One Hundred and Sixty-fifth streets.....	4,674 16
" 17	Building a Storage Reservoir on the middle branch of the Croton river, in the Town of South-East, Putnam Co.		402,530 c8
" 24	Furnishing Department with cast-iron water pipes.....	Seventh avenue, from Fourteenth to Forty-third street, with granite pavement.....	96,172 18
" 24	Paving	Waverley place, between Broadway and Christopher street, with granite pavement.....	83,423 51
" 24	Paving		15,379 76
	Total.....		\$1,736,781 52

RECAPITULATION.

8 Sewer Contracts.....	\$44,698 16
8 Paving Contracts.....	43,334 87
8 Regulating and Grading Contracts.....	372,792 57
4 Paving under chapter 476, Laws of 1875.....	128,587 76
2 Croton main Contracts.....	11,283 13
2 Receiving-basin Contracts.....	430 00
3 Fencing Contracts.....	233 76
4 Flagging Contracts.....	972 98
1 Crosswalk Contract.....	874 48
1 Boulevard Sewer Work.....	630,517 80
1 Reservoir Contract.....	402,530 08
1 Croton Pipe Contract.....	96,172 18
1 Tree Work.....	4,353 75
44 Contracts.....	\$1,736,781 52

DEPARTMENT OF PUBLIC WORKS,
CHIEF ENGINEER'S OFFICE, CITY HALL,
NEW YORK, January 2d, 1879.

ALLAN CAMPBELL, Esq., Commissioner of Public Works:

SIR—I have the honor to report that during the quarter ending December 31st, 1878, there has been expended in this Bureau, for work done and materials furnished, and for which bills have been transmitted, as follows:

Additional Alteration Aqueduct, Ninety-third to One Hundred and Thirteenth street.....	\$2,059 35
Aqueduct—Repairs and maintenance.....	27,476 43
Croton Water Fund.....	77,695 01
Croton Water Main Fund No. 2.....	121,380 22
Meter Stock.....	494 14
Repairing and renewal of pipes, stopcocks, etc.....	6,081 91
Supplying water to shipping and for building purposes.....	1,981 00
Contingencies, Department Public Works.....	127 94
Total.....	\$237,296 00

And for the year 1878—

Additional alteration Aqueduct, Ninety-third to One Hundred and Thirteenth street.....	2,059 35
Aqueduct—Repairs and maintenance.....	113,404 95
Croton Water Fund.....	156,793 26
Croton Water Main Fund No. 2.....	386,750 34
Contingencies, Department Public Works.....	210 88
Meter Stock.....	6,754 15
Repairing and renewal of pipes, stopcocks, etc.....	25,352 67
Supplying water to shipping and for building purposes.....	7,990 00
Repairing streets.....	627 26
Total.....	\$699,942 86

PROCURING WATER.

The contractors for the new Storage Reservoir on the middle branch of the Croton river completed their work in October, and the final estimate on same has been certified to. This Reservoir was filled on the 10th of December, and 18 inches running over through the overfall on the next day, the water having raised 19 feet 4½ inches since October 1st, 1878. All of the work has stood this sudden rise and overflow of the Reservoir and every part of same, and the roads around same are now in good substantial order.

Total cost of this Reservoir to date is as follows:

Labor and materials under contract.....	\$411,834 39
Land and Damages.....	160,422 94
Legal and other expenses.....	44,784 44
Engineering.....	39,022 12
Total.....	\$656,063 89

The commission to appraise damages to the Tilly Foster Iron Mine by the filling of this Reservoir, has had no session during the past three months. We have an engineer at the mine keeping a strict measurement of the amount of water pumped from same, and the rainfall, so as to have full data of the effects the filling of the Reservoir will have on the drainage of the mine.

During the storm of the 9th and 10th of December Lake Gleneida raised very fast, and to prevent its raising above high water mark a large stream was started from the lake, which washed out a piece of the retaining wall on the outlet and undermined the road bridge over the same. This has been rebuilt and repaired.

At Boyd's Corners reservoir during this storm a large stream was running through the overfall and washed out and through a bank of earth at the lower end of same, doing no immediate damage, but showing the necessity of blasting the overfall deeper at the lower end of the rock-cut, and protecting the earth-banks below the rock-cut by a masonry retaining wall, and the transferring of the filling between the overfall and fountain basin so as to protect both in heavy freshets.

Amount of work done on reservoirs and lakes during the year—

¼ clearing and grubbing.....	
1,853 cubic yards earth excavation.....	
5,579 cubic yards rock excavation.....	
14 cubic yards tunnel cutting in rock.....	
27,382 cubic yards embankment.....	
851½ cubic yards cut stone masonry.....	
1,941 cubic yards rubble stone masonry.....	
201 cubic yards brick masonry.....	
94 cubic yards concrete masonry.....	
293 cubic yards dry stone wall.....	
4,449 ft., B. M., white pine timber.....	
8,480 ft., B. M., yellow pine timber.....	
618 lbs. wrought iron.....	
16,030 lbs. cast iron.....	
30 acres reservoir lands cleared.....	
5,110 cubic yards earth excavation in roads.....	
233 cubic yards rock excavation in roads.....	
5,187 cubic yards embankment in roads.....	
2½ cubic yards rubble masonry in roads.....	
514 cubic yards dry wall stone in roads.....	
1,302 lineal feet of fence walls.....	
9,858 lineal feet of fence walls.....	
4,785 ft., B. M., white pine timber.....	
7,418 ft., B. M., oak and chestnut timber.....	
1,507½ lbs. wrought iron.....	
1 lb. cast iron.....	
Cost of above work.....	\$46,353 43
Hauling pipes from Brewster and laying.....	1,906 65
Repairing and painting house at new dam.....	221 77
Painting wooden bridge on new road.....	197 00
Macadamizing new road.....	9,304 30
Repairing Kennedy's dam on outlet Peach Pond.....	653 18
Raising walls of reservoir at Tilly Foster mine.....	119 50
Repairing dams at Kirk & Barrett Ponds.....	147 55
Repairing walls and road bridge at outlet Lake Gleneida.....	250 00
Total.....	\$59,153 38

The Commissioners to appraise damages to the owners of property and water rights in and around Lakes Mahopac and Kirk have had several sessions during the quarter. At their request we drew Lake Mahopac down two feet nine inches, to the low water mark decided upon by them, and kept it down some time, so that they could view the same.

On the 15th of November the gates at Lake Mahopac were closed, and since then the water has raised 17 inches, insuring the filling of same to high water mark during the spring rains.

All the rest of the lakes and reservoirs are full, except Lake Gilead, which is 18 inches below high water mark.

The amount of water drawn during this year in July, August, and October was from—
Boyd's Corner reservoir..... 724,700,000 gallons
Lake Mahopac..... 526,300,000 "

Total..... 1,251,000,000 gallons

The rainfall at Boyd's Corner reservoir was, in October, 3.78 inches; in November, 4.10 inches; in December, 8.14 inches, and for the year 1878, 54.14 inches.

STATEMENT OF STORED WATER AVAILABLE IN THE CROTON BASIN.

Boyd's Corner reservoir.....	2,727,000,000 gallons
Middle Branch reservoir.....	4,004,000,000 "
Lake Mahopac.....	575,000,000 "
" Kirk.....	565,000,000 "
" Gleneida.....	165,000,000 "
" Gilead.....	380,000,000 "
Barrett's Pond.....	170,000,000 "
China.....	105,000,000 "
White.....	100,000,000 "
Pine.....	75,000,000 "
Long.....	60,000,000 "
Peach.....	230,000,000 "
Cross.....	110,000,000 "
Lake Waccabuc.....	200,000,000 "
" Fonneta.....	50,000,000 "
Haines' Pond.....	25,000,000 "
Total gallons.....	9,000,000,000 "

With this amount of stored water we have a secure and full supply of water for the use of the present aqueduct to its full capacity, and are only limited by the capacity of the aqueduct in supplying the city with water.

The surveys for connecting the waters of the Croton and Housatonic rivers have been completed, and the party is now making the necessary maps, plans, and estimates, so as to give in detail the cost of the three several routes surveyed and show the advantages of each, and the amount of water to be obtained from this source. A separate report will be made on this work as soon as the estimates, plans, etc., are completed.

AQUEDUCT.

The Croton river furnished a full supply to the aqueduct during the past quarter, except six days in October.

Water has run over the Croton dam the whole year—except in July, 18 days, August, 21 days, September, 4 days, and October, 11 days—total, 54 days.

The timber, 12 inches high, placed on Croton dam has been very useful in storing water during the light rains during the summer months, it was put on June 30th, and taken off October 3d of this year.

The appropriations having been nearly expended, no work has been done towards strengthening the aqueduct during the past quarter. The ditches, drains, and culverts have been kept in order, and on account of the heavy rains this quarter a large amount of this work has been done, and the fences and road crossings put in order.

On the Third Division, a new roadway has been made over the bank of the aqueduct, giving access to the keeper's house, and storage buildings from the country road; a guard railway has been placed on each side of this road; this relieves the Department from the expenses of keeping in order a private road heretofore used for aqueduct purposes through the lands of Mr. Saccia.

On the Fourth Division, 175 cubic yards of earth has been moved from the top to the sides of one embankment, and 500 lineal feet of strip fence built.

On the Seventh Division, repairs have been made to engine and boiler, and necessary work of cleaning around gate-houses and engine-room.

On the Eighth Division, the walks around the reservoirs have been regraveled, and gates, stopcocks, and screws kept in order.

The following special work has been done during the year 1878:

2,151 lineal feet of roof arch built.....
5,008 cubic yards of earth removed from arches.....
812 cubic yards of protection wall built.....
600 cubic yards of stone quarried.....
1,450 lineal feet new strip fence built.....
800 lineal feet new picket fence built.....

The work of strengthening the aqueduct by carrying up the spandrels, and building another layer of brickwork over the top arch, commenced in 1876, has been carried on but slowly, the amount of the appropriations available for this work being small.

The masonry of the aqueduct, over several embankments where it was badly cracked, has been repaired in this way, and has shown its good effect by stopping former leaks. There has been in all about 3,000 lineal feet of this work done, and there is still about 9,000 feet of the aqueduct that is badly fractured, and requires immediate attention; and 10,000 feet of the aqueduct built on embankments where it is necessary to be strengthened, in order to prevent future injury from the overstrain which the aqueduct is now undergoing from the excessive quantity of water that is necessary to run through it for the wants of the city.

HIGH SERVICE.

The engines at High Bridge have steadily supplied the high service reservoir and the Tower. The amount of water used by parties in the high service district having largely increased by the building of new houses, and the pressure in this district having fallen to near the pressure from low service, in October a minute examination of the stopcocks, connecting the high and low service—pipes was commenced, and several of those stopcocks found not properly shut, and two open, and from all information that could be obtained they were opened by parties unknown, and not by persons in the employ of the Department.

After properly closing these gates, it was found necessary to deprive several blocks of houses of high service water and give them low service, in order to give the houses on high ground a fair supply. The pressures now in the high service district are about two pounds less than they were one year ago.

The resolution that the Commissioner of Public Works be and he is hereby authorized, under chapter 477, Laws of 1875, and as amended by chapter 386, Laws of 1878, to erect on the lots situated between Ninety-seventh and Ninety-eighth streets, one hundred (100) feet west of Ninth avenue, and which lots were retained by the Commissioner of Public Works, under chapter 230, Laws of 1870, a suitable building, and to place therein two (2) pumping engines and fixtures, including a tank and stand-pipes; and to lay the necessary pipes to connect the same with the Croton-main leading from the Reservoir in Central Park, and with the distributing mains now laid, so as to supply water at higher elevations to buildings on that portion of Manhattan Island situated above the level of sixty (60) feet above mean high tide, at a cost not exceeding the sum of two hundred and twenty thousand dollars, was passed and approved by the Mayor on December 7, 1878, and bids for part of the work under this resolution will in a few days be asked from several contractors, and the balance will be put under contract as fast as the necessary plans and specifications can be made, and as the weather will permit.

SIX-FOOT PIPES.

In 1866-7, the Croton Aqueduct Board replaced the Aqueduct between Ninetieth and Eighty-fifth streets, with two lines of 6-foot pipes, laid on Ninetieth street and on Eighth avenue, each 2,600 feet long. When the water was turned on 18 of these pipes cracked lengthwise and were repaired. Since that time the grades of Eighth avenue and of Ninetieth street have been raised so that these pipes are now covered from 5 to 13 feet. Since the grading of these streets has been completed these pipes have continued breaking, and have been repaired by banding them with wrought and cast-iron bands.

August 14, 1878, the water was passed through both of these pipes for the first time in two years, and they were both kept in service till December 15, 1878, when the west line again gave out. Experience has proven that the pipes are too large to be made of cast-iron and stand the pressures and settlements, and that the foundations on which they were laid were poor and have sunk under the weight of the pipes and filling, and that it is almost impracticable to make them a perfect and safe conduit for the water of the aqueduct.

The cost of laying 4-foot pipes to replace these pipes would be.....	\$165,000 00
For building sunken aqueduct.....	65,000 00
For repairing those broken, and reinforce both lines by concrete covering.....	55,000 00
And to repair those broken by banding, and banding all those not now banded, and re-adjusting the foundations and blow-offs.....	23,000 00
And to temporarily repair those 18 now broken, as has been done heretofore.....	8,600 00

The contract for fencing and grading the lots around the gate houses at Ninety-second and

Ninety-third streets and Ninth avenue, and at One Hundred and Thirteenth street and Tenth avenue has been delayed by the parties putting up the iron railing for the contractor; all the masonry, filling and coping has been completed and the railing is now well advanced.

LAYING WATER PIPES.

All of the contracts for laying water pipes have been prosecuted during the past quarter. One contract for laying pipe was entered into October 30th, 1878, which included all resolutions approved by the Mayor up to that date. The season is so far advanced that it is not deemed advisable to put out any further contracts for laying pipes until the weather will permit in the spring.

Contracts for laying pipes in One Hundred and Thirtieth street between Sixth and Seventh avenues; Sixth avenue, between One Hundred and Twenty-ninth and One Hundred and Thirtieth streets; One Hundred and Thirty-fourth street, between Lincoln and Willis avenues; One Hundred and Twenty-sixth street, between Eighth and St. Nicholas avenues; St. Nicholas avenue, east side, between One Hundred and Twenty-sixth and One Hundred and Twenty-fifth streets; One Hundred and Forty-second street, between Third and Willis avenues; Southern Boulevard, between Berrian avenue and Tompkins street; Sixty-ninth street, between First and Second avenues; Front street, between Jackson and Corlears streets; South street, between Jackson and Corlears streets; Corlears street, between Water and South streets; One Hundred and Sixty-fifth street, between Boston avenue and Prospect Place; Boston avenue, between One Hundred and Sixty-fifth street and Third avenue; Avenue B, between Seventy-ninth and Eighty-sixth streets; Fifty-first street, between Fourth and Fifth avenues; Tenth avenue, between Ninety-sixth and One Hundred and Fourth streets; Ninety-sixth street, between Ninth and Tenth avenues; Ninety-sixth street, between First and Second avenues; Ninety-seventh street, between First and Second avenues; First avenue, between Ninety-sixth and Ninety-seventh streets; One Hundred and Seventh street, between Third and Fifth avenues; One Hundred and Sixty-eighth street, between Third and Washington avenues; Mott avenue, between One Hundred and Fiftieth and One Hundred and Fifty-second streets; One Hundred and Fiftieth street, between Mott and Walton avenues; Seventieth street, between Avenue A and First avenue; on Blackwell's and Ward's Island, and on First avenue, between Thirty-seventh and Forty-eighth streets, have been completed.

All contracts and orders for pipes, branches, special castings, etc., are completed. Three gangs of men have been at work placing hydrants as called for by the Fire Department, but if the cold weather continues, this work will have to stop, as it is not safe to shut off the water from houses, for fear of the service pipes freezing.

AMOUNT OF PIPES LAID DURING THE QUARTER.

48-inch pipe.....	2,216	lineal feet.
36 " ".....	4,880	" "
20 " ".....	91	" "
12 " ".....	9,879	" "
6 " ".....	15,789	" "
Total.....	32,855	lineal feet.

Large hydrants placed.....152
Small " ".....108

Exhibit A will show the amount of pipe now laid in the city for distribution of water, and for each year since 1860.

Exhibit B will show the location of the pipes and the hydrants placed in 1878. Since the cold weather commenced, December 24th, 1878, we have lost in our reservoirs one to two inches per day, equal to an average of six million gallons per day over and above the amount received each day through the aqueduct. This extreme use of water reduces the pressures in the pipes, and thus the height to which it will run in houses.

There are a large number of houses whose service pipes are not properly laid and protected in the streets and not protected in the houses, and in order to keep their pipes from freezing the tenants keep the water running night and day.

No control of the manner in which service pipes are laid or placed after leaving the tap in the main has ever been exercised by the Department having charge of the mains throughout the city, and the plumbers and builders have had it all their own way, thus leaving the city to furnish the means to keep their pipes from freezing, instead of taking proper care to protect same when first put in.

The only remedy for this at present in the power of this Department, is the placing of meters on all buildings except private dwellings, and a strict supervision of the rest of the buildings during the winter season, and prompt cutting off of the supply if water is found running to waste.

The inspection of the pipes, etc., along the wharves, piers and bulkheads, and of the parties using water along the river fronts and for building purposes, has been continued, and on account of the extension of the supply to boats further up town along the rivers, and the increased amount of building this year, the force has not been adequate to thoroughly check waste.

During the last quarter there has been issued—

3 permits for engines on wharves, amounting to.....	\$125 00
231 permits to shipping, amounting to.....	7,667 70
Water measured by meters.....	14,863 65
172 permits for building purposes.....	3,217 81
Total.....	\$25,874 16

And for the year 1878—

63 permits for engines.....	\$2,558 90
978 permits to shipping.....	30,524 57
917 permits for building purposes.....	17,571 80
And for water measured by meters.....	69,111 15
Total.....	\$119,756 42

14 meters have been placed this year. 79 meters now placed along the water front.

The examination of buildings throughout the city has been continued, and the following statement shows the large number of leaking fixtures found during the year, and shows the necessity of steadily continuing this supervision and enforcing the necessary repairs.

REPORT OF EXAMINATIONS

Made by Inspectors relative to Leaky Fixtures and Waste of Water, from October 1 to December 31, 1878.

DISTRICT.	Whole number of Buildings Inspected.	Number in which Plumbing was Defective or Water Wasted.	FAUCETS.		WATER CLOSETS OR URINALS.		HYDRANTS IN YARDS.		PIPES REPT.	BALL-COCKS WANTED.
			Leak.	Waste.	Leak.	Waste.	Leak.	Waste.		
First.....	1,229	118	100	23	1	2	..	..	..	..
Second.....	559	21	1	..	..	7	3	7	5	..
Sixth.....	1,265	289	231	..	28	1	30	..	..	..
Eighth.....	1,260	290	141	..	11	..	15	..	..	..
Ninth.....	1,572	200	203	..	1	3	8	..	1	..
Tenth.....	1,227	305	157	80	27	28	23	31	1	..
Eleventh.....	1,382	153	298	..	20	2	..	..	1	..
Thirteenth.....	1,334	323	377	..	2	46	9	19	..	..
Fifteenth.....	1,283	137	132	..	6	1	19	1	..	..
Seventeenth.....	2,167	325	334	1	7	1	7	2	3	..
Nineteenth.....	937	70	81	1	7	1	8	..	8	6
Twentieth.....	2,126	716	1,183	20	64	69	27	8	11	1
Totals.....	16,341	2,948	3,238	225	174	161	291	68	30	9

SUMMARY

For the Year 1878.

	Whole number of Buildings Inspected.	Number in which Plumbing was Defective or Water Wasted.	FAUCETS.		WATER CLOSETS OR URINALS.		HYDRANTS IN YARDS.		PIPES REPT.	BALL-COCKS WANTED.
			Leak.	Waste.	Leak.	Waste.	Leak.	Waste.		
March 31.....	12,042	2,003	2,048	32	282	28	81	30	22	11
June 30.....	14,179	2,559	2,017	44	294	100	142	10	24	14
September 30.....	12,824	2,062	1,533	188	35	28	37	28	1	5
December 31.....	16,341	2,948	3,238	225	174	161	291	68	30	9
Totals.....	55,386	9,572	8,836	389	785	317	551	136	77	39

Having a sufficient supply of water at Croton Dam for the present aqueduct, and a large surplus running over most of the year, it becomes necessary to take into consideration the necessity of a larger supply of water being brought into the city.

Population, Amount of Water used, and Area of Pipes in the City of New York since the introduction of Croton Water.

DATE.	POPULATION.	Used per Day, Average Gallons.	Area Pipes from Reservoirs and Aqueduct, Sq. Feet.	REMARKS.
1835.....	268,089	.....	.....	Area Aqueduct, 53.34 square feet. Surveys and examinations under a Commission to introduce water into the city.
1840.....	312,710	.....	.....	Water introduced into the city—two 36-inch pipes.
1842.....	.....	12,000,000	14.14	30-inch main laid from reservoirs through Third avenue. The Croton Aqueduct Department reports, "that the last drop of water which the works in their present state can supply is now delivered in the city."
1845.....	371,223	40,000,000	19.05	48-inch main laid across Manhattan Valley and proceedings to take land for new reservoirs.
1850.....	515,547	.....	.....	30-inch main laid from Reservoir through Eighth avenue.
1854.....	.....	.....	.....	90-inch main laid across High Bridge.
1855.....	629,810	.....	23.96	60-inch main laid across Manhattan Valley, and 20-inch main connected with this to supply Harlem. Croton Aqueduct Department Report, "that 338,832,128 gallons per day is obtainable from the Croton Basin." New Reservoir in Central Park completed.
1860.....	805,658	.....	.....	Croton Aqueduct Department Report, "Unsafe to increase flow of water in Aqueduct."
1861.....	.....	.....	.....	48-inch main laid from New Reservoir, through Fourth avenue.
1862.....	.....	.....	.....	Dry season.
1863.....	.....	54,044,174	.....	Dry season.
1865.....	726,386	.....	38.71	20-inch main from Reservoir at High Bridge.
1866.....	.....	66,000,000	.....	36-inch main laid from Forty-second street to Chambers street.
1867.....	.....	72,000,000	.....	48-inch main laid from Reservoir, through Eighth and Tenth avenues.
1868.....	.....	78,000,000	.....	36-inch mains from N. Gate-house, New Reservoir, connected with 20 inch mains on Fifth and Eighth avenues.
1869.....	.....	75,000,000	.....	Very dry season.
1870.....	947,292	77,000,000	40.99	48-inch main laid from Reservoirs through First avenue, and 20-inch main connected with Aqueduct at Fordham.
1871.....	.....	79,000,000	.....	Very dry season.
1872.....	.....	51,000,000	.....	.....
1873.....	.....	88,000,000	.....	.....
1874.....	.....	92,000,000	53.56	.....
1875.....	1,041,886	95,000,000	59.19	.....
1876.....	.....	90,000,000	.....	.....
1877.....	.....	89,500,000	.....	.....
1878.....	.....	93,400,000	73.94	.....

By the above statement it will be seen that the average yearly increase of the consumption of water in the city of New York has been 2 1/4 million gallons per day since the introduction of Croton water.

Since 1873 the city has used all the water the aqueduct could with safety carry, and since 1874 we have not been able to keep full the reservoirs in Central Park, and have, in fact, supplied the increased demands for new buildings, etc., by reducing the pressures in the street mains.

It being necessary to keep the reservoirs nearly full to supply the city in case of an accident to the aqueduct, we have curtailed the supply by shutting down the outlet gates at the reservoirs, so that the daily consumption shall not exceed on an average the daily supply through the aqueduct.

We have an area of mains leading from the reservoirs and aqueduct for the distribution of water of 73 1/8 square feet, and are only using an area of 44 square feet.

We are furnishing not only the inhabitants of the city, as obtained by census, but a floating population of at least 50,000, and during the day 200,000, more who come to this city daily on business from the neighboring cities and towns.

The annexed district in Westchester county has been temporarily supplied by a connection across Harlem river and with the aqueduct at Fordham, but the large amount of territory in this district above the level of the water in the aqueduct necessitates a supply of water at a higher elevation.

The Bronx river has been for a long time looked upon as one of the best sources of supply for this city, but on account of the small daily amount to be obtained was thrown out in 1837, and the Croton river used.

With this new district bordering on this river annexed to the city, the Bronx becomes the natural source for obtaining the supply for the same, and the surveys and estimates made during 1877-8, shows that 10,000,000 gallons per day can be obtained from this source, and at an elevation of 60 feet above the height of the water in the present aqueduct, and furnished to this district at an estimated cost of 1,250,000 dollars.

That portion of the city of New York on Manhattan Island, with its 1,000,000 of inhabitants during the night, and 1,250,000 of inhabitants during the day, and rapidly increasing by the building of new houses, manufactories, etc., requires at present an increased supply of 40 millions of gallons of water per day, in order to supply water at the same elevation as supplied in 1863; since that date no new work has been done to increase the supply of water to the reservoirs in this city, and to maintain the height of the water in same.

The aqueduct is carrying more water than ever intended by its builder; as far as known, the aqueduct was built to have 5 1/2 to 5 3/4 feet of water running through same; this agrees with the calculations made at the time of its completion, that the aqueduct would furnish 60 million imperial gallons, equal to 72 million New York gallons, per day.

There is now running in the aqueduct, and has been since 1873, 7 1/8 feet of water, and in places where the aqueduct has settled it is now running full.

YEAR.	Rain-fall.	Average Amount per Day Running through Aqueduct.	Average Amount per Day Running from Croton Dam.	Equal to Inches of Rain over whole Basin.	Percentage of Rain-fall.	No. of Days Water did not run over Dam.
	Inches.	Gallons.	Gallons.		Per cent.	
1866.....	51.77	66,000,000	440,705,558	27.	51	50
1867.....	50.77	72,000,000	541,318,397	33.5	65	..
1868.....	50.33	78,000,000	600,524,194	37.	74	8
1869.....	48.36	75,000,000	456,575,841	28.	58	80
1870.....	44.63	77,000,000	347,935,318	21.	47	102
1871.....	48.94	79,000,000	357,195,341	22.	45	37
1872.....	40.74	81,000,000	307,208,408	20.	49	31
1873.....	43.87	88,000,000	444,236,877	27.5	67	116
1874.....	42.37	92,000,000	427,638,306	26.5	63	83
1875.....	43.66	95,000,000	425,021,738	26.	59	71
1876.....	40.68	90,000,000	367,872,936	23.	50	175
1877.....	46.03	89,600,000	346,503,178	21.	45	136
1878.....	54.14	93,400,000	462,854,308	28.3	52	54

The Croton river (as will be seen by the above table) has the capacity to furnish over three times the quantity now used by the city, and the necessary preliminary surveys and estimates for a new Aqueduct from the Croton river to this city were made in 1875-6, and this year these surveys have been extended to the Housatonic river, the nearest available river from which a large supply of water can be obtained, thus connecting the Croton and Housatonic rivers, if necessary.

The necessity of a new Aqueduct has been forcibly impressed on my mind by the former Chief Engineers. E. H. Macy stated in his reports, etc., that as soon as the necessary storage reservoirs were completed and large mains laid in the city, a new and larger aqueduct should be immediately commenced, equal in size to the remaining capacity of the Croton basin.

My own experience as Engineer in charge of the distribution of water throughout the city for six years has fully demonstrated the impracticability of so distributing the same quantity of water over larger districts and to more consumers that those on high and low elevations should be equally supplied.

As the use of water increases and decreases as the pressures in the mains increase and decrease, shall the city of New York stand still and see the supply of water on which it depends for health and comfort gradually decrease per capita until it has to be measured out to each and all of its inhabitants on a level with the streets?

Boston and Chicago have, during this year, completed tunnels and aqueducts and other works, more than doubling their former supply of water, and Baltimore is now building the necessary works to largely increase their supply.

Very respectfully,
G. W. BIRDSALL,
First Assistant Engineer Croton Aqueduct, in Charge of Bureau.

EXHIBIT "A."

Pipes of all sizes Laid for the Distribution of Croton Water to December 31, 1878.

	48"	36"	30"	24"	20"	16"	12"	10"	6"	4"	TOTAL FEET.	MILES
Previous to Jan. 1, 1860.....	49,477	44,862	9,742	41,324	14,978	282,782	5,875	937,463	9,472	1,395,975	264.38	
Laid in 1860.....						6,602		26,331		32,933	6.24	
" 1861.....						5,205		34,567		39,772	7.53	
" 1862.....	27,900					3,610		21,713		53,223	10.08	
" 1863.....						7,560		20,986		28,546	5.41	
" 1864.....						4,880		14,999		21,950	4.16	
" 1865.....						6,520		12,938		19,458	3.68	
" 1866.....						3,670		11,100		21,820	4.13	
" 1867.....						1,668		17,660		25,601	4.85	
" 1868.....						2,531		21,453		32,252	6.11	
" 1869.....						11,300		18,171		39,152	7.41	
" 1870.....						10,770		35,282	1,183	65,735	12.45	
" 1871.....	2,220	3,050				3,557		19,404		33,481	4.432	12.52
" 1872.....	82	16,402		174	3,098	72		25,372		52,750	107,381	20.34
" 1873.....	17,332	481		1,626	38,132			34,129		57,855	3,477	153,032
" 1874.....	9,513	109	2,157		8,059			18,055	754	27,430	3,344	69,447
" 1875 & '76.....	4,032		235		22,108			32,771		45,206		102,352
" 1877.....	9,497				14,998			20,663		34,142		79,210
" 1878.....	6,916	5,880			16,181			35,699		58,405		123,081
Total.....	75,402	75,399	47,274	11,542	180,773	17,130	549,647	6,629	1,481,938	31,339	2,477,323	469.08
Less amount taken up.....	10,355		5,854				4,100		5,400	3,100	28,809	5.45
Amount now laid.....	65,047	75,399	41,420	11,542	180,773	17,130	545,547	6,629	1,476,538	28,239	2,448,514	463.63

Number of Hydrants in the City.

No. 1, 2, and 3 hydrants.....	3-inch barrel.....	3,350
Victor hydrants.....	5 ".....	102
B ".....	5 ".....	811
A ".....	3 1/2 ".....	761
Total.....		5,024

EXHIBIT "B."

LOCATION OF PIPES LAID JANUARY 1 TO DECEMBER 31, 187—

Forty-eight-inch Pipe.

First avenue, between Thirty-ninth and Forty-fifth streets.
First avenue, between Twenty-fourth and Thirty-seventh streets.
First avenue, between Fourteenth and Twenty-first streets.

Thirty-six-inch Pipe.

First avenue, between Houston and Fourteenth streets.
Houston street, between Allen and Orchard streets.
Orchard street, between Houston and Grand streets.

Twenty-inch Pipe.

Third avenue, between Tremont and Kingsbridge road.
Kingsbridge road, between Third avenue and Highbridge road.
Highbridge road, between Kingsbridge road and Croton avenue.
Croton avenue, between Highbridge road and Croton Aqueduct.
Seventh avenue, between Eleventh and Fifty-seventh streets.

Twelve-inch Pipe.

Pelham avenue, between Kingsbridge road and Hoffman street.
Tenth avenue, between Gansevoort and Forty-second streets.
Eleventh avenue, between Fourteenth and Fiftieth streets.
Avenue B, between Seventy-ninth and Eighty-sixth streets.
First avenue, between Ninety-sixth and Ninety-seventh streets.
Boulevard (West Side), between Manhattan and One Hundred and Thirty-eighth streets.
Sixth avenue (West side), between One Hundred and Twenty-ninth and One Hundred and Thirtieth streets.
St. Nicholas avenue, between One Hundred and Twenty-fifth and One Hundred and Twenty-sixth streets.
Boston avenue, between Third avenue and One Hundred and Sixty-fifth street.
Chrystie street, between Houston and Division streets.
Elizabeth street, between Bleeker and Baxter streets.
Madison avenue, between One Hundred and Tenth and One Hundred and Thirteenth streets.
Boston avenue, between One Hundred and Sixty-eighth and One Hundred and Sixty-ninth streets.

Six-inch Pipe.

Forty-fourth street, between First and Third avenues.
Fifty-eighth street, between Avenue A and East river.
Avenue A, east side, between Fifty-seventh and Fifty-eighth streets.
Forty-ninth street, between First avenue and East river.
One Hundred and Fifth street, between Ninth and Tenth avenues.
Ninth avenue, between One Hundred and Fourth and One Hundred and Sixth streets.
Eighty-eighth street, between First and Third avenues.
Eightieth street, between First avenue and Avenue A.
Avenue A, west side, between Eightieth and Eighty-third streets.
Berrian avenue, between Kingsbridge road and Southern Boulevard.
Nineteenth street, between Tenth and Eleventh avenues.
Seventeenth street, between Tenth and Eleventh avenues.
Sixteenth street, between Tenth and Eleventh avenues.
Eighty-second street, between Avenues A and B.
Fifty-first street, between Fourth and Fifth avenues.
Tenth avenue, between Ninety-sixth and One Hundred and Fourth streets.
Ninety-sixth street, between Ninth and Tenth avenues.
Ninety-sixth street, between First and Second avenues.
Ninety-seventh street, between First and Second avenues.
One Hundred and Seventh street, between Third and Fifth avenues.

One Hundred and Sixty-eighth street, between Third and Washington avenues.
Eighty-first street, between Fifth and Madison avenues.
Mott avenue, between One Hundred and Fiftieth street and railroad.
One Hundred and Fiftieth street, between Mott and Walton avenues.
On Blackwell's Island.
On Ward's Island.
Seventieth street, between First avenue and Avenue A.
One Hundred and Thirtieth street, between Sixth and Seventh avenues.
One Hundred and Thirty-fourth street, between Lincoln and Willis avenues.
One Hundred and Twenty-sixth street, between Eighth and St. Nicholas avenues.
One Hundred and Forty-second street, between Third and Willis avenues.
Southern Boulevard, between Berrian avenue and Tompkins street.
Sixty-ninth street, between First and Second avenues.
Front street, between Jackson and Corlears streets.
South street, between Jackson and Corlears streets.
Corlears street, between Water and South streets.
Boston avenue, between Third avenue and One Hundred and Sixty-fifth street.
One Hundred and Sixty-fifth street, between Boston avenue and Prospect place.
Ninety-third street, between Eighth and Ninth avenues.
Ninth avenue, between Ninety-second and Ninety-third streets.
One Hundred and Fourth street, between Fourth and Fifth avenues.
One Hundred and Fifteenth street, between Fourth and Madison avenues.
Lexington avenue, between Ninety-fourth and Ninety-fifth streets.
Ninety-fifth street, between Third and Lexington avenues.
Hoffman street, between Pelham avenue and Kingsbridge road.
Spring place, between Third and Fulton avenues.
Fulton avenue, between Spring place and One Hundred and Seventieth street.
One Hundred and Seventieth street, between Third and Fulton avenues.
One Hundred and Sixty-ninth street, between Third and Boston avenues.
Sixty-eighth street, between Fifth and Madison avenues.

Rain-fall at Storage Reservoir, Boyd's Corners, Putnam Co., N. Y., including Melted Snow.

MONTH.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.
January.....	3.33	2.11	2.90	3.79	4.51	3.80	1.44	5.66	6.95	2.74	1.42	2.68	4.49
February.....	3.60	3.00	1.38	3.64	6.40	3.81	1.22	3.09	2.78	3.47	4.91	0.80	3.65
March.....	3.33	1.49	2.55	5.48	3.80	4.27	2.59	3.08	1.57	4.99	6.33	7.66	3.10
April.....	3.79	3.74	3.87	2.11	5.45	3.01	3.04	3.77	6.31	3.04	4.43	2.35	2.85
May.....	5.12	6.86	8.79	4.52	2.30	3.45	3.69	2.91	1.99	1.08	1.99	0.85	4.97
June.....	4.45	5.28	4.53	3.59	2.66	5.73	4.00	0.71	3.57	3.02	2.52	4.05	4.65
July.....	4.01	5.25	2.13	2.26	3.43	5.07	4.34	2.21	5.98	3.16	3.42	4.65	4.28
August.....	6.36	10.04	6.08	1.62	5.10	5.24	5.09	5.73	10.33	1.20	2.54	2.54	2.66
September.....	4.92	3.62	9.33	3.20	2.85	1.44	3.69	3.73	3.56	2.11	5.21	1.49	6.61
October.....	5.09	3.66	0.87	9.46	4.73	6.18	2.15	5.13	2.40	3.61	1.50	8.38	3.78
November.....	3.80	1.10	4.65	2.43	2.51	4.35	4.91	3.72	2.72	4.61	3.40	8.16	4.36
December.....	3.27	2.62	2.35	5.96	1.49	2.59	3.68	4.13	1.78	1.56	2.35	1.52	8.74
Totals.....	51.77	50.77	50.33	48.36	44.63	48.94	40.74	43.87	42.37	43.66	40.68	46.03	54.14

To GEORGE W. BIRDSALL, First Assistant Engineer, in charge of Croton Aqueduct:

DEAR SIR—Since my last report of October 3, 1878, the surveys to determine the practicability and cost of diverting a portion of the water of the Housatonic river to the Croton basin, upon which I have been engaged, have been finished, and the plans and estimates have been so far advanced as to enable me to state with definiteness the leading facts that were developed by the survey.

A study of the topography of the country between the Housatonic and the Croton indicated the possibility of diverting the waters of the former stream from three points, viz.: at or near Falls Village and West Cornwall, by gravity system alone, and Bull's Bridge by pumping to an elevation sufficient to reach the headwaters of the Croton at Pawling.

To determine the facts with reference to these routes, connecting these points with the Croton basin was the object of the survey.

These lines may be briefly described as follows: The Falls Village route begins on the Housatonic, a short distance north of Falls Village, and immediately south of the dam of the Housatonic Railroad Company.

We began our survey for the canal at an elevation of 622 feet above tide (which had been previously established by a transfer of levels from the Croton river). From the central point the line follows down the valley of the Housatonic river to the valley of Salmon Brook, a tributary of the Housatonic river, thence westerly up the Valley of Salmon Brook to Lime Rock, whence, crossing the stream, it proceeds still westerly across the dividing ridge to the headwaters of the Sharon Brook or Weebutuck. In passing this ridge a tunnel will be required. After a thorough examination, the shortest line for this tunnel was found to be 2.5 miles long. From the western end of this tunnel, natural watercourses can be used for more than eight miles by expending a comparatively small sum for straightening and widening. This route is then, by the outlet of Long Pond, so-called, to Mudge Pond, through Mudge Pond and by the outlet of Mudge Pond, called Sharon Brook or the Weebutuck, to a point near Leedsville, crossing from the State of Connecticut to the State of New York about half way between Mudge Pond and Leedsville.

Here the elevation is 460 feet above tide, and it becomes necessary to leave this stream and construct an artificial channel, in order to overcome the summit at Pawling. The route from here, therefore, follows the hillsides with a descending grade of one foot per mile. It runs along the westerly side of the valley of the Weebutuck to a point near South America, where it was necessary to swing around to the westward, and cross Wassaic creek—which here joins the Weebutuck, forming the Ten-mile river—and also the Harlem Railroad.

The height of our grade above the creek was 38 feet, and the Harlem Railroad, 15 feet. From this point the line runs down the valley of the Ten-mile and up the valley of the Swamp river to Pawling, where it joins the headwaters of the Croton. There are no points of special interest to be mentioned in connection with this portion of the route of the proposed canal, except that in places the ground is extremely rugged, requiring many large culverts in crossing ravines and much slope wall on steep hillsides. The soil was generally sand and gravel, with very little clay.

It is not of a character to retain water, and it seems to me that it would be necessary to allow for puddling the bottom and sides of the canal the whole way, except in rock cutting.

The distances on this route are as follows—

Falls Village to eastern end of tunnel.....	4.87 miles.
Tunnel.....	2.50 "
West end of tunnel to State line.....	4.94 "
State line to Leedsville.....	3.50 "
Leedsville to Pawling.....	25.32 "

Total length of canal..... 41.13 miles.

By natural watercourses.....	8.44 miles.
By artificial channel.....	32.69 "

The other routes, viz.: to Bull's Bridge and West Cornwall, are upon the same ground as far as Bull's Bridge, where they reach the valley of Housatonic at a distance of about eleven miles from Pawling, whence the Cornwall route bears northward along the western slope of the valley of the Housatonic. These routes may therefore be described as one. Commencing at station 19 of the Falls Village line, near the village of Pawling, it crosses to the east side of the Swamp river, and continuing for a short distance along this valley, it bears still more to the eastward, and crosses the Harlem Railroad seven feet below the track. Thence in a northerly direction, being at times quite near the railroad, to a point near South Dover, whence, turning to the east again, it crosses the dividing ridge between the valley of the Swamp and Ten-mile rivers, by a deep cut reaching the latter stream at a distance of 8.1 miles from Pawling.

Thence crossing the Ten-mile river a distance of 1,500 feet from grade to grade, and 126.5 feet above the stream, it follows down the valley of the Ten-mile to Bull's Bridge, crossing in that distance two wide and deep ravines, the first being 850 feet between grade points, and 37.5 feet deep at its lowest point, and the second with a span of 700 feet from grade to grade, and 98 feet deep at its deepest point. In reaching Bull's Bridge, two alternate lines were examined. The first was run on the south side of the Ten-mile river from South Dover to a point opposite Bull's Bridge, where it connects with a canal leading water from the Housatonic at the head of Bull's Falls to pumps to be located there, whence the water could be raised to the elevation of this line and flow thence by gravity to Pawling.

This line is 14.77 miles long, being about three miles longer than the direct line to Bull's Bridge, but it avoids the expensive crossing of the Ten-mile river and the two ravines spoken of, the cross-

ing of the canal from the head of the Falls to the pumping station on the south side of the Ten-mile being only 68 feet above the water, against 126 feet at the upper crossing.

The second alternate line was run from a point on the north side of the Ten-mile river, northward to and around Ellis lake, so called, to avoid crossing the two ravines heretofore spoken of. This line is alternate to the direct route to Bull's Bridge as well as the Cornwall route.

From Bull's Bridge the Cornwall route bears northward along the Housatonic, being at this point about 110 feet above the water. The mountain upon which the line is located is extremely steep and rocky, involving great expense in building the canal from Bull's Bridge to Kent.

Near Kent the line crosses the valley of the Macedonia creek, a wide and deep ravine, 1,700 feet from grade to grade and 99 feet deep at its lowest point. The nature of the ground from here to the end of this line near West Cornwall improves as we approach the bottom of the valley, and is without any special engineering difficulties.

In the main the soil is not calculated of itself to retain water, and doubtless a large amount of puddling will be required to make the canal water-tight.

The length of this line by the direct route to Bull's Bridge, and thence to the proposed dam at West Cornwall, is 26.8 miles, and the elevation above tide at that point is 468 feet. The proposed dam at this point for turning water into the canal is ten feet above average water level.

The line to Bull's Bridge has been heretofore described in connection with the Cornwall line, as far as the high ground above Bull's Bridge.

It is only necessary to speak of the means of raising the water to this height, whence it may flow by gravity to Pawling.

To do this, I propose a dam at the head of Bull's Falls, 8 feet high, thence the water to be led by a canal to pumping works at the foot of the hill, whence it can be driven through a force-main to a small basin on the heights, 109 feet above the level of the water in the dam then connecting with the canal.

By the alternate route spoken of, the canal from the head of the Falls would run southward to and across the Ten-mile river, and the water then be elevated 112 feet to the level of the canal.

While these lines were run upon the assumption that the Housatonic river would at all times afford an abundant supply of water, certain measurements and gaugings of the stream were made throughout the season to ascertain the facts in the case.

The watershed, calculated from all the data at my command, is as follows:

Above Falls Village.....631 square miles.
" West Cornwall.....709 "
" Bull's Bridge.....790 "

The rainfall kept at Kent from May 22 to November 1st, a period of a little more than five months, was 17.96 inches.

The average daily flow of the Housatonic for the season was 300,000,000 gallons, the maximum was 470,000,000 gallons, and the minimum 170,000,000 gallons.

In comparing the gravity routes we find that the Falls Village route is the longest by 14.3 miles, but of this 8.44 is the channel of the Sharon brook, which, with small expense, could be made capable of carrying the additional volume of water, viz., 100,000,000 gallons daily, leaving a mileage balance against this route of 5.86 miles. With the exception of the tunnel through the mountain at Sharon, which is quite a formidable undertaking, there are no engineering difficulties to be encountered.

The Cornwall route is the shorter, but has much more rock excavation and masonry in proportion to its length, and the crossing of the Ten-mile river and three deep ravines are serious obstacles to overcome, which would cost nearly as much as the Sharon tunnel.

The Bull's Bridge (gravity and pumping combined), which is eleven miles long by the direct line and fourteen via Duell hollow, would be the cheapest as well as the simplest of all the plans for diverting the waters of the Housatonic, were it not for the great cost of machinery, pumps, etc., necessary to raise this vast volume of water to the required height as well as the cost of maintaining and operating the same, which must not be overlooked in any estimate of ultimate cost. It has been supposed that water-power could be used for pumping at this place at much less expense than steam-power.

The results of our gauging seem to decide this point in the negative, since with the head of 45 feet which could be obtained, and with the most improved wheels now in use, to raise 100,000,000 gallons 106 feet daily would require 350,000,000 gallons, it is plain that only when the river is running near its maximum, would there be sufficient water to yield 100,000,000 gallons and raise it to the required height.

Using steam-power, however, this difficulty, lack of water, does not occur, therefore the following estimate of cost has been made on that basis: The cost of water-power pumping, for machinery, etc., provided it were possible, would be about \$587,000; and the expense \$400 per day, while by steam-power the same items are \$787,500 and \$1,000 respectively.

I am not prepared to state, in all their details, at this time, the cost of these various routes, but I may state as a close approximation to the truth, that the canal

By the Falls Village route will cost.....\$2,050,000 00
" Cornwall route.....1,920,000 00
" Bull's Bridge route.....2,013,000 00

By taking the alternate route, via Duell Hollow, for the combined gravity and pumping project, a saving of probably \$100,000 could be effected over the direct route.

I hope to be shortly able to present to you a detailed estimate of the cost of building a canal by these different routes, as well as a more extended report upon this plan for the increase of the water supply of New York. I submit herewith a profile of the several lines of our survey, also a map of the territory lying between the Housatonic and Hudson rivers, embracing the section of country covered by our examinations, to which I invite your attention.

All of which is respectfully submitted.

Dated NEW YORK, January 18, 1879.

HORACE LOOMIS, Assistant Engineer.

DEPARTMENT OF PUBLIC WORKS,
WATER PURVEYOR'S OFFICE, NO. 4 CITY HALL,
NEW YORK, January 6, 1879.

Hon. ALLAN CAMPBELL, Commissioner of Public Works:

SIR—I have the honor to submit herewith the following report of the transactions of this Bureau for the months of October, November, and December, 1878; also a brief review of the business of the Bureau for the year 1878.

REPAIRING CROTON PIPES, ETC.

The usual work by the three companies employed has been done during the quarter in repairing and renewing pipes, stopcocks, and fire hydrants.

PLACING LARGE HYDRANTS.

A small force has been engaged in placing large fire-hydrants, principally in the down-town part of the city, and in repairing our Croton water mains.

REPAVING, UNDER CHAPTER 476, LAWS OF 1875.

All contracts under this appropriation have been completed except two, one of which was suspended by reason of the frost, and work on the other has not yet been commenced. A marked improvement in many of the principal thoroughfares is already apparent in the work done under this head, and the business portion of the community has been greatly benefited by the increased facilities for traffic afforded by the new pavement.

REPAIRS TO PAVEMENTS.

Work in repairing street pavements has been progressed as thoroughly during the quarter as the force at my command would allow, and much good work has been done. It is impossible to meet all the complaints made, but all dangerous places in the pavements have received prompt repair, and the streets are now in very good condition.

BOULEVARD, ROADS, AND AVENUES, MAINTENANCE OF.

For a report of the transactions of this department of my Bureau, I respectfully refer you to the statement hereto appended, marked "A," of F. H. Hamlin, Engineer in Charge.

Number of men employed under charge of Bureau of Water Purveyor during the months of October, November, and December, 1878, paid from different appropriations, with amounts of pay-rolls.

MONTHS, 1878.	REPAIRING AND RENEWAL OF PIPES, STOPCOCKS, ETC.	CROTON WATER MAIN FUND NO. 2.	REPAIRS AND RENEWAL OF PAVEMENTS.
October.....	59 \$3,758 06	130 \$7,066 70	331 \$14,474 23
November.....	62 3,541 34	127 5,865 85	338 12,612 84
December.....	61 3,560 81	122 4,980 94	95 3,047 83
Totals.....	182 \$10,860 21	379 \$17,913 49	764 \$30,134 90

RECAPITULATION.

Amount of Pay-rolls for October, November, and December, 1878.

Repairing and Renewal of Pipes, Stopcocks, etc.....	\$10,860 21
Croton Water-main Fund No. 2.....	17,913 49
Repairs and Renewal of Pavements.....	30,134 90
Total.....	\$58,908 60

Paving Works under Contract Completed.

NUMBER OF SQUARE YARDS.	LOCATION.
14,828	Twenty-third street, between Third avenue and the East river, and Forty-second street, between Third and Fourth avenues.
9,942	Eleventh avenue, from Fifty-ninth to Sixty-fifth street.
42,374-14	Seventh avenue, from Fourteenth to Forty-third street, except the horse-paths of the Seventh Avenue R. R.
9,323	Waverley place, from Broadway to Christopher street.
4,292	Sixty-fifth street, from First to Third avenue.
1,408-43	Seventy-fifth street, from Fourth to Madison avenue.
3,379	Eighty-fourth street, from the Boulevard to the Riverside drive.
1,382	One Hundred and Eighth street, between Fourth and Madison avenues.
2,095	One Hundred and Twentieth street, between Second and Third avenues.
89,023-57	Total number of square yards.

Number of vault permits issued during October, November, and December, 1878, was thirty-six (36).

Receipts for vault permits, same period, was (\$5,623 13), five thousand six hundred and twenty-three dollars and thirteen cents.

Respectfully,

DANIEL O'REILLY, Water Purveyor.

BRIEF STATEMENT OF THE BUSINESS OF THE BUREAU OF WATER PURVEYOR FOR THE YEAR 1878.

REPAIRING AND RENEWAL OF PIPES, STOPCOCKS, ETC.

During the year three companies have been constantly engaged in the repairing and renewal of pipes, stopcocks, and fire hydrants. The many complaints made have received prompt attention, and all necessary repairs have been made. I am pleased to state that no serious breaks along the entire line of water pipes in this city have occurred during the year.

REPAIRING SIX-FOOT PIPES.

From March 15 to August 15, a small force was employed in repairing six-foot pipes, which are the continuation of the Aqueduct in Ninetieth street, between Eighth and Ninth avenues. The insufficiency of the appropriation made it impossible to continue this necessary work after August 15. It will have to be resumed as early in the present year, 1879, as the weather will permit.

REPAIRS TO STREET PAVEMENTS.

The work of repairing street pavements was begun about the middle of April, and continued with as large a force as the appropriation would allow until December 1. Much general work has been done during the year in different parts of the city in the entire relaying or repaving of whole or parts of blocks. Some of this work has been done by special contract, but mostly by our own forces. The repairs to the old and decayed wooden and concrete pavements have required a great deal of labor and material, and as they are constantly getting out of order much of the money of the appropriation has been necessarily expended upon them. The streets are now in better condition than they have been at the close of the season in many years.

REPAVING, UNDER CHAPTER 476, LAWS OF 1875.

Fourteen contracts were made under this appropriation during the year, twelve for stone-block pavements, and two for macadam pavements. Of the former all were completed except two, one (Second avenue, from Twenty-third to Forty-second street) was suspended December 21, by reason of the cold weather preventing further work, and on the other (Vesey street, from Broadway to West street), work has not yet been commenced. For a statement in relation to the macadam contracts, see the report of Mr. F. H. Hamlin, Engineer in charge. Much excellent pavement has been laid during the year, and at prices lower than in many years before. Could a liberal appropriation be made for a few years for this work, the streets of the city would be placed in a condition requiring the expenditure for repairs of much less than is now required. The health and comfort of the city demand that all the wooden pavement at present remaining should be replaced with stone blocks as early as possible.

WELLS AND PUMPS—REPAIRING AND CLEANING.

The wells and pumps of the city have received the necessary repairs when complaints have been made. The increase in the number of public drinking hydrants in the uptown part of the city has made it advisable to abandon some of the pumps and fill in the wells connected therewith.

VAULT PERMITS.

During the year one hundred and eighty permits were issued. Total receipts for the year for vault permits was thirty-five thousand four hundred and four dollars and sixty-seven cents (\$35,404.67).

Respectfully,

DANIEL O'REILLY, Water Purveyor.

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF WATER PURVEYOR,
NEW YORK, January 2, 1879.

D. O'REILLY, Esq., Water Purveyor:

SIR—Respectfully I present the following report detailing the work done under the immediate direction of the Engineer-in-Charge, for the Bureau of Water Purveyor, during the three months ending December 31, 1878, also a resume of what has been done in this respect during the past year.

The appropriation for the maintenance, during 1878, of all the macadamized and gravel boulevards, streets, and avenues was.....\$40,000 00
Added by transfer.....1,000 00

Amount expended to April 1, 1877.....	\$8,277 66
Amount expended from March 31 to July 1.....	9,946 84
Amount expended from June 30 to October 1.....	11,959 06
Amount expended from September 30 to January 1, 1879.....	8,944 23
Estimated outstanding liabilities, including labor pay-roll, from December 21, 1878 to January 1, 1879.....	1,870 00
	40,997 79

Estimated balance.....\$2 21

Expenses during the last three months are specified as follows:

Sprinkling.....	\$1,606 83
Cleaning roads and gutters.....	1,817 88
Spreading road covering.....	349 74
Repairing roads.....	250 40
Cleaning basins.....	132 75
Material.....	1,347 58
General expenses, including supervision, clerk hire, foremen's time, watchman, repairing tools, etc., maintaining trees, and other necessary expenses.....	3,439 05
Total.....	\$8,944 23

The labor was thus apportioned with reference to various boulevards:

Avenue St. Nicholas, One Hundred and Tenth to One Hundred and Twenty-fifth street.....	\$161 22
Avenue St. Nicholas, One Hundred and Twenty-fifth to One Hundred and Fifty-fifth street.....	377 99
Boulevard south of Manhattan street.....	831 24
Boulevard north of Manhattan street.....	305 69
Sixth avenue, One Hundred and Tenth street, north.....	512 25
Seventh avenue, One Hundred and Tenth street, north.....	503 06
Fifth avenue, One Hundred and Twenty-fourth to One Hundred and Thirtieth street..	53 81
Fifth avenue, Fifty-ninth to Sixty-fifth street.....	161 00
Other streets and avenues.....	2,439 66
Total.....	\$5,346 82

For the entire year the various items of expenditure were as follows :

Sprinkling	\$7,428 01
Cleaning roads and gutters	6,647 01
Repairing roads	3,139 01
Gravel furnished and spread	1,626 13
Cultivating trees	918 51
Repairing sidewalks	69 69
Spreading road covering	1,066 22
Paving gutters	291 47
Clearing snow	105 89
Repairing monitors	432 19
Material	4,354 23
General expenses, including supervision, clerk hire, foremen's time, watchman, repairing tools, etc., cleaning basins, maintaining trees, and other necessary expenses	13,049 73
Total	\$39,128 09

The labor for the year was apportioned with reference to various boulevards as follows ;

Avenue St. Nicholas, One Hundred and Tenth to One Hundred and Twenty-fifth street	\$1,431 55
Avenue St. Nicholas, One Hundred and Twenty-fifth to One Hundred and Fifty-fifth street	2,988 29
Boulevard south of Manhattan street	4,547 55
Boulevard north of Manhattan street	2,089 28
Sixth avenue, One Hundred and Tenth street, north	2,882 40
Seventh avenue, One Hundred and Tenth street, north	2,834 56
Fifth avenue, One Hundred and Twenty-fourth to One Hundred and Thirtieth street	161 00
Fifth avenue, Fifty-ninth to Sixty-fifth street	53 81
Other streets and avenues	9,692 76
Total	\$26,681 20

The completion of the macadamizing of Fifth avenue, from Fifty-ninth to Seventy-second street, original contract for which was finally abandoned after numerous and unavoidable delays, is now being vigorously prosecuted, notwithstanding the unfavorable condition of the weather.

The use of the avenue from Fifty-ninth street nearly to Sixty-fifth street, since October 10, 1878, has, however, greatly relieved local travel ; 6,660 square yards were thus made available.

Fifth avenue from One Hundred and Twenty-fourth to One Hundred and Thirtieth street, was opened to the public November 7, 1878. The macadam seems fully to meet all the requirements of the avenue between these limits. 6,996 square yards of pavement built, 834 square feet bridging laid.

As soon as the season will permit, I respectfully suggest that Avenue St. Nicholas, and Seventh avenue, north of One Hundred and Tenth street, and the west roadway of the Western Boulevard, be resurfaced in like manner as the Sixth avenue was last year. The success of this road covering, which, to a certain extent, was an experiment, the economy of maintenance and the expectation of the driving public, whose interests have been during the past year carefully promoted as far as the opportunity and a conservative care of these expensive causeways would permit, would seem to warrant the continuance and extension of this treatment of suburban drives.

It seems well that Sixth avenue north of Central Park, and the east roadway of the Western Boulevard, should remain as an ordinary macadam road, for purposes of heavy travel, and to insure a drive free from mud in rainy weather.

The present force is thus constituted : 2 foremen, 6 skilled laborers, 16 laborers, 1 blacksmith, 1 carpenter, 1 watchman, 7 carts, and 5 two-horse teams.

The extent and description of the various roadways maintained are exhibited in the following table.

STREETS AND AVENUES.	KIND OF ROADWAY.	Width of Roadway in Feet.	Area in Square Yards.	Length in Miles.
Boulevard, from Circle at Fifty-ninth to One Hundred and Fifty-fifth street	Telford-Macadam	80 & 102	256,181	4.894
Sixth avenue, from One Hundred and Tenth street to Harlem river	Telford-Macadam	80	84,835	1.807
Seventh avenue, from One Hundred and Tenth street to Harlem river	Telford-Macadam	80	103,313	2.201
Avenue St. Nicholas, from One Hundred and Tenth street to One Hundred and Forty-fifth street	Gravel	55	75,505	2.346
Tenth avenue, from One Hundred and Fifty-fifth to One Hundred and Ninety-fourth street	Macadam 50, and earth 50	70	79,283	1.930
One Hundred and Fifty-fifth street, from Ninth } avenue to Hudson river	Telford-Macadam and gray- } wacke	60	17,506	0.485
Manhattan street, from Avenue St. Nicholas to One Hundred and Twenty-fifth street	Telford-Macadam	70	5,799	0.139
Avenue A, from Fifty-seventh to Eighty-sixth street	Telford-Macadam	60	52,528	1.458
Avenue A, from One Hundred and Sixteenth to One Hundred and Twenty-fourth street	Telford-Macadam	60	8,791	0.248
Seventy-second street, from Avenue A to Fifth avenue	Telford-Macadam	40	18,836	0.779
Seventy-second street, from Eighth avenue to Riverside Drive	Telford-Macadam	60	19,933	0.605
One Hundred and Tenth street, from First avenue to Riverside Drive	Telford-Macadam	30 & 40	34,794	1.734
One Hundred and Sixteenth street, from Avenue A to Seventh avenue	Telford-Macadam	40 & 60	32,382	1.115
One Hundred and Twenty-fourth street, from Avenue A to Seventh avenue	Telford-Macadam	30	14,961	0.840
One Hundred and Forty-fifth street, from Sixth avenue to the Boulevard	Telford-Macadam	60	27,923	0.809
One Hundred and Twenty-second street, from Tenth avenue to Riverside Drive	Telford-Macadam	42	6,255	0.275
One Hundred and Twenty-third street, from avenue west of Mt. Morris square to Eighth avenue	Telford-Macadam	30	6,903	0.431
Ninth avenue, from One Hundred and Twenty-third to One Hundred and Twenty-sixth street	Telford-Macadam	60	4,441	0.113
One Hundred and Fifty-second street, from Avenue St. Nicholas to Boulevard	Macadam	30	5,018	0.269
First avenue, from Ninety-second to One Hundred and Sixteenth street	Telford-Macadam	60	12,252	0.348
Avenue B, from Seventy-ninth to Eighty-sixth street	Earth	60	11,935	0.339
Fifth avenue, from One Hundred and Twenty-fourth to One Hundred and Thirtieth street	Telford-Macadam	40	6,996	0.293
Fifth avenue from Fifty-ninth to Sixty-fifth street	Telford-Macadam	40	6,660	0.278
Total			892,940	23.736

All of which is respectfully submitted.

FRED. H. HAMLIN,
Engineer-in-Charge Roads and Avenues.

Statement of Contracts for Paving done in 1878.

LOCATION OF WORK.	NAME OF CONTRACTOR.	KIND OF PAVEMENT.	NO. OF SQUARE YARDS PAVEMENT.	NO. OF SQUARE FEET BRIDGE STONE.	AMOUNT PAID CONTRACTORS.	REMARKS.
Barrow street, between Washington place and West street, and White street, between Broadway and Centre street	Charles P. Devlin	Trap-block	8,144	1,902.4	\$11,953 29	Repaved under chap. 476, Laws of 1875.
Washington Square Roadway, between Fifth and South Fifth avenues, and Mercer street, between Canal and Bleecker streets	John G. Smith	Granite-block	12,178.1	661	24,288 30	Repaved under chap. 476, Laws of 1875.
One Hundred and Fourteenth street, between Second and Fourth avenues	Wm. A. Cummings	Trap-block	5,128	788	6,342 60	Repaved under chap. 476, Laws of 1875.
Fourteenth street, between University place and Ninth avenue	Leonard W. Johnson	Granite-block	16,516.1	564.8	30,120 05	Repaved under chap. 476, Laws of 1875.
Pearl street, between Broadway and New Bowery, and Water street, between Whitehall and Fulton streets	Denis McGrath	Trap-block	13,494.45	3,476.6	18,774 21	Repaved under chap. 476, Laws of 1875.
Madison street, between Pearl and Market streets ; Market street, between Division street and the East river ; and Clinton street, between Division street and the East river	John Slattery	Trap-block	18,043.3-10	5,878.9-10	25,761 25	Repaved under chap. 476, Laws of 1875.
One Hundred and Twentieth street, from First avenue to Harlem river	James Reilly	Trap-block	4,164	214	4,645 76	Repaved under chap. 476, Laws of 1875.
Barclay street, between Broadway and College place, and Morris street, between Broadway and Greenwich street	Owen Gearty	Granite-block	3,608.35	359	7,287 95	Repaved under chap. 476, Laws of 1875.
Seventy-sixth street, from Eighth avenue to the Riverside Park	Owen Gearty	Granite-block	10,404	2,902	17,823 56	Repaved under chap. 476, Laws of 1875.
Irving place, between Fourteenth and Twentieth street ; Fifteenth street, between Broadway and Fifth avenue ; and Fifteenth street, between Third and Fourth avenues	John G. Smith	Granite-block	11,040.45	890.8	20,384 08	Repaved under chap. 476, Laws of 1875.
Twenty-third street, between Third avenue and East river, and Forty-second street, between Third and Fourth avenues	Charles P. Devlin	Trap-block	14,828	2,678.8	17,627 19	Repaved under chap. 476, Laws of 1875.
Lexington avenue, between Seventy-fourth and Seventy-ninth streets	John M. Shannon	Trap-block	5,084	1,027	6,329 25	Repaved under chap. 476, Laws of 1875.
Eleventh avenue, from Fifty-ninth to Sixty-fifth street	William A. Cummings	Trap-block	9,942	3,642	12,489 48	Repaved under chap. 476, Laws of 1875.
Fifth avenue, from Fifty-ninth to Seventy-second street	Jeremiah R. Byron	Macadam	8,850	.....	6,060 60	Repaved under chap. 476, Laws of 1875.
Eighty-second street, between Third and Madison avenues	John M. Shannon	Trap-block	4,918	775	6,061 67	Repaved under chap. 476, Laws of 1875.
Seventh avenue, from Fourteenth to Forty-third street, except the horse-paths of Seventh Avenue Railroad	Leonard W. Johnson	Granite-block	42,374.14	3,044.2	79,186 10	Repaved under chap. 476, Laws of 1875.
Lexington avenue, between Eighty-fifth and Eighty-sixth streets	Peter J. Masterson	Trap-block	919	.....	1,093 61	Repaved under chap. 476, Laws of 1875.
Seventieth street, crossing, Fourth avenue	John S. Masterson	Trap-block	462½	129¾	598 36	Repaved under chap. 476, Laws of 1875.
Waverley place, from Broadway to Christopher street	James Pollock	Granite-block	9,323	790	14,447 46	Repaved under chap. 476, Laws of 1875.
Fifth avenue, from One Hundred and Twenty-fourth to One Hundred and Thirtieth street	James Reilly	Macadam	6,996.1	834.4	10,674 50	Repaved under chap. 476, Laws of 1875.
Sixty-fifth street, from First to Third avenue	Thomas Gearty	Trap-block	4,292	.....	4,892 88	Repaved under chap. 476, Laws of 1875.
Seventy-fifth street, from Fourth to Madison avenue	Peter J. Masterson	Trap-block	1,408.43	167.50	1,647 48	Repaved under chap. 476, Laws of 1875.
Eighty-fourth street, from Boulevard to Riverside Drive	John M. Shannon	Trap-block	3,379	926	3,966 92	Repaved under chap. 476, Laws of 1875.
Second avenue, from Twenty-third to Forty-second street	James Pollock	Trap-block	7,500	2,500	7,087 50	Suspended December 21, 1878.
One Hundred and Eighth street, between Fourth and Madison avenues	Denis McGrath	Trap-block	1,382	224	1,534 74	
One Hundred and Twentieth street, between Second and Third avenues	Denis McGrath	Trap-block	2,095	.....	2,241 65	

Statement of Contracts for Crosswalks laid in 1878.

At each of the intersections of Lexington avenue, One Hundred and Twenty-ninth and One Hundred and Thirtieth streets	Patrick Burns .....	.....	1,237	\$346 36	
Fourth avenue, at intersections of One Hundred and Tenth, One Hundred and Eleventh, One Hundred and Twelfth, and One Hundred and Thirtieth streets	P. J. Masterson .....	.....	3,442	729 34	
Lexington avenue, on the north and south side of Eighty-fourth street	Gilbert Palmer .....	.....	288	82 08	

Total number of square yards of granite-block pavement laid during the year 1878 was	105,444.14
Total number of square yards of trap-block pavement laid during the year 1878 was	105,183.51
Total number of square yards of Macadam pavement laid during the year 1878 was	15,846.10
Total	226,473 75
Total number of square feet bridge stone laid in contracts for paving during the year 1878 was	34,376.15
Total number of square feet bridge stone laid in contracts for crosswalks during the year 1878 was	4,967
Total	39,343.15

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF SEWERS, ROOM NO. 21, CITY HALL.
NEW YORK, January 5th, 1879.

HON. ALLAN CAMPBELL, Commissioner of Public Works :

SIR—In compliance with your instructions, I beg leave to hand you herewith a Report of the transactions of this Bureau for the quarter ending December 31st, 1878, with a statement of the work done by our mechanics and laborers during the whole of the year 1878, and also a general review of all the operations of this Bureau.

These operations have, by the steady and rapid growth of the city in population and wealth, become so extended in their character, and involve so many important elements intimately connected with the comfort, convenience, and health of the community, that I have deemed it proper, in order to remove many manifest errors in regard to this subject that have obtained in the minds of even intelligent persons, to make a concise statement of some facts connected therewith that have not heretofore become generally known.

To more clearly illustrate the several matters which will be referred to, I have divided the report into three general heads, viz :

- 1st. Such facts as appertain to the old system, or those in existence prior to the year 1865.
- 2d. Such as relate to those constructed since that period.
- 3d. Such facts as relate to subsoil drainage.

THE OLD SYSTEM.

There are now laid down within the limits of the city (exclusive of the Twenty-third and Twenty-fourth wards, the improvements in which are under the control of the Department of Parks), three hundred and seventy miles of sewers ; two hundred and five miles of these pertain to the old system, and one hundred and sixty-five miles are embraced in the new system.

Of the former, many miles are sewers only in name, having been laid down before the introduction of Croton water ; most of them being simple drains, open at the bottom, while the sides are built of dry stone, without mortar or cement, and were made for the purpose merely of carrying off the waste water from the houses, at that time derived from wells and cisterns, while refuse and excrementitious matter were deposited in vaults and periodically removed. After the water supply was introduced, these drains were, many of them, suffered to be used as sewers, to the great and manifest injury of health ; and from that time up to the adoption, in 1865, of a general system under the "Sewerage Act," were simply added to or extended by the Croton Aqueduct Department, as ordered by the Common Council, at random, and were built on haphazard plans, as they were called for by individuals from time to time ; not a few of them being built by the individual owners of property to suit their own views and convenience.

The consequence of this fatal stupidity and negligence cannot be exaggerated, the city in its older sections having been honeycombed with an incongruous variety of badly constructed, irregularly shaped conduits, inadequate to the public wants, and which, in consequence of the inferior

quality of the materials used, are fast falling into decay, to the great injury of the public health, and involving a large outlay to keep them in working order. This vicious system grew with the growth of the city, and has been extended in all its defects over a very large area.

On assuming charge of the Bureau at the time of the organization of the Department of Public Works, I found that the records gave no reliable information regarding these old sewers; that the plans, such as they were, referred to different datum levels, and were so disconnected as to mislead rather than assist me in determining their location. In most instances no records could be found, especially of those built by private parties; many were without manholes or other means of entering them for examination or repairs, except by excavating the street; and as most of these old sewers are located in thoroughfares, and under street railways, the work was both difficult and expensive, especially along the river fronts, and over the sites of old ponds and watercourses, where they are often found sunken several feet below the level they were originally placed on; and often two or three different layers of pavement were passed through, before the sewers could be reached, the sewers, street surfaces, and houses having all settled together.

The sizes of most of these old sewers are found to be out of all proportion with the service they have to perform; some are several times larger than can be kept clean with the limited amount of sewage flowing through them; for instance, a sewer will be found five feet in diameter, with scarcely sufficient flow through it to keep one of as many inches free from deposits, while others are found nearly as much too small, which latter overflow during a heavy storm, while the limited flow spread over the broad bottom of the larger sewer, loses much of the power necessary to carry off the solid matter, the result being to reduce the velocity so low as to make the flow hardly sufficient to prevent stagnation.

In the construction of these sewers there seems to have been a total disregard of the principle of hydraulics, that the velocity of flow is in proportion to the hydraulic depth or radius.

Alterations made to relieve or improve one sewer, without considering the effect on the sewers in the district below, have resulted in transferring trouble from one neighborhood to another, without doing any permanent good.

As the area of the city was extended and built upon, the sewers already built were added to or lengthened out, without regard to the effect the additional drainage thrown into them would have on the sewers below, which, being often taxed much beyond their capacity, are continually flooding cellars and damaging property; while, on the other hand, many of the old sewers, originally built too large, have been greatly benefited by having the storm water carried to them in greater quantity from the increased areas of surface covered by the many new buildings, some of them of vast proportions, and more recently from the smoother surface of the large amount of new pavements that has replaced the dilapidated and irregular cobble stone pavements. Little or no precaution was formerly taken to secure a firm foundation for sewers built on made ground, especially along the river front, where, for a considerable distance back from their discharging point, the sewers have sunk several feet below low water, while the part of the sewer built through the solid bulkhead remains at the original level it was built on, cutting off the discharge of the solid portion of the sewage, and all possible escape of gases, which, when confined by storm water or a rising tide, is forced back and, with the aid of improper plumbing, is disseminated through the dwellings.

The sewers that were built over the sites of ponds and streams and above the original surface of the ground have settled out of shape and grade; some are often found to flow in directions contrary to the inclination they were first built upon; fortunately, however, they were originally built so large that they admit of a new grade or bottom being made by the hardening of the gravelly portions of the street washings, which have also served to fill up the irregularities and depressions in the bottom, a channel being thus formed through this deposit, proportionate to the required flow, showing how nature has apparently endeavored to correct the faults of art.

Some sewers are built of stone laid dry, or brick laid in common lime mortar, with porous bottoms, having walls only four inches thick. These, while making excellent drains for the purpose of carrying off subsoil water, are absolutely unfit for sewers; the liquid portions of the sewage leaking away, leaving the solid and heavier portions behind to accumulate and form deposits, which have to be removed by manual labor at great expense. Before the introduction of Croton water, each dwelling had its privy vault, and only the liquid portion was carried off by the sewers, but the general use of croton water, and modern improvements, made it necessary that sewers should carry off all waste and refuse from dwellings, and these old sewers or drains were called into use without reference to the purpose they were originally built to serve; and in addition to waste from houses, refuse from manufactories of every kind has been turned into them, and large quantities of coal ashes have to be removed from the sewers, being carried there from dwellings, through the house connections.

This especial evil has been produced by the now common practice of washing cinders over the sinks, to separate them from the ashes, in place of the proper method of sifting out the ashes. Not only in tenement districts, but in first-class households is this means of disposing of ashes and other prohibited matter used; not only is irreparable damage thus done the sewers and to the harbor, but a very great quantity of Croton water is thus consumed, which cannot be spared even for the legitimate flushing of the sewers.

There is no other city in the world where the sewers carry off such large quantities of solid matter, street dirt, refuse and ashes, etc., and that they can do so is not that they are better constructed, but because of the advantageous situation of the city for thorough and easy drainage into the rivers; and the exceedingly ample supply of water to which the people have been allowed to accustom themselves.

In most European cities, the refuse from houses including the contents of water closets, is not allowed to be emptied into public sewers at all, and only under very restricted conditions is liquid matter suffered to flow into them, while the emptying of privy vaults is carefully regulated by law.

The imperfect manner in which plumbers have in former times been allowed to make connections with the sewers has been the cause of much trouble and injury to them; connection pipes have often been found to extend entirely through the sewer, and the obstructions thus made have the effect to create deposits which, sooner or later, entirely clog the sewer. When these obstructions are discovered and removed, the sewers keep clean without any further trouble.

The discharge of exhaust steam from buildings where machinery is used for elevators, heating and manufacturing purposes, is another serious evil; and even when steam is not discharged directly into the drains connecting with the sewers, the condensing apparatus sometimes used fails to reduce the temperature of the water sufficiently low to prevent its evolving steam on entering the sewer, and this practice is rapidly rendering many of our sewers unfit for use, especially those built of common lime mortar. Although this is in open violation of law, it is found difficult to trace the offending parties; the advantage and convenience of disposing of the exhaust steam in this way being so great that plumbers will resort to every means to conceal the offense.

The old sewers were always difficult of access; the manhole covers being square and very imperfectly fitted into granite frames, consisting of four separate pieces, held together by the pavement alone; the frames were easily displaced, allowing the cover to fall through into the sewer, often causing accidents, and a great deal of loss through damages recovered from the city.

Over two thousand five hundred of these old manholes have been repaired and fitted with new round iron frames and covers adopted by the Department.

Among the principal improvements to the old sewers are the following:

Taking up and relaying of the sewer in Oak street, from James to Oliver street; sewer in Delancey street, from Cannon street to East river; sewer in Thomas street, from West Broadway to Church street; sewer in Grand street, from Wooster to Thompson street; sewer in West Twelfth street, from West street to Hudson river; sewer in Jane street, from West street to Hudson river; sewer in Sixth street, from Avenue B to Avenue C; sewer in Thirty-fourth street, from Eleventh avenue to Hudson river; sewer in Fortieth street, between Tenth avenue and Hudson river (outlet); sewers in Forty-fourth and Forty-fifth streets (extensions at Hudson river with overflows and alterations); sewer in Forty-second street, between Third avenue and East river, with alterations to old sewers; sewers in Centre street, from Grand to Broome street, and in Centre street, from Canal to Pearl street. This sewer replaced a very old and much larger sewer, originally constructed to drain the old Collect Pond, but when called into use as a sewer it was not of the proper form and size for its duty; and for over fifty years that it was used as a sewer was little better than a large cesspool, from which almost the whole sewage had to be frequently removed, at an annual expense of almost as much as the cost of the new sewer. The new sewer is egg-shape, three feet six inches (3ft. 6in.) high by three feet (3ft.) wide, the old sewer having been seven feet (7ft.) wide and four feet (4ft.) high, and a practical example of a sewer failing from being too large.

For over twenty-five years great damage was done by the flooding, during heavy rain storms, of cellars on Third avenue and adjoining streets, from Fortieth to Forty-sixth streets.

After a careful examination, it was discovered to be caused by a want of capacity of the main sewer in Thirty-ninth street, from Second to Third avenues, and in Third avenue, from Thirty-ninth street to Forty-second street.

As the work of taking up these main sewers and providing for the drainage of four hundred and thirty-six (436) acres during their construction, would have been both expensive and difficult, it was decided to build a large main sewer, six feet (6ft.) in diameter, through Forty-second street, from Third avenue to East river, as the most economical plan and least inconvenient to the public.

This plan rendered it necessary to cut a tunnel through the rock forming the high hill at Second avenue, some sixty feet (60ft.) below the street surface, and this sewer was completed in time to take off the great rainfalls of August 6th and December 11th and 12th, saving the neighborhood from much damage.

The district from Forty-second street to Forty-eighth street, between Sixth and Eighth avenues, lies in a low position, and partly over an old water way; its outlet sewer was built in 1849, and was not designed to carry off the amount of drainage brought to it by the extension of the branches to accommodate the rapid building improvements in that section, and it was found to be entirely too small, resulting in the frequent flooding of the cellars; especially those that have been built lower

than the storm flow in the sewer, or below even a moderate and usual height of ordinary flow. To relieve this district, overflows have been built at Fifty-fourth street and Eighth avenue, Forty-sixth street, and Fifty-first street and Ninth avenue, and in Forty-fourth and Forty-fifth streets at Tenth avenue; and it is believed that these will relieve the overtaxed sewers at a trifling cost.

In addition to the preceding improvements, the following sewers were, during the past year, taken up and rebuilt:

In Lexington avenue, from Sixty-first to Sixty-fifth street; in Sixtieth street, between Fourth and Madison avenues; in Fifty-seventh street, between Fourth and Fifth avenues; in Sixty-ninth street, between Third and Lexington avenues; in Ninth avenue, between Sixty-second and Sixty-fifth streets; in One hundred and Twenty-sixth street, between Fourth and Madison avenues; in Fourth avenue, between Seventy-first and Seventy-second streets; in One Hundred and Third street, between Fourth and Madison avenues; in Avenue A, between Sixtieth and Sixty-first streets.

CLEANING THE OLD SEWERS.

Previous to 1872 the sewers were cleaned by contract, at a fixed price per cart load removed, and was the best possible way of increasing, rather than lessening the trouble the sewers were giving; for it was to the interest of the contractor to remove as many loads as he could find; hence obstructions that had formed deposits were left, so as to accumulate fresh deposits, to be removed when a sufficient quantity had collected, and in this way sewers were converted into cesspools, to the profit of the contractor, and loss to the people both in money and health. On the expiration of this contract, December 31st, 1871, and from that time to January 1st, 1876, the cleaning was done by contractors who furnished labor, tools, and carts at fixed prices; the work, however, was not sufficiently under my control to assist me in locating and determining causes of defect in the old sewers; and although their condition was greatly improved under this contract, still much valuable information of the condition of these old sewers, when the accumulated deposits were removed, was in possession of the laborers who entered the sewers to clean them, and who were not directly under our control, and who, for their own purposes, kept this information to themselves. So important and necessary was this information in the preparation of plans for the improvement of the defective sewers, that since January, 1876, this work has been done by day's work and by skilled laborers, under my personal supervision, selected for their long experience with the sewers; and the positive information thus obtained has enabled me to discover and remedy many important defects.

The work of cleaning and repairing is so intimately connected, that by having different gangs for each work act together, obstructions are removed, sewers cleaned, and defects of construction are made good at the same time, to the great saving of expense and labor. Generally, the removal of a slight obstruction, or a small repair or alteration is all that is required to place a sewer in perfect working order.

The receiving-basins were cleaned by contract from 1871 to 1876 inclusive, at a fixed sum of forty-eight thousand (\$48,000) dollars per year. Since the expiration of this contract, December 31st, 1876, it has been done by day's work at a greatly reduced rate.

The annexed table will show the expenditures for all cleaning and repairing for the past ten years; and the constant diminution of cost from year to year, is a fair index of the condition of all the sewers, and represents the great improvement in the old sewers, where nine-tenths of the cleaning is done. Sewers built under the new system require little or no cleaning; an occasional flushing is all that is required. There never was a time when the sewers were in a cleaner condition than at present.

RECEIVING-BASINS, OLD AND NEW.

There are at present forty-four hundred and ninety receiving-basins, and on their good order in a great measure depends the condition of the sewers.

All built subsequent to 1849 are designed to intercept and retain all street dirt not proper to enter the sewer, and to exclude all sewer gas.

Many of the old basins were constructed simply for surface drainage, and did not exclude sewer gas, being built of dry stone, the liquid portion being allowed to filter away from below the trap, leaving a free escape for sewer gas.

The head or covering stone was in several pieces, and always difficult to remove for the purpose of cleaning or repairing, and readily displaced by a slight blow from passing vehicles.

Many of these old basins were completely useless, as the street refuse was not retained, but carried directly to the sewer. More than one thousand of these old basins have been put in complete order, and furnished with a covering of a single stone, into which is fitted a round iron cover, which can be readily removed when the basin requires cleaning.

The old sewers have been greatly benefited, and the cost of cleaning them considerably lessened by this improvement.

Before plans can be prepared to further improve the condition of these old sewers, or even lessen the evils of so many years of mismanagement and neglect, a general examination of all those built prior to 1865, will be required; and much study, care, and time will be necessary before plans for their systematic and extensive improvement can be considered; for it is very much easier and would probably in the end be more economical to originate a new and complete system of sewerage, than to adapt existing and defective sewers to a general and more perfect system.

While the evils arising from the imperfection of the old system are much to be deplored, it is a matter of some satisfaction to know that we are spared the enormous expense in correcting them that other cities have been called upon to meet. London has expended an incredible sum in efforts to remedy past errors. Boston has called for three million dollars for this purpose, and even Brooklyn, which has but recently completed its plan of sewerage, is about to expend a million of dollars in correcting the errors that have already been discovered. Many other cities are equally unfortunate in this respect.

Statement of Amounts Expended for Cleaning Receiving-basins and Sewers, and for Repairing Sewers, Basins, and Culverts, from 1868 to 1878, both years inclusive.

DATES.	Cleaning Receiving-basins.	Cleaning Sewers.	Repairing Sewers, Basins, and Culverts.	Totals.	Total Miles of Sewerage.	Total Number of Basins.	Cost Cleaning Sewers per Mile.	Cost Cleaning Basins, each.	Cost Cleaning both Sewers and Basins per Mile of Sewer.
1868.....	\$28,000 00	\$48,636 38	\$50,568 99	\$127,205 37	244.50	3,226	\$108 92	\$8 68	\$313 44
1869.....	24,000 00	26,379 53	76,310 06	126,719 59	261.	3,372	101 07	7 12	193 03
1870.....	24,000 00	47,862 50	55,254 16	127,116 66	276.	3,603	173 41	6 66	260 37
1871.....	48,000 00	31,272 50	158,035 62	237,308 12	295.	3,764	106 01	12 75	268 72
1872.....	48,000 00	12,128 14	102,209 16	162,337 30	307.63	3,858	39 42	12 44	195 46
1873.....	48,000 00	16,933 25	64,519 46	129,552 71	323.16	3,973	52 40	12 08	200 93
1874.....	48,000 00	11,796 00	82,751 15	142,547 15	342.76	4,166	34 41	11 52	174 45
1875.....	48,000 00	12,348 89	116,976 75	177,325 64	351.66	4,252	35 12	11 29	171 61
1876.....	48,000 00	4,050 00	26,438 27	78,488 27	356.63	4,340	11 36	11 06	145 95
1877.....	15,950 00	4,620 00	30,465 69	51,035 69	362.39	4,397	12 75	3 63	56 76
1878*.....	17,100 00	4,200 00	38,700 00	60,000 00	369.19	4,489	11 37	3 81	57 68

* The work done in December, 1878, and the cost thereof, have been necessarily estimated, but will be found very nearly exact.

THE NEW PLAN.

Under the sewerage law of 1865, plans for the sewerage of the city south of One Hundred and Fifty-fifth street, were made and filed by the late Croton Aqueduct Department, based upon a system of pipe-sewers. A system of pipe-sewers has many advantages over one of brick, being cheaper, less liable to become obstructed, besides requiring little or no cleaning.

It has, however, been found that the larger sizes of pipe-sewers are liable to break, either from some defect in the manufacture, or careless laying through improperly made streets.

Previous to 1870, the building of sewers, and the grading of streets were in charge of separate Departments. The filling of streets and building of sewers were carried forward without providing for the drainage of the land, or preserving the flow of the natural water-courses, by properly constructed culverts through them, and sewers were laid through the newly-filled streets, and sometimes on a foundation of loose filling before the street was graded, to save expense of excavating. These sewers were often several feet above the original surface of the ground, the loose filling would be sure to settle and carry the sewer with it, saturating the ground, and rendering it unfit to live upon.

The topography of the upper part of the Island is such as to require great care in selecting a material for the sewers that will resist all possible accidents from being laid in a soil so variable; sand, clay, rock, quicksand, and the filling of loose rock, sometimes forty feet deep, employed in grading streets, often being met with on the line of the same sewer.

After careful consideration it has been found advisable to change the filed plans by enlarging the size of both pipe and brick, and substituting brick for pipe in branch sewers above twelve (12) inches in diameter, except in small lateral sewers, and where a sewer could not be constructed small enough of brick to be made self-cleaning.

In the original filed plans the subsoil drainage was entirely overlooked, the neglect of which was rapidly rendering whole neighborhoods unfit to live in, and the revision of these plans became an absolute necessity, so as to place the sewers at such depth as to intercept the original water-courses,

the benefit of which has been very great to the health of the whole city, and of two-fold advantage as it serves both to drain the land and flush the sewers.

The original filed plans will be carried out where the sewerage of any district is so far completed as to make any change unwise, and the pipe-system will be continued, strengthened, however, by a brick or concrete arch, thus making a very strong and perfect sewer.

The main sewers into which the flow of branch sewers is concentrated, very seldom, if ever, require cleaning, and the circular shape has proved to be the best form, as combining the greatest strength with the smallest amount of brick work, together with the least cost.

In the main collective sewers, where the grade does not admit of sufficient earth covering over the sewer to lay the pavement, the full circular sewer is flattened and given an oblate form. In all the branch sewers, the egg shape, with the narrow part downward, is preferable, as being most suitable for both dry and wet weather; in dry weather, the flow of sewerage being small, the greatest velocity and scouring power is obtained in this section, by narrowing and proportionately deepening the current at the time it is most required, and the broader section at the upper part affords room for the passage of storm-water, as well as for cleaning and examinations.

Invert blocks of glazed earthenware are very generally used in the construction of small brick sewers, as they greatly assist the flow by their smooth surface, making the sewer self-cleaning, and the continuous openings through the bottoms of them, get rid of a large amount of subsoil water that otherwise would greatly impede and impair the work of building.

As the several sections of the new bulkhead wall and other improvements now being carried forward by the Department of Docks are completed, the collective sewers along the river front, from the Battery to Twenty-third street, will be constructed, to intercept all the present sewers that discharge into the slips at the old bulkheads, and will be built of sufficient capacity to call for as few outlets as possible, and these will be carried through the piers to their extreme ends, discharging directly into the tidal current, which is so rapid at these points that the greater portion of the sewage is held in suspension until carried beyond the city limits, or at such points from which it can be readily removed by dredging at a very small cost compared to the removal of sewer deposits either from the slips or directly from the sewers.

This seems to be the most practical method of disposing of the enormous amount of matter brought down by the sewers; street dirt, garbage and ashes forming the principal, and by far the largest portion.

The possibility of utilizing the sewage of the city at some future day, has been considered in the arrangement of the present plan, and the few discharging points have been selected with this view, but under present circumstances the expense of pumping and disposal would be simply enormous, without any corresponding benefit.

The sewage of New York would be almost valueless at this time for fertilizing purposes, being mixed with so many destructive and improper substances, which, when acted on by the air and water, undergo chemical changes, in the course of which they either become resolved into their original elements or are combined in new forms very different from those in which they originally existed. These changes are so rapid that the discharged sewage contains little or none of the fertilizing substances that entered the sewer; and for this reason, when discharged into the rapid current of the river, it does not render the water permanently impure. When, however, the sewage is discharged into the still waters of the slips, as it now generally is, and often at the principal ferries at the foot of thoroughfares, and being there kept in a constant state of agitation by the movements of steamboats and vessels, it gives off gases which, if not prejudicial to health, are intolerable to the senses.

The collective sewers on both sides of the city, will, when built, remedy this nuisance, but as it will probably be many years before the Dock Department completes the work along the river front, relief must be given by discharging the present sewers through convenient piers, beyond the possibility of returning or remaining in the slips.

It is the intention to arrange with the Department of Docks early in the coming spring, for extending suitable trunk sewers through the piers, to relieve the worst cases which at present exist.

The new bulkhead wall along the Hudson river, is so far progressed, that the building of the main collective sewer between Canal street and West Eleventh street, will be contracted for early next spring. The outlet will be carried through the new pier, foot of Clarkson street, and discharged at its extreme end, directly into the rapid tideway. It will intercept all sewers west of Broadway, between Canal and Fifteenth streets, now discharging into the slips between Spring and West Eleventh streets, comprising an area of six hundred and forty-one (641) acres.

All the great European steamship companies occupy piers along this front, and it is particularly desirable that the water in the adjoining slips be kept as free from impurities as possible, and this can only be accomplished by discharging the sewage at the pier heads into the tide-way as proposed.

The collective sewer, when built throughout the length of West street, intercepting all sewers from the Battery to West Eleventh street, with only three outlets, viz., at Clarkson, Canal, and Vesey streets, all discharging into the rapid current of the North river, will improve greatly the sanitary condition of the water front, and greatly lessen the cost of dredging.

COMPLAINTS AND THEIR CAUSES.

Frequent complaints are received of defective sewers, while in nine cases out of ten the trouble is found on examination to have been caused by defects in the plumbing and drains of the houses from which the complaints emanate.

Plumbers are in the habit of laying the blame on the sewers to cover up their own dishonest and defective work, which our experts readily detect, determine the cause of the trouble, and suggest the proper remedy.

The drains laid through cellars are frequently without sufficient fall, and those laid on made ground are often found to have settled and broken, allowing the liquid portion to leak out and saturate the ground under them, the solid matter remaining in the drains to obstruct them, rendering the dwelling and those adjoining unfit to live in.

Whole blocks of up-town dwellings are in this condition, and must remain so until the owners are compelled by the Department of Health to lay new house drains through the cellars to the main sewer, in a secure and proper manner; either by using the best quality of earthenware, or a heavy cast-iron drain pipe, made water-tight and thoroughly secured from settling. A simple trap in the drain, placed so as to be easily accessible, and the soil pipe carried from it direct to the roof will secure the dwelling from all possible danger from sewer gas.

VENTILATION OF SEWERS.

In the old system no regular ventilation was provided for; all the ventilation that existed was obtained through the house connections and open drains, also through the leaders for roof-water that connected directly with the sewers, and through the untrapped receiving-basins.

After the introduction of croton water, when the sewers came to be used to convey foul matter and refuse, the exclusion of sewer gas became of vital importance, and more carefully devised means of ventilation were absolutely necessary. The pressure on an unventilated sewer, exerted by the rising tide and storm water, and also that due to steam and hot water, aided at times by the force of the wind blowing into the mouths of the sewers, is such that the most effectual sewer trap cannot resist.

As long as house connections were open and extended untrapped through the roof (remote from chimneys and windows) little other ventilation was required, but as it has now become the general practice, as well as a requirement of the Department of Health, to trap the soil pipes as near the sewer as possible, without providing a separate ventilating shaft, and the placing of gates at the permanent sewer outlets, to exclude wind, have cut off ventilation in both directions; it has been found necessary to perforate the covers to the sewer manholes sufficiently to allow of the free escape of sewer gas into the centre of the street (as remote from dwellings as possible), where it is so thoroughly disseminated into the atmosphere as to be rendered harmless. In this way, also, air is supplied to the sewers to replace the receding tides and storm flows, and thus providing against pressure from the constant daily fluctuations in the density of the sewer air due to other causes. But sewers that are laid under the sidewalks, or closely adjoining them, cannot be ventilated through the manholes without annoyance and offense to persons passing near them, and ventilation must be had through the soil pipes, or separate shafts carried untrapped through the roofs.

As this Department is without authority to direct the ventilation of sewers through the house connections, legislation must be obtained that will require owners (as a condition to connecting with the public sewer) to make such provision for ventilation as may be necessary.

There are some twenty thousand (20,000) manholes, provided for the sewers, and as many of these as can be used for ventilation, will be fitted with perforated ventilating covers; the progress of supplying them, however, must depend on the amount of money that can be spared from the inadequate appropriation for the year 1879.

During the past two years, several hundred manholes have been fitted with these covers, with marked effect in many neighborhoods that had suffered from want of ventilation in the sewers.

UNDERGROUND DRAINS.

By singular and unfortunate oversight in the plans for the sewerage of the city from the beginning, until within a comparatively recent period, the subject of subsoil drainage has been entirely ignored, and the consequences have been deplorable. A very large area of the older portions of the city, has been suffered to become and to remain completely saturated with water from the old water-

courses, to the great depreciation of property and a general detriment to the public health, and even on the adoption of the new system, which was intended to remedy the old, this important subject was neglected. This matter became still more complicated in the regulating and grading of streets. Where they crossed deep ravines of former watercourses, either an insufficient culvert, or none at all, was constructed in the beds of these streams, and consequently the embankment which formed the new street became in every instance a drain behind which surface water accumulated in large quantities. In this way a very large aggregate of land became permanently wet, and the dwellings erected thereon were soon found by the medical profession to be the locale of fatal epidemic diseases of a malignant type. The attention of the community has previously been called to this important subject by the publication of a topographical map of the city, and through very strenuous efforts on the part of some prominent citizens, a law was enacted by the Legislature in 1871, by which the Department of Public Works was authorized, on the requisition of the Board of Health, to construct stone drains in the beds of these old watercourses.

Under this law some fourteen miles of drains have been laid, and many hundred acres of land that were formerly saturated with water, and rendered absolutely unfit for occupation, have become permanently freed from moisture, not only improving the value of this property by a very large percentage, but increasing the salubrity of the entire district drained, as well as benefiting to a very large degree the general health of the city, inasmuch as the malaria, which originated in the undrained districts, spread itself over a wide area that, so far as soil was concerned, ought to have been free from it. In the construction of these drains the fact soon became evident to me that, unless some change was made in the plans that had been adopted for the sewerage of those portions of the city affected by the old water ways, an enormous expense would be involved in the thorough drainage of these lands by the methods that had been adopted, while in some cases it was doubtful whether those methods could be made successful at any cost. It became necessary, therefore, to adapt the sewer plans to the drainage requirements, or at least to so modify them that the sewers could be used as auxiliaries to the drains and *vice versa*, by placing them at sufficient depth to intercept the subsoil drainage at certain points, and were laid with porous tile inverts, which became in fact a continuation of the drainage system, and brought the two systems into perfect harmony. The result has been entirely satisfactory, and so successfully have these low lands been drained, that I have the fullest confidence in being able, by the reconstruction of the old sewers, to accomplish the same result in the older sections of the city, that have long been given over by the medical profession as the permanent and unavoidable home of malaria; and I have reason to feel a certain degree of professional pride in the successful accomplishment by this bureau of results so important to the general welfare of our citizens.

The following table shows the extent of underground drains:

Table exhibiting the extent of Land Drainage and Underground Drains in the City.

LOCATION.	Drains, Lineal feet.
Built previous to passage of Drainage Act of 1871.....	5,000
Built under chapter 566, Laws of 1871—	
Between Fifty-fourth and Fifty-fifth streets, Fourth and Madison avenues.....	442
Between Fifty-sixth and Fifty-seventh streets, Lexington and Fourth avenues.....	470
Between Fifty-sixth and Fifty-seventh streets, Madison and Fifth avenues.....	235
Between Fifty-seventh and Fifty-eighth streets, Madison and Fifth avenues.....	275
Between Sixty-first and Sixty-third streets, Fourth and Madison avenues.....	272
Between Sixty-second and Sixty-eighth streets, Eighth and Ninth avenues.....	4,012
Between Sixty-third and Sixty-seventh streets, Fourth and Fifth avenues.....	3,618
Between Sixty-second and Sixty-ninth streets, Boulevard and Hudson river.....	2,557
Between Sixty-sixth and Sixty-seventh streets, Madison and Fifth avenues.....	225
Between Seventy-first and Seventy-fourth streets, Boulevard and Ninth avenue.....	1,993
Between Seventy-second and Seventy-third streets, First and Third avenues.....	153
Between Seventy-third and Eighty-first streets, First and Fifth avenues.....	7,158
Between Seventy-sixth and Ninety-second streets, Eighth and Tenth avenues.....	9,602
Between Seventy-seventh and Eighty-eighth streets, Ninth avenue and Hudson river.....	6,388
Between Seventy-seventh and Seventy-eighth streets, First and Second avenues.....	567
Between Seventy-eighth and Eightieth streets, Second and Third avenues.....	662
Between Ninety-first and Ninety-third streets, Second and Third avenues.....	354
Between Ninety-second and One Hundred and Sixth streets, Third avenue and Harlem river.....	3,328
Between Ninety-sixth and One Hundred and Eleventh street, Tenth and Eleventh avenues.....	4,674
Between One Hundred and Tenth and One Hundred and Twenty-fourth streets, Fifth and Eighth avenues.....	7,107
Between One Hundred and Seventy-third and One Hundred and Eighty-third street, Kingsbridge road and Harlem river.....	7,175
Between One Hundred and Fifty-third and One Hundred and Fifty-fifth streets, west of Eighth avenue	281
On the lines of Inwood and Dykman streets.....	6,816
Total.....	73,444

Making a total of 13 91-100 Miles of Underground Drains.

Few people are able to form a comprehensive idea of the extent and complications of the underground works necessary for the drainage and sewerage of a large city, or of the constant care required to maintain them in good order.

It has been shown that many of the old sewers of the city have become so dilapidated by time, and, in consequence of the use of inferior material, are so thoroughly disintegrated in many places, that they are liable at any moment to fall into pieces, and are only kept in working order by unremitting attention and repairs; and even then their preservation is limited by the small sum usually appropriated for the purpose, and which is the only available fund since the repeal of the sewer repair law, three years ago.

The repeal of this law, and the fact that the present contract law does not always secure fitness in the lowest bidder, have greatly embarrassed this Bureau in carrying out the plan already adopted for the extensive improvement of the old sewers, which has now become a matter of the first necessity.

The most important and difficult of these improvements are those called for in crowded thoroughfares, where the inconvenience to the public will always be very great, no matter how short a time the work may be in progress, and should the contracts for these difficult works, as they generally do, fall to the lot of parties who are financially or otherwise incompetent to carry them to a speedy and satisfactory completion—since experience, capital, and character are seldom found united in the lowest bidder—the embarrassment to business and interruption of travel becomes greatly increased.

The present contract law should be so modified as to allow the exercise of a broad discretion in receiving bids, so that only competent and responsible parties shall be permitted to undertake the rebuilding of sewers. Until this is done, many contemplated improvements, the execution of which in incompetent hands might interfere disastrously with commerce and business, must be deferred.

In some particular sewer work it is impossible to obtain reliable data upon which to base an intelligent bid, and such work, in fact, can only be satisfactorily accomplished by day's work, under the immediate supervision of the Bureau.

It was to meet cases of this kind that the sewer repair law was enacted in 1871. Its repeal in 1876 left us with many unfinished plans, that, in order to carry out, requires the re-enactment of this law.

The selection of inspectors on account of their fitness has resulted in securing a much better class of work than heretofore, and has enabled me to carry on difficult improvements, that in absence of the supervision of competent and honest inspectors it would have been impossible to execute properly.

The co-operation of the Health Officers with this Bureau, in compelling property owners to place their house drains in order, in connection with and during these repairs to the public sewers, has permanently relieved many neighborhoods that had been rendered unhealthy by the sewage escaping from the open jointed and badly laid house drains, and saturating the loose earth under and around the dwellings, and often undermining the sewers themselves.

But the injury done to the sewers by such defective house drains is slight compared with the injury to health, and for this great evil there can be no relief until owners are compelled by law to make indestructible water-tight house drains connecting with the sewers.

The improvements of several districts on the west side is greatly retarded by the opposition of large property owners to having the streets through which the main outlet sewers should run opened by law. Especially is this the case with Carmansville, where for several years past a few influential owners have been enabled to defeat the opening of several streets in which sewers are required in order to drain houses already built.

The waste water from these houses has no way to run off, except over the surface of the ground, and as a consequence the whole neighborhood will soon be rendered unfit to live in.

The extension of rapid transit must bring into demand portions of the city which have received little attention in the way of public improvements, principally in consequence of this opposition of the large real estate owners, who object to having their property cut up by the opening of streets, through which main outlet sewers must run in advance of extended settlement.

In this way the growth of large districts has been retarded, and individual purchasers embar-

passed, by not being able to dispose of or improve their property, as the construction of the sewer is the preliminary step in all building improvements.

The construction of many sewers necessary to the health and convenience of settled neighborhoods must consequently be postponed until owners withdraw their active opposition to the legal opening of these streets, the proceedings for which have been pending in the courts for several years.

I have endeavored to make clear the difficulties that surround the proper administration of the Bureau under my charge, in order that the general public may become familiar with the facts and recognize the part that they necessarily play in the execution of the laws that have been enacted to perfect and maintain this important branch of municipal management; and, above all, I desire to impress upon the intelligent portion of the community the responsibility that devolves upon them in the use of those appliances which are supplied at the public expense for their convenience and comfort. To misuse these appliances, either within or without their premises, is a public wrong and injury that reacts upon themselves, and in its consequences creates evils that are not possible to calculate.

The introduction into the sewers of matter foreign to their use, the improper arrangement of sewer connections, the neglect to give an intelligent supervision to the use of these connections by careless and ignorant employees, all contribute to the permanent injury to this great system, the care and preservation of which is of the most vital necessity to the community at large, and to every individual.

All of which is respectfully submitted,

STEVENSON TOWLE,
Engineer in Charge of Sewers.

Statement of Work done under Contract, by the Bureau of Sewers, in the Construction of Sewers, Receiving-basins and Culverts, during the Year 1878.

TITLES OF CONTRACTS.	CONTRACTORS.	DATE OF CONTRACT.	LINEAL FEET BUILT OF—			NUMBER OF BASINS.
			BRICK SEWER.	PIPE SEWER.	CULVERT.	
Eighty-fourth street, between Ninety-second and One Hundred and Fifth streets, with branches in Ninety-third and Ninety-sixth streets.	Alexander Lutz.	July 29, 1875.	238	....	105	1
Eleventh avenue, between Sixty-sixth and Seventy-sixth streets, with branches in Sixty-seventh, Sixty-eighth, Sixty-ninth, Seventy-first, Seventy-second and Seventy-third streets, with connection of present sewer in Seventieth street.	John D. Crimmins, Abraham Downey, and Thomas E. Crimmins.	Oct. 28, 1876.	....	5,496	430	19
Eleventh avenue, between Sixtieth and Sixty-fourth streets, and in Sixty-first street, between Tenth and Eleventh avenues.	John H. McCabe.	Dec. 12, 1877.	1,549	....	258	11
First avenue, between Ninety-second and One Hundred and Tenth streets, and in Second avenue, between Ninety-fifth and One Hundred and Ninth streets, with branches in Ninety-third, Ninety-sixth, Ninety-seventh, Ninety-ninth, One Hundredth, One Hundred and First, One Hundred and Second, One Hundred and Third, One Hundred and Fourth, One Hundred and Fifth, One Hundred and Seventh and One Hundred and Eighth streets.	John C. Dowling.	Nov. 1, 1876.	11,485	....	364	27
Tenth avenue, between Seventy-seventh and Eighty-first streets, with branches in Seventy-seventh, Seventy-eighth, Seventy-ninth and Eightieth streets.	Bartholomew Noonan.	Oct. 30, "	....	1,119	60	3
Forty-second street, from Third avenue to East river, with alterations and improvements to existing sewers in Sewerage District No. 5.	John Mulholland.	" 10, "	914	....	36	1
One Hundred and Nineteenth street, between Fourth and Fifth avenues, and in Fourth avenue, west side, between One Hundred and Seventeenth and One Hundred and Twenty-first streets.	John G. Smith.	Dec. 26, "	....	874	213	9
Ninety-fourth street, between Third and Fourth avenues, and in Fourth avenue, east side, between Ninety-third and Ninety-fifth streets.	Edward Bradburn.	" 19, 1877.	....	1,047	25	1
Ninth avenue, between One Hundred and First streets, and in One Hundred and First street, between Ninth and Tenth avenues.	Bartholomew Noonan.	Aug. 29, "	....	729	97	4
Extension of sewers in Forty-fourth and Forty-fifth streets, at Hudson river, with alterations to existing sewers in Sewerage District No. 2.	Terrence Smith.	April 22, 1878.	1,130	....	..	..
One Hundred and Tenth street, between New avenue, between Eighth and Ninth avenues, and Ninth avenue, and in New avenue, west of Morningside Park, between One Hundred and Tenth and One Hundred and Sixteenth streets.	Michael Noonan.	June 26, "	540	....	140	4
One Hundred and Thirty-second and One Hundred and Thirty-third streets, between Sixth and Seventh avenues.	Charles Devlin and John McKim.	" 27, "	....	1,358	..	..
New avenue, west of Morningside Park, and in One Hundred and Twenty-second street, between One Hundred and Sixteenth street and Tenth avenue.	James Everard.	" 15, "	325	....	30	..
Ann street, between William and Gold streets.	Franklin P. Nesbit.	July 24, "	....	232	..	..
Waverley place, between West Tenth and Charles streets.	Franklin P. Nesbit.	June 3, "	....	184	..	..
Nassau street, between Beekman and Spruce streets.	Thomas J. Reilly.	Jan. 25, "	....	135	..	..
Sixty-ninth street, between First and Second avenues.	Lawrence Rock.	July 3, "	....	647	..	..
Washington street, between Perry and West Eleventh streets.	Lawrence Rock.	Nov. 1, 1877.	....	5	..	..
Fifth avenue, or the avenue west of Mount Morris square, between One Hundred and Twenty-second and One Hundred and Twenty-third streets, from end of present sewer in One Hundred and Twenty-third street.	Thomas H. Casey.	Aug. 25, "	....	131	..	..
Fifty-first street, between First and Second avenues.	William E. Dean.	April 23, 1878.	977	....	..	..
Twelfth avenue, between One Hundred and Thirtieth and One Hundred and Thirty-first streets, and in One Hundred and Thirty-first street, between Twelfth avenue and the Boulevard.	Frank Stollmeyer.	May 4, "	....	265	..	..
Ninety-ninth street, between Boulevard and Tenth avenue.	Edward Bradburn.	July 15, "	897	....	53	3
One Hundred and Fourth street, between Fourth and Fifth avenues.	George A. Treacy.	April 17, "	....	300	..	..
Seventy-sixth street, between Boulevard and Eleventh avenue.	Charles Devlin and John McKim.	June 27, "	534	....	..	..
Fourth avenue, west side, between One Hundred and Twenty-third and One Hundred and Twenty-fifth streets.	Lawrence Rock.	July 3, "	....	183	..	..
Greenwich street, between West Houston and Clarkson streets.	Gilbert Palmer.	Aug. 19, "	....	....	21	1
Northwest corner Madison and Birmingham streets.	R. A. Cunningham.	May 13, "	....	....	50	2
Northwest corner of Sixty-fifth street and Fifth avenue.	Gilbert Palmer.	Aug. 19, "	....	....	20	1
East Broadway or Chatham square, east side, between Oliver and Catharine streets.	John S. Masterson.	" 21, "	....	....	46	1
Northwest corner of One Hundred and Forty-third street and Boulevard.	Lawrence Rock.	" 19, "	....	....	195	..
Northeast and southeast corners of Sixty-first street and First avenue.	R. A. Cunningham.	" 14, "	....	....	13	..
Goerck street, between Houston and Third streets.	Thomas L. Butler.	May 13, "	....	....	39	2
Extension of sewer at foot of Fifty-seventh street, East river.	Lawrence Rock.	Aug. 19, "	....	....	206	..
West street, between Barclay street and Park place.	Peter T. Masterson.	Nov. 12, "	....	....	107	..
Seventieth street, between First and Second avenues.	Charles Devlin.	" 15, "	....	....	194	..
Greenwich avenue, between Thirteenth street and Eighth avenue, and in Bank street, between Waverley place and Greenwich avenue, from end of present sewer to near Greenwich avenue.	Charles Devlin and John McKim.	June 27, "	....	....	595	..
Ninety-fifth street, between Third and Lexington avenues, with branch in Lexington avenue.	Peter T. Masterson.	Nov. 12, "	....	....	266	..
One Hundred and Fourth street, between Ninth and Tenth avenues.	John B. Healy.	" 25, "	....	....	100	..
One Hundred and Nineteenth street, between Fifth avenue and summit west of Fifth avenue.	James Reilly.	" 23, "	....	....	60	..
Southwest corner Fifty-fourth street and Avenue A, and on northwest corner Fifty-fifth street and Avenue A.	John H. McCabe.	Oct. 19, "	....	....	300	..
Open culvert, between One Hundred and Fifty-third and One Hundred and Fifty-fifth streets, west of Eighth avenue.	Peter T. Masterson.	Nov. 12, "	....	....	40	2
	John B. Healy.	Dec. 19, 1877.	....	....	Land Drains.	..
		Totals.	18,696	14,810	2,040	92

Brick Sewer..... 18,696 Lineal Feet.
Pipe Sewer..... 14,810 "
Culvert..... 33,506, total lineal feet of Sewer built.
Open Culvert or Land Drain..... 2,040, " " Culvert built.
Receiving-basins..... 301 " " Land Drain built.
..... 62 " Receiving-basins built.

Table showing the Principal Rain-falls during the Year 1878.

DATE, 1878.	TIME OF BEGINNING.	TIME OF ENDING.	DURATION.	AMOUNT OF WATER IN INCHES.
Jan. 4.	6 A. M.	5:30 P. M.	H. M.	.92
" 10.	2:50 A. M.	12 P. M.	20.10	.60
" 14.	A. M.	9 A. M.	9.00	1.13
" 26.	A. M.	5 A. M.	5.00	.50
Feb. 22.	4:15 A. M.	12 P. M.	19.45	2.39
Mar. 12.	4 A. M.	12 P. M.	20.00	.98
" 13.	A. M.	9 A. M.	9.00	.57
" 17.	3:30 A. M.	1 P. M.	9.30	.75
April 11.	1 P. M.	7:30 P. M.	6.30	.59
May 5.	A. M.	12 P. M.	12.00	.54
" 9.	6 A. M.	1 P. M.	7.00	.61
" 31.	5:15 A. M.	12 P. M.	18.00	1.19
June 22.	6 A. M.	1 P. M.	7.00	1.20
July 9.	2:30 P. M.	8 P. M.	5.30	.52
" 10.	4:15 P. M.	5:30 P. M.	1.15	.45
" 12.	2:30 A. M.	11:30 P. M.	21.00	1.63
" 30.	A. M.	7 A. M.	7.00	.68
Aug. 1.	6 A. M.	12 P. M.	18.00	2.85
" 6.	7:40 A. M.	9 A. M.	1.20	2.66
" 6.	1:20 P. M.	9:20 P. M.	8.00	.65
" 16.	1:20 P. M.	12 P. M.	10.40	1.06
Sept. 1.	2:30 A. M.	5 A. M.	2.30	.51
" 4.	5 P. M.	12 P. M.	7.00	.34
" 5.	A. M.	5 A. M.	5.00	2.44
Oct. 18.	9:20 A. M.	9 P. M.	11.40	.96
" 23.	2 A. M.	12 P. M.	10.00	.73
Nov. 22.	A. M.	12 P. M.	12.00	1.99
" 27.	0:30 P. M.	12 P. M.	11.30	1.66
Dec. 2.	1 A. M.	2:10 P. M.	13.10	1.00
" 9.	4 A. M.	12 P. M.	20.00	.63
" 10.	A. M.	7 P. M.	19.00	1.62

August 6th, rain fell to the depth of 2 66-100 inches, in one hour and twenty minutes.
The total fall of rain for the year 1878, amounted to 48 6-10 inches.

Table Exhibiting the Extent of Sewerage to December 31, 1878.

PERIODS.	NUMBER OF MILES.			Number of Receiving-basins.
	Sewer.	Underground or Land Drains.	Culvert.	
Estimated, as constructed prior to the organization of the Croton Aqueduct Department, in the year 1849.	69.36	....	3.67	969
Estimated, as constructed by the Croton Aqueduct Department, from the year 1849 to the passage of the Sewerage Act, in the year 1865.	125.16	....	7.09	1,871
Constructed by the Croton Aqueduct Department, from the year 1865 to the organization of the Department of Public Works, in the year 1870.	57.17	0.94	2.01	532
Constructed by the Department of Public Works, from the year 1870 to the year 1873. (Passage of Charter of 1873).	36.98	3.89	1.95	482
Constructed by the Department of Public Works, from the year 1873 to the year 1878, inclusive.	48.78	9.08	3.11	635
Totals.	337.45	13.91	17.83	4,489

Total extent of Sewerage, including Sewers, Land Drains, and Culverts, 369 19-100 miles.

REPORT OF THE TRANSACTIONS OF THE BUREAU OF SEWERS, FOR THE QUARTER ENDING DECEMBER 31, 1878.

Credits to General Fund—	
Amount received for 247 permits for sewer connections.	\$5,717 73
Amount received for inspection fees from the New York Elevated Rail Road Companies.	106 75
Amount received for inspection fees from the Gas-light Companies.	240 00
	\$6,064 48
Vitrified Stoneware Pipe—	
Amount received for pipe sold to contractors and credited to Street Improvement Fund.	\$342 45
Engineers' Fees—	
Amount of Engineers' and Surveyors' fees assessed on property benefited, and charged in Assessment Lists, and credited to Street Improvement Fund.	\$10,309 00
Sewer Repair Stock—	
Unexpended balance, March 31, 1876.	\$563 03
Sewers—Repairing and Cleaning—1877 account—	
Unexpended balance, September 30, 1878.	\$2,091 71
Vouchers transmitted to the Commissioner of Public Works:	
Carriage-way securities.	\$327 40
Transfer by Board of Estimate and Apportionment.	1,764 31
	2,091 71
Sewers—Repairing and Cleaning—1878 account—	
Unexpended balance, September 30, 1878.	\$20,065 58
Vouchers transmitted to the Commissioner of Public Works:	
Pay-rolls of Mechanics and Laborers.	\$8,252 00
Odorless Excavating Company.	2,400 00
Repairs to sewers and basins.	4,734 71
Sundries—Materials, etc.	1,670 87
Balance, December 31, 1878.	3,008 00
	20,065 58

Street Improvement Fund—

Vouchers transmitted to the Commissioner of Public Works.....	\$82,419 77
Pay-rolls of Engineers, etc.....	\$10,220 79
“ Inspectors on sewers, etc.....	3,604 00
On contracts for sewers, etc.....	67,852 14
Sundries.....	742 84
	<u>82,419 77</u>

Work done by Mechanics and Laborers, William Webb, Foreman—

1,227	receiving-basins and culverts cleaned.
2,245	lineal feet of sewer cleaned.
803	lineal feet of sewer rebuilt.
171	lineal feet of culvert rebuilt.
129	lineal feet of spur pipe laid.
1	receiving-basin rebuilt.
49	receiving-basins repaired.
26	new basin heads and gutter stones put on.
17	basin-heads and gutter-stones reset.
8	new basin covers put on.
17	basin covers replaced.
3	manholes built.
128	manholes repaired.
35	new manhole frames and covers put on.
21	new manhole covers put on.
100	manhole frames and covers reset.
81	cubic feet of brick masonry laid.
788	cubic yards of earth excavated.
906	cubic yards of earth filled in.
88	square feet of sidewalk relaid.
1,522	square yards of pavement relaid.
2,550	cart loads of dirt removed.

Work done by contract—

10,736	lineal feet of sewer built.
743	lineal feet of culvert built.
39	receiving-basins built.
154	lineal feet of house connections built.
29	lineal feet of old culvert rebuilt, and
1,471	piles driven.
Making the present total length of sewerage in the city 1,949,337 lineal feet (369 19-100 miles), with 4,489 receiving-basins.	

Statement of Out Door Work done by the Employees of the Bureau of Sewers, for the Year ending December 31, 1878.

By Mechanics and Laborers, William Webb, Foreman—

5,200	receiving-basins and culverts cleaned.
11,400	lineal feet of sewer cleaned.
2,683	lineal feet of sewer rebuilt.
521	lineal feet of culvert rebuilt.
360	lineal feet of spur pipe laid.
7	receiving-basins rebuilt.
244	receiving-basins repaired.
68	new basin heads and gutter stones put on.
49	basin heads and gutter stones reset.
41	new basin covers put on.
112	basin covers replaced.
22	new manholes built.
484	manholes repaired.
157	new manhole frames and covers put on.
343	manhole frames and covers reset.
78	new manhole covers put on.
3,186	cubic yards of earth excavated.
3,823	cubic yards of earth filled in.
10	cubic yards of concrete laid.
240	cubic feet of stone wall built.
81	cubic feet of brick masonry laid.
63	lineal feet of curb and gutter stone reset.
2,530	square feet of sleepers and plank relaid and spiked.
398	square feet of crosswalk relaid.
376	square feet of sidewalk relaid.
2,980	square yards of pavement relaid.
9,922	cart loads of dirt removed.

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF STREET IMPROVEMENTS—ROOM 11, CITY HALL,
NEW YORK, January 6, 1879.

Hon. ALLAN CAMPBELL, Commissioner of Public Works:

SIR—I have the honor to transmit herewith a report of the transactions of this Bureau for the months of October, November, and December, 1878, showing statements of the amount of work done on the various contracts; of the amount of vouchers drawn; of contracts completed, and contracts under way and suspended; also permits issued by this Bureau during these three months as well as during the year 1878.

For contracts entered during this period I beg to refer to the Contract Clerk's report
Respectfully,

GEO. A. JEREMIAH,
Superintendent of Street Improvements.

Statement showing the amount of Work done in 1878.

	From Oct. 1 to Dec. 31.	From Jan. 1 to Dec. 31.
Earth excavation.....cubic yards,	2,342.	5,786.05
Rock “.....“	939.	28,864.73
Filling furnished.....“	70,607.	390,809.15
Curb and gutter-stones set.....lineal feet,	9,710.41	38,653.62
Curb and gutter-stones reset.....“	662.53	1,587.53
Curb-stones furnished and set.....“	258.90	258.90
Curb-stones not furnished, but set.....“	1,973.30	1,973.30
Flagging laid.....square yards,	67,575.80	250,499.41
Flagging not furnished, but laid.....“	5,206.80	5,206.80
Flagging relaid.....“	2,662.68	6,653.28
Fence built.....lineal feet,	614.33	2,724.24
Rubble range masonry.....cubic yards,	.....	1,535.
Brick masonry.....“	.....	600.
Curb-stone set.....“	.....	40.
Elm trees planted.....	.....	172
Maple trees planted.....	.....	266

WORKS COMPLETED DURING OCTOBER, NOVEMBER, AND DECEMBER, 1878.

Regulating, Grading, etc.—

Fourth avenue, from One Hundred and Second to One Hundred and Tenth street.
Eighth avenue, from One Hundred and Twenty-eighth street to the Harlem river.
Ninth avenue, from Seventy-second to Eighty-first street.
Tenth avenue, from One Hundred and Tenth to Manhattan street.
Eighty-eighth street, from First avenue to Avenue A.
Ninety-sixth street, from Boulevard to Hudson river.
One Hundredth street, from Bloomingdale road to Boulevard.

Flagging—

East side of Madison avenue, from Fifty-sixth to Fifty-seventh street, and north side of Fifty-six street, between Fourth and Madison avenues.
North side of Fifty-seventh street, between Third and Lexington avenues.
Eighty-fifth street, from First avenue to Avenue A.
In front of No. 411 East Thirty-fourth street.

Fencing Vacant Lots—

South side of Fifty-seventh street, between Fifth and Sixth avenues.
North side of Seventy-fourth street, between Fourth and Madison avenues.
Eighty-fifth street, between First avenue and Avenue A, and also on southwest corner of Eighty-sixth street and Avenue A.

AMOUNT OF VOUCHERS DRAWN DURING OCTOBER, NOVEMBER, AND DECEMBER, 1878.

On account of Regulating, Grading, etc.....	\$95,529 14
“ Boulevard and Avenues.....	5,816 35
“ Street Improvements—For street signs, etc.....	30 00
“ Flagging Sidewalks, and Fencing Vacant Lots in front of City Property.....	585 43
“ Contingencies—Department of Public Works.....	126 70
“ Salaries—Department of Public Works.....	48 00
Total.....	<u>\$102,135 62</u>

PERMITS ISSUED DURING 1878.

Twelve permits to property-owners to regulate, grade, etc., in front of their premises.

AMOUNT OF VOUCHERS DRAWN DURING THE YEAR 1878.

On account of Regulating, Grading, etc.....	\$265,468 10
“ Boulevard and Avenues.....	16,266 12
“ Street Improvements—For Streets Signs, etc.....	548 00
“ Flagging Sidewalks and Fencing Vacant Lots in front of City Property.....	1,081 99
“ Contingencies—Department Public Works.....	1,294 20
“ Salaries—Department Public Works.....	48 00
Total.....	<u>\$284,706 41</u>

APPROPRIATIONS FOR 1878.

Street Improvements—For Street Signs, etc.....	\$1,000 00
Amount of Vouchers drawn.....	\$548 00
“ transfer by Board of Estimate and Apportionment.....	380 00
“ balance on December 31, 1878.....	72 00
	<u>1,000 00</u>

Flagging Sidewalks and Fencing Vacant Lots in Front of City Property.

Appropriation for 1878.....	\$1,000 00
By transfer by Board of Estimate and Apportionment.....	100 00
	<u>\$1,100 00</u>
Amount of vouchers drawn.....	\$1,081 99
“ balance on December 31, 1878.....	18 01
	<u>\$1,100 00</u>

List of Works Completed during the Year 1878 and their Total Cost.

Regulating, Grading, etc—	
Fourth avenue, from One Hundred and Second to One Hundred and Tenth street.....	\$10,740 84
Eighth avenue, from One Hundred and Twenty-eighth street to Harlem river.....	180,499 45
Ninth avenue, from Seventy-second to Eighty-first street.....	9,542 72
Tenth avenue, from Ninety-fifth to One Hundred and Tenth street.....	13,875 42
Tenth avenue, from One Hundred and Tenth to Manhattan street.....	124,618 72
Eleventh avenue, from Fifty-ninth to Seventy-second street.....	42,152 24
Seventy-eighth street, from Boulevard to Ninth avenue.....	19,068 29
Eighty-first street, from Ninth to Tenth avenue.....	4,717 11
Eighty-eighth street, from First avenue to Avenue A.....	1,664 82
Ninety-sixth street, from Boulevard to Hudson river.....	25,938 74
One Hundredth street, from Bloomingdale road to Boulevard.....	718 99
One Hundred and Ninth street, from Third to Fifth avenue.....	2,763 95
One Hundred and Twelfth street, from Madison avenue to a point 175 feet east.....	845 64
One Hundred and Forty-sixth street, from Tenth avenue to Boulevard.....	9,215 06
	<u>\$446,361 99</u>
Curb, Gutter, and Flagging—	
Fourth avenue, from Seventy-first to Seventy-ninth street.....	\$2,580 23
Sixty-third street, from First avenue to East river.....	1,965 40
Seventy-sixth street, from First avenue to Avenue A.....	935 81
	<u>\$5,481 44</u>
Flagging—	
East side of Madison avenue, from Fifty-sixth to Fifty-seventh street, and north side of Fifty-sixth street, between Fourth and Madison avenues.....	\$331 29
East side of Second avenue, from Sixty-fourth to Sixty-fifth street.....	201 84
North side of Twenty-second street, from First avenue to Avenue A.....	302 44
In front of No. 411 East Thirty-fourth street.....	30 96
South side of Fortieth street, between First and Second avenues.....	269 25
North side of Fifty-seventh street, between Third and Lexington avenues.....	145 20
North side of Fifty-eighth street, between Lexington and Fourth avenues.....	151 57
Eighty-fifth street, from First avenue to Avenue A.....	465 53
Total.....	<u>\$1,898 08</u>
Flagging and Fencing—	
Fifty-fifth street, between Madison and Fourth avenues.....	\$415 10
	<u>\$1,037 56</u>
Fencing Vacant Lots—	
Northwest corner of Madison avenue and One Hundred and Twenty-fourth street.....	\$53 97
Northeast corner of Madison avenue and Fifty-sixth street.....	41 23
Northeast corner of Eighty-third street and Second avenue.....	16 00
South side of Twenty-fourth street, 82 feet east First avenue.....	35 80
South side of Fifty-seventh street, between Fifth and Sixth avenues.....	9 32
South side of Fifty-seventh street, between Second and Third avenues.....	32 25
North side of Seventy-fifth street, between Second and Third avenues.....	104 55
North side of Seventy-fourth street, between Fourth and Madison avenues.....	106 14
South side of Seventy-ninth street, north side of Seventy-eighth street, and east side of Madison avenue, between Seventy-eighth and Seventy-ninth streets.....	202 89
South side of Eighty-third street, north side of Eighty-second street, and east side of Fifth avenue, between Eighty-second and Eighty-third streets.....	317 11
Eighty-fifth street, between First avenue and Avenue A, and also on southwest corner of Eighty-sixth street and Avenue A.....	118 30
Total.....	<u>\$1,037 56</u>

RECAPITULATION

OF CONTRACTS COMPLETED DURING 1878.

14 contracts for regulating, grading, etc.....	\$446,361 99
3 “ curb, gutter, and flagging.....	5,481 44
8 “ flagging.....	1,898 08
1 “ flagging and fencing.....	415 10
11 “ fencing vacant lots.....	1,037 56
37 contracts amounting to.....	<u>\$455,194 17</u>

GEO. A. JEREMIAH,
Superintendent Street Improvements.

EXHIBIT "A,"

Showing the Number and Amount of Vouchers drawn on account of the Appropriations therein named, from October 1, 1878, to December 31, 1878, inclusive.

TITLE OF APPROPRIATION.	NUMBER OF VOUCHERS.	AMOUNT.
Supplies for and Cleaning Public Offices.....	78	\$23,999 61
Public Buildings—Construction and Repairs.....	68	7,728 03
Free Floating Baths.....	7	509 02
Additional Free Floating Baths.....	10	1,975 09
Totals.....	163	\$34,211 75

EXHIBIT "B,"

Showing the Amount of Expenditures for which Certified Vouchers have been drawn on account of the several Appropriations therein named, and also showing the Buildings, Courts, Departments, etc., to which the same has been charged, from October 1, 1878, to December 31, 1878, inclusive.

NAMES OF BUILDINGS, COURTS, DEPARTMENTS, ETC.	Supplies for and Cleaning Public Offices.	Public Buildings—Construction and Repairs.	Free Floating Baths.	Additional Free Floating Baths.	TOTALS.
First District Police Court.....	\$50 62				\$50 62
Second ".....	1 50				1 50
Third ".....	89 35	\$49 97			139 32
Fifth ".....	53 00				53 00
Sixth ".....	1 50				1 50
First District Civil Court.....	101 00				101 00
Second ".....	24 43				24 43
Third ".....	15 50				15 50
Fourth ".....	32 61				32 61
Fifth ".....	73 95	8 20			82 15
Sixth ".....	68 88	20 50			89 38
Seventh ".....	11 80				11 80
Eighth ".....	53 28	4 75			58 03
Ninth ".....	12 48				12 48
Court of General Sessions.....	29 08				29 08
Court of Special Sessions.....	66 87				66 87
Supreme Court.....	792 43				792 43
Superior Court.....	412 32				412 32
Marine Court.....	112 68				112 68
Court of Common Pleas.....	52 46				52 46
Washington Market.....		47 33			47 33
Jefferson ".....		59 47			59 47
Clinton ".....		319 89			319 89
Union ".....		146 67			146 67
Fulton ".....		369 40			369 40
Essex ".....		210 59			210 59
Centre ".....		87 01			87 01
Tompkins ".....		684 80			684 80
Gouverneur ".....		41 64			41 64
Commissioner's Office, D. P. W.....	9 00				9 00
Chief Clerk's Office.....	39 79				39 79
Bureau of Repairs and Supplies.....	305 83	392 73			698 56
Bureau of Repairs and Supplies, Pay-rolls.....	17,530 90	468 00			18,000 90
Bureau of Lamps and Gas.....	1 47				1 47
Bureau of Incumbrances.....	4 75				4 75
Bureau of Sewers.....	34 90				34 90
Mayor's Office.....	6 75				6 75
Corporation Counsel.....	38 30				38 30
Corporation Attorney.....	36 50				36 50
Public Administrator.....	5 00				5 00
District Attorney.....	28 20				28 20
Register's Office.....	50 21	221 21			271 42
Surrogate's Office.....	12 46				12 46
Engineer's Office, One Hundred and Twenty-fifth street.....	15 75				15 75
Board of Assessors.....	46 28				46 28
Department of Finance.....	112 85				112 85
Department of Buildings.....	57 40				57 40
Department of Taxes and Assessments.....	34 30				34 30
Free Floating Baths.....		\$509 02			509 02
Additional Free Floating Baths.....		\$1,975 09			1,975 09
New Court-house.....	959 21	673 35			1,632 56
City Hall.....	763 20	1,430 99			2,194 19
Brown Stone Building.....	191 90	669 76			861 66
Third District Court-house.....	389 77	329 53			719 30
Seventh District Court-house.....	226 06	291 37			517 43
Ninth District Court-house.....	30 24	27 19			57 43
Tenth District Court-house.....	128 54	4 08			132 62
County Jail.....	247 24	481 63			728 87
City Prison.....	15 50	66 56			82 06
Dispensary Building.....	8 50	41 07			49 57
49 Beekman street.....	38 64				38 64
27 Chambers street.....	47 40				47 40
202 West 31st street.....		127 80			127 80
128 West Broadway.....		7 52			7 52
Troop "A".....	26 00				26 00
Troop "B".....	47 00				47 00
Battery "K".....	66 50				66 50
Fifth Regiment.....	60 00				60 00
Seventh ".....	37 50				37 50
Eighth ".....	16 00				16 00
Ninth ".....	9 50				9 50
Eleventh ".....	26 00				26 00
Twelfth ".....	32 50				32 50
Twenty-second Regiment.....	80 03	445 00			525 03
Sixty-ninth ".....	49 00				49 00
Seventy-first ".....	11 00				11 00
Totals.....	\$23,999 61	\$7,728 03	\$509 02	\$1,975 09	\$34,211 75

EXHIBIT "C,"

Showing the condition of the Appropriations of 1878, upon which Vouchers have been drawn, from October 1, 1878, to December 31, 1878, inclusive.

Supplies for and Cleaning Public Offices—	
Balance September 30, 1878.....	\$23,000 70
Amount transferred.....	2,250 00
	\$25,250 70
Vouchers drawn.....	\$23,999 61
Liabilities (estimated).....	1,248 44
	25,248 05
Available balance December 31, 1878.....	\$2 65
Public Buildings—Construction and Repairs—	
Balance September 30, 1878.....	\$16,859 60
Amount transferred.....	9,000 00
	\$7,859 60
Amount transferred.....	250 00
	\$8,109 60
Vouchers drawn.....	\$7,728 03
Liabilities (estimated).....	351 11
	8,079 14
Available balance December 31, 1878.....	\$30 46

Additional Free Floating Baths—

Balance September 30, 1878.....	\$6,251 91
Vouchers drawn.....	\$1,975 09
Liabilities (estimated).....	310 50
	2,285 59
Available balance December 31, 1878.....	\$3,966 32
Free Floating Baths—	
Balance September 30, 1878.....	\$3,397 74
Amount transferred.....	3,000 00
	\$397 74
Amount transferred.....	280 00
	\$677 74
Vouchers drawn.....	\$509 02
Liabilities (estimated).....	155 50
	664 52
Available balance December 31, 1878.....	\$13 22

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF STREET INCUMBRANCES—ROOM 13, CITY HALL,
NEW YORK, January 6, 1879.

Hon. ALLAN CAMPBELL, Commissioner of Public Works:

I respectfully submit herewith a quarterly report of the operations of this Bureau for the quarter ending December 31, 1878 (months of October, November, and December), as well as a condensed statement of the entire business during the year 1878:

Complaints received against obstructions and incumbrances on streets and sidewalks, 705, which in every case was followed by the service of an official notice to the offending party for the removal of the obstruction or incumbrance.

The number of removals to the Corporation Yard, or other suitable place, of merchandise, trucks, wagons, stands, stones, dirt, etc., 59.

The expense of such removals (including 670 loads of stones and dirt) from various parts of the city, was \$536.

The total expenses for the quarter, \$1,078.50.

Amount received from owners for redemption of articles seized and redeemed, \$32, which amount was paid over to the City Chamberlain.

Number of builders' permits issued during quarter..... 1,805

“ permits to cut down trees..... 11

“ special permits..... 53

“ notices to repair sidewalks..... 178

“ vault covers..... 1

During the year 1878, the total number of complaints received and notices issued therefor..... 3,616

Removals to Corporation Yards, etc..... 158

“ of loads of stones, refuse material, etc..... 3,367

Builders' permits issued..... 5,200

Permits to cut down trees..... 28

“ for special purposes..... 219

Notices to repair sidewalks..... 992

“ vault covers..... 7

Total expenditures for the year, \$4,248.23.

Receipts from sale at Corporation Yard of merchandise, trucks, etc., etc., seized by this Bureau..... \$160 35

Received from owners for seizures redeemed..... 161 75

Total..... **\$322 10**

—which amount was paid over to the City Chamberlain.

As I stated in a former report, the work of this Bureau has not been always of such a character as to permit its performance without embarrassment and sometimes considerable trouble.

The position which the Board of Aldermen and other city officials have assumed with reference to the obstruction of streets and sidewalks by all manner of unseemly and unnecessary stands, booths, etc., etc., has added vastly to the labor of this Bureau, and often set at naught its efforts to abolish even the most flagrant and apparent violations of public and private rights.

Under your instructions and the clear intent and purposes of the law, as set forth in the opinion of the Corporation Counsel, this Bureau has gone steadily on in its work, and has at least attempted to perform the undoubted object for which it was created, and which the people of this city expect of it.

During the last quarter the attention of this Bureau was called to the almost impassable condition of Vesey and other streets approaching Washington Market, by reason of the large number of stands, platforms, etc., which were placed thereon for the sale of all manner of meats, poultry, fruit, vegetables, and other merchandise. These obstructions were of such a character that not only the public were seriously inconvenienced, but the owners and occupants of the stores bitterly complained of the annoyance and nuisance created thereby.

When this Bureau attempted to remove these obstructions it was met with the claim that the Clerk of Washington Market had issued permits therefor, and would insist on his right to control all the streets within 300 yards of the market, and allow whatever obstructions or incumbrances he saw proper.

Acting under your instructions I, with two Inspectors, repaired to the scene of operations, and after considerable trouble and difficulty removed some thirty stands and platforms, virtually leaving the streets clear and open for travel and business.

A few days thereafter the Sinking Fund Commissioners, under the plea of protecting the revenues of the city, engaged counsel, and obtained the usual convenient injunction, by which the hands of the law restraining the violation of the rights of property and the public were tied, and the evil abated by us again permitted to grow and flourish with all the increased vigor of its temporary triumph.

The case has since been fully argued, and will doubtless soon receive a judicial interpretation. To my mind and in my humble judgment the paramount rights of the public to the use of the public highways is so clear in law and in justice that no quibbling as to the mere policy of a paltry income to the revenues of the city, or to the advantage of a few interested individuals, can hold for one moment to the deprivation of, or interference with, such rights.

In the full light of the people's verdict at the late election, may we not hope that the year 1879 may bring about a more harmonious and better understanding between those branches of the City Government who should work conjointly in regard to these matters, and that some clearly and defined laws and methods may be adopted to the end that the streets and sidewalks of our city shall be in fact, as they are in-law, the property and convenience of the whole public.

As will be easily seen by comparison, the work done by this Bureau during the past year is largely in excess of previous years, and I venture to assert that certainly not within ten years have the streets been as free from dangerous obstructions in the way of large stones, etc., to the peril of life and limb to those driving after dark, etc., as at the present time. There is no good or valid reason why the streets and sidewalks of this great city, should not present a proper appearance in their freedom from unnecessary and hideous obstructions and incumbrances.

Respectfully,

JOSEPH BLUMENTHAL,
Superintendent of Incumbrances.

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF LAMPS AND GAS,
NEW YORK, January 4, 1879.

Hon. ALLAN CAMPBELL, Commissioner of Public Works:

SIR—In compliance with the directions contained in your circular letter of 5th ultimo, I herein submit a report of the transactions of the Bureau of Lamps and Gas for the quarter ending December 31, 1878, with a summary of the same for the entire year.

Exhibit "C" is a summary of the appropriation for "Lamps and Gas," showing the amounts expended in each of the four quarters, and total for the year, also the surplus balance and how it has been disposed of.

Exhibit "D" is a summary of the "Lamp Account," and shows the changes in the number of lamps lighted by each gas company during the quarter and the year; the net increase during the year being six hundred and twenty-two.

Exhibit "E" shows the average illuminating power of the gases supplied by the several gas companies.

Exhibit "F" is a table showing figures relative to the public lamps in the principal cities of this country and Europe.

Exhibit "H" is a time table for lighting and extinguishing the public lamps of this city for the year 1879.

Exhibit "G" is a copy of the existing contracts for lighting the public lamps for the year ending April 30 next.

The apparatus or appliances required for the successful production of the light consist of an engine for supplying the necessary motive power to the machine (and it is of the highest importance that the engine employed shall be capable of performing its functions with the utmost regularity of movement ; there must be no sudden, jerking or irregular motions, but, on the contrary, its work must be performed in an easy, steady, and regular manner during all its continuous revolutions ; the power required is about two-horse power per lamp) ; a magneto-electric machine, for generating a continuous and powerful current of electricity ; a lamp containing the carbon electrodes ; two carbons for each lamp from which the light is obtained, one is called the positive and the other the negative carbon ; a regulator or contrivance for establishing and constantly maintaining a proper distance between the carbons ; the necessary copper wire for conducting the electric current from the machine to the lamp.

It has, no doubt, been presumed by some that the electric force is produced in the manner ordinarily employed by electricians, but it is not so, for no battery is used, nor zincs, acids, or other chemical agents employed, although it can be so obtained for laboratory experiments, or for lighting on a small scale. The electric current required for effective electric illumination is magneto-electricity, and is obtained from the machine, as before stated, by the aid of steam or other motive power.

Generating machines of various kinds have been devised in Europe, and several in this country, the American machines being equal, and in some respects superior, to those made abroad. They generally bear the name of their inventor, and, although of different form and make, are all based upon the same principle. The latest and, said to be, the best machines in Europe, are the "Gramme" and the "Siemens," manufactured in Paris, which are used in lighting several manufacturing establishments and yards, and are also employed on several vessels of the French and Russian navies. In this country we have the Hockhausen, the Weston, the Fuller, the Wallace-Farmer, and the Brush machines.

Among other serious objections or drawbacks to the use of the electric light is its almost constant wavering or fluctuations, or we might call it a severe blinking, frequently presenting the appearance of about being extinguished, and showing no luminosity, but only a live coal or red ember. This has, no doubt, been noticed by all observers. This defect arises from several causes, one of which is from the irregular action of the motor or machine, which is transmitting a varying current of electricity; others arise from the carbons, sometimes by impurities, but most generally by the gradual separation as combustion goes on. The positive carbon is wasted away twice as fast as the negative carbon; hence the space between the two points becomes too great, the voltaic arc is lost, and the light disappears and is gone until the positive carbon is again brought into contact with the negative carbon and then separated to the proper distance, when the voltaic arc is again renewed, and the light reappears in all its brilliancy. To remedy the defects of the separation of the carbons, and to provide a steady and even light, regulators of various kinds have been devised, some composed of a sort of clock-work mechanism, some worked by counterpoise weights, and others by a magnet only; and, notwithstanding much has been done in the way of improvement, much more yet remains to be done before the difficulty is entirely overcome.

Considerable attention is now being paid to the manufacture of the carbon electrodes, as it is very requisite that they should be chemically pure in order to provide a regular and brilliant light. The carbon pencils first used were made from the retort carbon found in gas retorts, which was cut to proper size and shape. It was found, however, that this material contained some objections; it does not possess a uniform density; it is quite brittle, and hence is liable to splinter and break; it contains foreign matters, and these produce considerable variations in brilliancy. A very good carbon is now made from the best coke, which is pulverized to a fine powder and mixed with some suitable gummy substance into a paste, then pressed in moulds to the proper form, and baked, and sometimes covered with a coating of copper. They are in shape generally cylindrical or rectangular, varying in size from a quarter-inch to one inch, and are of various lengths; the Wallace lamps sometimes use carbons in the shape of blocks one-half inch in thickness and from two to ten inches in width.

From the foregoing description all technical phrases have been omitted, so that an insight can be obtained as to what is required for the production of this so-called "wonderful light," which is pronounced to revolutionize the whole field of artificial illumination. During the past year the public has had frequent opportunities of seeing it in operation and witnessing its effects. It has been shown at Manhattan Beach, where three lamps were lighted by the Hockhausen machine, run by a ten horse power Baxter engine. It was used outside of Gilmore's Garden, the Cathedral Fair, Macy's, and Lord & Taylor's by the same parties, and with good effect, the naked light being shown at these places. It is now employed at the Equitable building, where two "Maxim" lamps are used in ground glass globes, for lighting the basement hall, and fed from a Wallace machine. It was exhibited at the late fair of the American Institute, at which place twenty-five lamps were lighted, all in opal or ground glass globes. Of these, twenty-one were supplied from five Wallace machines, and four from one Brush machine. Nineteen of the Wallace lamps were in the main building, an inclosed place 285 feet by 135 feet, and the four Brush lamps were in Machinery Hall. In addition to the above twenty-five electric lamps, all the gas-burners were kept lighted, although the gas was slightly checked at the meter. This was a wise precaution; because, first, the electric lamps did not afford sufficient light, and second, to guard against the risk of the building being placed in darkness in case of accident to the engines or machines.

With a view of ascertaining whether the use of this light can be made available in any of the public buildings or places over which this Department has jurisdiction, I have frequently examined all the lamps and machines shown in this vicinity, and have given the matter careful consideration. I have looked at it from various standpoints, and, having studied its merits and demerits, I know that it cannot be used with advantage by this city. I am also free to assert that the electric light, as at present constituted, cannot compete with gas as an economical, convenient, and reliable illuminating agent for the ordinary purposes of a public light.

When considering the adoption of this light, and entirely dispensing with gas, the question of its reliability for general use should certainly be taken into account, and we should see whether it can be depended upon at all times and under all emergencies, without interruption or possible failure, for furnishing a perfectly sure and steady light. We know that electricity cannot, as can gas, be stored for future expected uses, but that it must be generated or produced as and when needed. We also know that artificial light is required, more or less, at all times of the twenty-four hours of the day. The necessities of some parts of a building may require artificial light during the day, while other parts may need light only at night; some parts may require a few lights of small volume, another part many lights of large volume, and these requirements may frequently vary. During the winter months a vast amount of artificial light is required, during the summer comparatively little. With gas the supply can be regulated, and the distribution insured, and a slight accident at the works need not affect the consumer. In summer but little coal need be carbonized, and but few retorts kept at work. It is not so, however, with the electric light, as for this, the same magneto-electric machines must be used in summer as in the winter, and the varying necessities of a house cannot well be known. To produce the light by the electric current these engines and machines must be kept constantly and incessantly at work, and the machines moving at the rate of from 800 to 1,000 revolutions per minute; there can be no cessation, not even for an instant, for the moment the engine or machine stops its work, that moment the electric current ceases. Now, all persons having any knowledge of machinery particularly of the steam engine, are well aware of its sudden liability to derangement; how, at an inopportune moment, when least expected, and when it can least be spared, something may give out, such as the breaking of a crank-pin, the loosening of a screw, or perhaps some more serious matter, and when such things occur, out goes the light, and no more can be obtained until repairs have been made or other motive power or machine supplied. It would seem, therefore, most essential that in order to provide for such emergencies, and to insure an almost continuous and permanent light, it would be necessary to have at hand an extra engine or machine ready for immediate use.

In the foregoing remarks, I have referred only to the electric light of to-day, and with the view of showing that this city cannot use it with advantage. I do not mean to assert that the future will not bring forth better results, but I do say that until some practical method is devised for subdividing this light, that is to say, instead of giving one intense light of two or three thousand candles, giving an equivalent number of lights of small foci, varying from six to twenty candles, and doing this without the enormous loss of electric force, and in an economical and perfectly reliable manner, there is not much probability that this light will ever be applied to general household illumination.

Of course, there are many places in which it can now be utilized with advantage. In lighting mines, by incandescence and in vacuum, it would be an excellent substitute for the feeble and somewhat dangerous miner's lamp. For lighting large yards, factories, lighthouses, large excavations, river steamboats, ocean steamers, and steamship piers, and other places where surplus motive power is at hand, it might be used with good effect. It might also be made available, if not very economical, in a large park, like Central Park, where it is not deemed expedient or desirable to lay gas-mains. In cases such as these the electric light will have its sphere in the lighting world, as gas will hold its own place. No doubt the demand for gas may be lessened in some places where the new light might be substituted, but what business should be lost in this way can more than be made up in another; for by proper and earnest effort on the part of gas managers, the uses of gas can be extended to purposes other than illumination. Let the gas makers of the world take advantage of every improvement in the method of its manufacture, so that its production will be cheapened, its quality improved, the residual products utilized, the expense of distribution economized, and the leakages reduced to a minimum; then let the managers endeavor to educate the people as to the advantages to be obtained from its further use, and I venture to say that the consumption of gas, instead of being diminished, will be very largely increased during the next decade.

I submit herewith a report on the electric light, made by Mr. Love, the Gas Examiner of this Department, in which will be found woodcuts and descriptions of the Wallace and Brush machines and lamps, and the manner of their working.

Very respectfully,

S. McCORMICK, Superintendent of Lamps and Gas.

EXHIBIT "C."

Summary of the Appropriation for "Lamps and Gas for 1878," showing the amount of Expenditures during the Year, with the Balance standing to the Credit of the Appropriation.

Amount appropriated for "Lamps and Gas," 1878.....	\$600,000 00
Amount of vouchers drawn in first quarter ending March 31.....	\$93,031 44
Amount of vouchers drawn in second quarter ending June 30.....	130,525 75
Amount of vouchers drawn in third quarter ending September 30.....	118,435 33
Amount of vouchers drawn in fourth quarter ending December 31.....	156,809 04
	498,801 56
Balance.....	\$101,198 44

Less amounts transferred by Board of Apportionment, as follows:

May 28. To "Contingencies, Mayor's Office, 1878".....	\$3,500 00
" 28. To Department of Public Charities and Correction, "for the erection of a Brick Pavilion at Bellevue Hospital for insane patients".....	10,000 00
June 5. To "Public Buildings—Construction and Repairs, 1878".....	5,000 00
" 19. To "Repaving under Chapter 476, Laws of 1875".....	65,000 00
Aug. 1. To "Third District Court-house, 1877".....	190 41
" 9. To "Aqueduct—Repairs and Maintenance, 1878".....	10,000 00
Oct. 3. To "Maintenance and Government of Parks and Places—For the keeping, preservation, and exhibition of the collection in the American Museum of Natural History and the Metropolitan Museum of Art".....	5,000 00
" 14. To "Repairs and Renewal of Pavements, 1878".....	2,500 00
Total transfers.....	\$101,190 41
Surplus Balance.....	\$8 03

EXHIBIT "D."

Summary of the "Lamp Account," showing the number of New Lamps Lighted, Old Lamps Relighted, and number discontinued by each Gas Company, during the Quarter ending December 31, 1878, with a Recapitulation for the Year.

NEW YORK GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	3,206
Number of new lamps lighted during the quarter.....	16
Number of old lamps relighted during the quarter.....	3,222
Less lamps discontinued during the quarter.....	3
Total number of lamps burning December 31, 1878.....	3,219

MANHATTAN GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	6,649
Number of new lamps lighted during the quarter.....	4
Number of old lamps relighted during the quarter.....	5
Less lamps discontinued during the quarter.....	3
Total number of lamps burning December 31, 1878.....	6,655

METROPOLITAN GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	3,940
Number of new lamps lighted during the quarter.....	13
Number of old lamps relighted during the quarter.....	22
Less lamps discontinued during the quarter.....	20
Total number of lamps burning December 31, 1878.....	3,955

NEW YORK MUTUAL GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	587
Number of new lamps lighted during the quarter.....	6
Number of old lamps relighted during the quarter.....	593
Less lamps discontinued during the quarter.....	6
Total number of lamps burning December 31, 1878.....	587

HARLEM GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	3,829
Number of new lamps lighted during the quarter.....	19
Number of old lamps relighted during the quarter.....	13
Less lamps discontinued during the quarter.....	1
Total number of lamps burning December 31, 1878.....	3,860

NEW YORK AND NEW JERSEY GLOBE GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	509
Number of new lamps lighted during the quarter.....	2
Number of old lamps relighted during the quarter.....	2
Less lamps discontinued during the quarter.....	3
Total number of lamps burning December 31, 1878.....	510

CENTRAL GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	1,667
Number of new lamps lighted during the quarter.....	12
Number of old lamps relighted during the quarter.....	5
Less lamps discontinued during the quarter.....	3
Total number of lamps burning December 31, 1878.....	1,681

NORTHERN GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	994
Number of new lamps lighted during the quarter.....	6
Number of old lamps relighted during the quarter.....	1,000
Less lamps discontinued during the quarter.....	
Total number of lamps burning December 31, 1878.....	1,000

YONKERS GAS-LIGHT COMPANY.

Number of lamps burning September 30, 1878.....	72
Number of new lamps lighted during the quarter.....	
Number of old lamps relighted during the quarter.....	72
Less lamps discontinued during the quarter.....	
Total number of lamps burning December 31, 1878.....	72

Total number of public lamps burning under Department of Public Works December 31, 1878.....	21,539
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RECAPITULATION FOR QUARTER.

Number of lamps burning September 30, 1878.....	21,453
Number of new lamps lighted during the quarter.....	72
Number of old lamps relighted during the quarter.....	53
Less lamps discontinued during the quarter.....	39
Total number of lamps burning December 31, 1878.....	21,539

RECAPITULATION FOR YEAR.

Number of lamps burning December 31, 1877.....	20,917
Number of new lamps lighted during the year.....	628
Number of old lamps relighted during the year.....	150
Less lamps discontinued during the year.....	156
Total number of lamps burning December 31, 1878.....	21,539
Number of lamps burning under Department of Public Parks.....	628
Total number of lamps burning in city December 31, 1878.....	22,167

EXHIBIT "E."

Statement showing the Illuminating Power of the Gas supplied by the several Gas-light Companies, during the Quarter ending December 31, 1878, as shown by the Daily Observations at the Photometrical Rooms of the Department of Public Works, with the Average for the Year.

FOR WHAT TIME.	During the Week Ending—	NEW YORK GAS CO.			MANHATTAN GAS CO.			NEW YORK MUTUAL GAS CO.			METROPOLITAN GAS CO.			HARLEM GAS CO.		
		ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.		
		Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.
Oct.	5...	16.48	17.14	16.72	17.82	18.42	18.09	20.01	21.68	20.90	17.08	17.32	17.19	16.24	16.77	16.57
"	12...	16.50	17.64	17.04	16.84	18.18	17.70	20.02	21.18	20.64	16.68	17.40	16.99	15.21	16.30	15.79
"	19...	16.28	17.14	16.77	17.28	18.20	17.68	19.90	21.49	20.54	16.64	17.05	17.23	15.46	17.47	16.89
"	26...	16.36	16.93	16.60	17.64	18.03	17.89	20.26	20.91	20.50	17.02	18.01	17.51	16.44	17.80	17.07
Nov.	2...	16.18	16.88	16.62	16.89	19.56	17.83	19.58	20.99	20.17	17.18	17.99	17.71	16.01	16.50	16.29
"	9...	16.08	16.98	16.59	17.09	18.10	17.52	19.38	20.89	20.11	17.20	17.68	17.45	16.42	16.58	16.53
"	16...	14.68	17.35	16.07	16.49	17.96	17.24	18.74	20.06	19.29	16.44	16.95	16.69	16.13	16.79	16.34
"	23...	15.47	17.09	16.35	15.54	17.66	16.98	18.21	18.99	18.81	16.30	17.32	16.83	16.04	16.58	16.30
"	30...	16.03	16.74	16.37	17.20	17.99	17.43	17.82	19.01	18.50	16.94	17.23	17.08	16.15	16.52	16.30
Dec.	7...	16.00	16.72	16.33	16.52	17.47	17.03	18.13	19.92	18.90	16.81	17.46	17.01	15.03	16.57	15.89
"	14...	15.57	16.77	16.20	16.22	17.44	16.79	18.52	19.07	18.70	17.13	17.69	17.43	16.08	16.77	16.46
"	21...	16.12	16.82	16.50	16.47	16.97	16.90	18.79	19.83	19.39	16.55	17.08	16.92	15.00	16.71	15.66
"	28...	14.56	16.52	15.41	15.68	17.38	16.44	17.34	19.77	18.94	16.63	17.19	16.95	15.66	16.61	15.39

Average Illuminating Power, in Candles, for the Year 1878.

FOR WHAT TIME.	Month.	NEW YORK GAS CO.			MANHATTAN GAS CO.			NEW YORK MUTUAL GAS CO.			METROPOLITAN GAS CO.			HARLEM GAS CO.		
		ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.			ILLUMINATING POWER IN CANDLES.		
		Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	Lowest.	Highest.	Average.
January	...	15.06	18.10	16.24	15.64	17.29	16.59	17.16	20.54	19.09	16.09	17.49	17.04	15.76	16.86	16.30
February	...	14.48	17.68	16.49	15.38	17.84	16.67	18.09	20.98	19.16	15.59	17.88	16.78	15.02	17.52	16.16
March	...	15.76	18.47	16.96	15.44	19.03	17.39	18.02	22.25	20.43	16.01	17.69	16.75	15.70	18.52	17.11
April	...	15.56	18.44	16.96	16.42	19.10	17.60	19.83	22.77	21.25	16.11	17.76	16.85	15.34	19.18	17.14
May	...	15.07	17.63	16.48	16.65	19.51	17.83	18.13	23.82	20.35	16.00	17.56	17.30	16.00	18.87	16.72
June	...	14.76	17.61	16.51	16.37	18.48	17.01	17.65	21.88	19.56	15.93	18.73	17.12	15.83	20.16	17.05
July	...	15.42	17.93	16.31	15.74	17.30	16.35	18.55	22.40	20.24	16.05	18.35	16.94	15.66	18.45	16.66
August	...	15.50	17.74	16.41	15.42	18.00	16.58	17.95	22.33	20.02	16.03	18.29	17.17	15.73	18.34	16.51
September	...	15.80	17.76	16.64	16.17	18.38	17.32	18.02	20.50	19.59	16.34	17.95	17.52	15.90	17.77	16.77
October	...	16.28	17.64	16.80	16.84	18.42	17.84	19.01	21.68	20.64	16.64	18.01	17.23	15.21	17.80	16.58
November	...	15.47	17.35	16.40	15.54	19.56	17.40	18.21	20.99	19.38	16.30	17.99	17.15	16.01	16.79	16.35
December	...	15.57	16.82	16.11	15.68	17.47	16.79	17.34	19.92	18.98	16.55	17.69	17.08	15.00	16.77	16.10
Year	Average	...	...	16.52	...	...	17.11	...	...	19.89	...	...	17.08	...	...	16.63
Dist'ce from Gas Works		2 4-100 Miles.			1 83-100 Miles.			1 79-100 Miles.			3 33-100 Miles.			1 75-100 Miles.		

EXHIBIT "F."

Table showing the Number of Lamps, Size of Burner, Number of Hours Burning, etc., in Various Cities of the Country and Europe.

CITY OF—	NUMBER OF LAMPS.	SIZE OF BURNER.	NUMBER OF HOURS BURNING PER YEAR.	PRICE PER LAMP PER YEAR.	DISTANCE BETWEEN LAMPS.	PRICE TO PRIVATE CONSUMERS PER 1,000 FEET.
Albany, N. Y.	{ Gas, 1,032 Oil, 1,042 }	3 feet.	3,833½	\$35 00	300 feet.	\$2 50
Baltimore, Md.	5,799	5 "	2,400	32 00	Variable.	\$1 50 & 1 90
Brooklyn, N. Y.	13,892	3 "	3,536½	30 16	130 feet.	2 50
Boston, Mass.	{ Gas, 9,992 Oil, 2,077 }	4 "	3,828	Av. 36 41	180 "	{ \$2 25, & 3 00
Buffalo, N. Y.	{ Gas, 4,518 Naphtha, 732 }	4 "	3,250	26 00	125 "	2 25
Cincinnati, O.	895	5 "	2,500	21 10	133 "	2 25
Columbus, O.	10,691	4 "	2,300 to 3,000 ac. to moon.	22 64	187 "	2 25
Chicago, Ill.	9,000	2 "	3,711	\$9 75	150 "	\$2 25 & 2 50
Glasgow, Scotland	1,232	4 "	2,138	27 88	250 "	1 00
Hartford, Ct.	2,468	5 "	3,650	11 00	117 "	2 75
Havre, France	10,000	4 "	3,620	17 32	180 "	1 40
Liverpool, England	2,452	6 "	2,300	17 32	200 "	1 00
Louisville, Ky.	8,601	4 "	3,666½	11 60	150 "	2 35
Manchester, England	{ Gas, 896 Naphtha, 404 }	4 "	3,833½	30 00	300 "	75
New Haven, Ct.	22,167	3 "	3,833½	11 25	100 "	...
*New York City	39,129	{ 3½ " 5 " 7 "	{ 3,749½ 3,749½ 3,749½ }	{ 15 00 22 50 22 50 }	117 "	2 00
Paris, France	1,653	7½ "	3,650	\$20 to 40 00	175 "	\$1, \$2, & 2 50
Pittsburg, Pa.	11,981	6 "	3,939½	25 00	200 "	2 15
Philadelphia, Pa.	2,581	4 "	2,048	26 81	225 "	2 00
Providence, R. I.	1,188	5 "	Nothing.	150 "	150 "	2 50
Richmond, Va.	5,212	4 "	2,250	\$56 69	Variable.	3 00
San Francisco, Cal.	280	5 "	1,825	47 00	Variable.	5 00
Saratoga, N. Y.	7,150	5 "	2,600	37 00	150 feet.	2 50
St. Louis, Mo.	3,956	6 "	2,200	30 70	150 "	2 25
Washington, D. C.	290	5 "	Nothing.	17 28	350 "	1 02
Wheeling, Va.	180	4 "	Nothing.	30 00	500 "	3 00
Wilkesbarre, Pa.	455	3 "	3,833½	33 00	150 "	2 85
Yonkers, N. Y.						

* Prices shown elsewhere.

EXHIBIT "G."

AGREEMENT.

This agreement, made, entered into and concluded, this second day of May, in the year one thousand eight hundred and seventy-eight, by and between the Mayor, Aldermen, and Commonalty of the City of New York, parties of the first part, by the Commissioner of Public Works, acting in conjunction with the Mayor and Comptroller, and The New York Gas Light Company of said City, party of the second part:

A. Witnesseth, that the said party of the second part hereto has agreed, and by these presents does agree, with the said parties of the first part, for the consideration hereinafter mentioned, and under the penalty expressed in a bond bearing even date with these presents and hereunto annexed, to furnish the illuminating gas for the lamps, and to light, extinguish, clean, repair and reglaze the lanterns, replace the cocks, tubes and burners, crossheads, lamp-irons and lanterns, repair the lamp-posts, and paint the lamp-posts and lanterns, and to fit up and light such new lamps as may be required by the parties of the first part in the portions of the City of New York mentioned and described as follows, to wit:

In the district lying south of the centre of Grand street, from the East river to Sullivan street, through Sullivan street to Canal street, and through Canal street to the Hudson river, for the term of one year, commencing May first, one thousand eight hundred and seventy-eight, and ending April thirtieth, one thousand eight hundred and seventy-nine, both days inclusive.

B. And it is further agreed that the said parties of the first part shall have the right to order the pipes or gas-mains of the party of the second part to be extended in and along all the streets, avenues, and public places within the limits aforesaid or adjacent thereto, providing the lamps

lighted by the said parties of the second part shall be lighted by the material commonly called illuminating gas.

C. All the gas or materials furnished, and all the work and labor done by the party of the second part hereto, shall be of the kinds and qualities, and furnished and done in all respects in strict conformity to the terms, conditions, and requirements of the hereinafter specifications.

D. Should any alteration or any attachment be required to any portion of the lamps to be lighted under this agreement, for the purpose of using any other material than illuminating gas, then such alteration will be done and attachments placed on the lamps by the party of the second part hereto at his own cost and expense.

E. If the proposal of the party hereto of the second part included any lamps with which the pipes or mains of said party of the second part were not connected at the time of the making of its proposal or bid, thirty days from the date of the execution of this agreement, and such further time, not exceeding thirty days, as may be deemed reasonable by the Commissioner of Public Works, will be allowed the party of the second part in which to connect such pipes or mains with such lamps: Provided, the said party of the second part have or shall procure a grant or franchise from the Mayor, Aldermen, and Commonalty, authorizing the laying of gas-mains in the streets or parts of streets in which the said lamps are located.

F. But no payment on account of any such lamps will be made to the party of the second part for the time so allowed, nor until the same shall have been connected with the mains of the party of the second part, nor will payment be made on account of any lamp except for the time during which all the requirements herein mentioned shall have been fully performed in accordance with the following

Specifications.

1. Lighting.—The lamps shall be lighted during such times as the public lamps throughout the City of New York may be required to be lighted, by the regulations of the said parties of the first part, in accordance with a Time table to be furnished by the Commissioner of Public Works. Also, the Department of Public Works may direct and require, by notice to that effect, that all or any portion of said public lamps shall be lighted, and kept burning, at any other time or times during the continuance of this contract; and the said party of the second part shall and will light the same, and continue them burning, in accordance with any and every direction of the Department of Public Works, to that effect: Provided that, if in compliance with the direction of the Department of Public Works, the whole number of hours during which the said lamps, or a portion of them, are kept burning, shall exceed the average number of hours during which the public lamps throughout the city have been kept burning during the corresponding periods of the last five years, prior to the date of this contract (which the parties hereto estimate to be, and fix at thirty-eight hundred and thirty-three hours and twenty minutes for the term), then, in that case, the said party of the second part shall be entitled to claim and receive, for such additional number of hours, during which the public lamps, or such portion of them, in the district aforesaid, are kept burning in accordance with such direction of the said Department of Public Works, an additional compensation, equivalent to a pro rata increase of the compensation hereinafter allowed, proportioned to the increased number of hours beyond the said average number, and the number of lamps so kept burning. And also, provided, that if at any time, in compliance with the direction of the said Department of Public Works, the number of hours during which the said lamps, or any portion of them, are kept burning, shall be less than the aforesaid number of thirty-eight hundred and thirty-three hours and twenty minutes per term, then, in that case, there shall be deducted an amount equivalent to a pro rata decrease of the compensation hereinafter allowed, proportioned to the decrease of the number of hours below the said average number, and to the decrease of the number of lamps so kept burning. And also, provided, that said Department of Public Works shall have the right at any time to increase or diminish the number of lamps awarded to be lighted by the party of the second part under this contract. It is expressly agreed that the lamps shall be lighted either by the means of a torch, or the use of a ladder, and that the lamp-lighters will not be permitted to climb the lamp-post for such purpose. The party of the second part to keep the service-pipes and stand-pipes (if any are used) of said lamps cleared of all obstructions and in good order, at its own cost and expense, except such service-pipes as shall have been broken or removed by the construction of sewers.

2. Illuminating Material, Quality of.—If the material to be used under this agreement, shall be illuminating gas, then such gas shall be of such an illuminating power, by photometrical test, made at a distance of not less than one mile from the place of manufacture, that an Argand burner having fifteen holes and a seven-inch chimney, and consuming at the rate of five cubic feet of gas per hour, shall give a light equal to the light of sixteen sperm candles, of six to the pound, and each burning at the rate of one hundred and twenty grains of spermaceti per hour, and as regards purity, free, within limits not injurious to public health, from ammonia, sulphuretted hydrogen, and other sulphur or noxious compounds. In case the illuminating material shall be other than what is commonly known as illuminating gas, then the quantity of light produced by such material shall be equal to the quantity (by photometrical test) produced by sixteen candle coal-gas consumed by the gas-burners called for in this agreement.

3. Burners.—All the burners to be used for the illuminating material, commonly called illuminating gas, shall be of a capacity to burn, and shall burn three cubic feet of gas per hour during the time they are required to be lighted, under a pressure of one inch of water, and should the illuminating material be other than illuminating gas, then the burners to be used for such illuminating material shall give a light (by photometrical test) equal to the light given by the gas burners in use in the public lamps in the City of New York. The burners to be kept clear at all times, so as to allow a free flow of the illuminating material.

4. Cleaning.—All the lamps to be kept in a cleanly condition, and they shall be thoroughly cleaned at least twice in each week, and oftener if the Department of Public Works shall direct or require the same.

5. Repairing and Reglazing.—The lamps to be reglazed, within twenty-four hours after the same shall be broken. The glass and putty for that purpose to be furnished by the party of the second part without cost to the city. The lanterns to be repaired and kept in repair by the party of the second part, at its own cost and expense.

6. Repairing Lamp-posts.—Whenever the Department of Public Works shall require that any lamp-post or posts shall be straightened, or that any column or columns be releaded, or that any lamp-post or posts be repaired in any other manner in this contract specified, the same shall be done within twenty-four hours after said Department shall notify said party of the second part of such requirement.

7. Painting.—The lamp-posts, lamp-irons, brackets and lanterns are to have one heavy coat of best paint, ground in oil, as follows: The lamp-posts, cross-heads, and stand-pipes of bracket lamps to have one coat of dark green paint, blue shade. The square lamp-irons, brackets, and outside of lanterns to have one coat of green paint, pea-green shade; the design being to make a strong contrast between lamp-posts and lanterns. The tin-work on inside of lanterns to be painted in all their parts with one heavy coat of best white lead paint; the round lamp-irons and underside of the reflectors of the globe lamps to be painted with one coat of best white lead paint, and so much of the stand-pipes as project above the lamp-posts to be painted in the same manner as the lamp-posts. The ornamental lamp-posts to be painted in at least three colors. All the material shall be of the best quality, and prepared so as to present a gloss finish. All the painting is to be completed by the first day of November next.

8. Removing Lamp-posts.—All lamp-posts to be taken down which the Department of Public Works may require to be removed for any purpose.

9. Cocks, Tubes, and Burners.—The cocks, tubes, and burners which may become worn out and useless, or which, in the opinion of the Department of Public Works are worn out or useless, to be immediately replaced by the party of the second part, at its own cost and expense.

10. Fitting up New Lamps.—New lamps are to be fitted up on any street, avenue, pier or public place, wherever the same may be required by the Department of Public Works. The butts and columns are to be placed in a strictly perpendicular position, the socket of the butt to be caulked with yarn gasket and melted lead, the lead to be tamped and then trimmed even with rim of butt. The service-pipe and stand-pipe to be of three-quarter inch wrought-iron pipe, the service-pipe to have a direct fall to the main, the service-pipe and bend on bottom of stand-pipe to rest on solid earth to prevent the same from settling and forming a trap; the earth is to be thoroughly tamped about the butt as the same is thrown into the excavation. Bracket-lamps are to be fitted up in lieu of lamp-posts, when required, the brackets and stand-pipes to be fastened to the wall in a firm and secure manner. The service-pipes, stand-pipes and fittings are to be furnished and connected by the party of the second part; the lamp-posts, lamp-irons, lanterns, and brackets will be furnished by the parties of the first part, through the Department of Public Works, to the party of the second part. New lamps, which may be required to burn any other material than illuminating gas, to be fitted up without service-pipes or stand-pipes. All new lamp-posts are to be painted immediately after the same shall have been erected.

11. Lanterns.—All lanterns which, in the opinion of the Superintendent of Lamps and Gas, may become so worn out, broken, or useless as to be unfit to be repaired, are to be removed from the posts and other lanterns substituted in lieu thereof by the party of the second part without charge to the city, when ordered so to do by the said Superintendent. The lanterns for that purpose will be furnished by the parties of the first part, through the Department of Public Works, to the said party of the second part.

12. Crossheads and Lamp-irons.—The crossheads and lamp-irons which, in the opinion of the Department of Public Works, may become broken or out of order, are to be replaced on the posts by the party of the second part without charge to the city. The crossheads and lamp-irons for that purpose are to be furnished by the parties of the first part, through the Department of Public Works, to the said party of the second part.

13. Street Signs.—The glass street-signs to be placed and retained in their proper places and positions in the lantern. The signs to be furnished by the Department of Public Works to the party of the second part.

14. Cartages.—All supplies which, under this agreement, may be required to be furnished by the parties of the first part, will be so furnished, but the cartage thereof shall be done by the parties of the second part.

15. Whenever in these specifications or in this agreement of which they form part, the words "party of the second part," or pronouns in place thereof are used, such words and pronouns are to be understood as meaning and referring to the party or parties (as the case may be) of the second part of this agreement.

G. The prices fixed for the various services herein provided to be performed by the party of the second part are as follows:

For furnishing the aforesaid illuminating material for each lamp, including the lighting, extinguishing, cleaning, repairing, reglazing, painting, replacing cocks, tubes, burners, crossheads, lamp-irons, and lanterns thereto, for the aforementioned period of one year, the sum of twelve dollars (\$12.)

For each lamp-post straightened, the sum of one dollar and fifty cents (\$1.50).

For each column releaded, the sum of one dollar and fifty cents (\$1.50).

For each column refitted, the sum of three dollars and fifty cents (\$3.50).

For each lamp-post removed the sum of three dollars and fifty cents (\$3.50.)

For each lamp-post reset, the sum of ten dollars (\$10).

For each new lamp fitted up, the sum of ten dollars (\$10).

H. United States Revenue Tax.—And it is hereby agreed, by and between the parties to these presents, that the parties of the first part shall not be called upon to pay to the said party of the second part, any amount for any tax which the Government of the United States may assess upon the illuminating material consumed by the public lamps within the district aforesaid.

I. And it is further agreed, that the said party of the second part shall have the right to lay pipes at any time between May 1, 1878, and April 30, 1879, upon giving forty-eight hours' written notice to the Department of Public Works of its intention to break up or open any street, avenue, or public place, or part thereof, or to remove any part of the pavement thereof, for the purpose of laying or repairing the pipes, to conduct the said gas. And the party of the second part shall, whenever it shall break up or open any street, avenue, or public place, replace the earth which may be removed in so doing, before sunset of the day on which such opening shall be made (the earth to be thoroughly tamped as the same is thrown into the trench or excavation), and replace the pavement, and repave and repair the same, in such reasonable time and manner as the Department of Public Works may direct, and in as good and firm a manner as such street, avenue, or public place, or part thereof, was in before being broken up for the purpose aforesaid, and shall, from time to time, as required by the Department of Public Works, readjust and fill and finish the same as long as in the opinion of the Department of Public Works may be necessary on account of the settling of the earth or pavement caused by the opening. Also, that all such repairs as shall at any time become necessary to said pavement, by reason of laying the said pipe or conductors, shall be made and done by said party of the second part, at its own cost and expense. Also, that no such street, avenue, or public place, or part thereof, shall be so broken up or opened, or the pavement thereof removed, or shall be again filled up or repaired, except under the direction and supervision of a competent person, to be appointed by the Department of Public Works; but the said party of the second part shall not be called upon to pay any sum, to any party or parties, for the inspection of any pavement which it may have occasion to replace. And it is further agreed, that the said party of the second part shall and will so conduct the manufacture and manufactories of gas as not to create a nuisance, and that it will in all things be governed by such reasonable rules and regulations as the said Department of Public Works may from time to time establish or direct, relative to the opening of such streets, avenues, or public places, or parts thereof, and laying down the pipes and conductors, and for lighting, cleaning, and protecting the lamps and street signs aforesaid. And it is hereby expressly provided, that nothing herein contained shall be construed or deemed as granted to the said party of the second part, any sole or exclusive right or privilege, or as preventing the said parties of the first part from granting the like privileges as are hereby given to the said party of the second part, to any other company, persons, or parties whatsoever, or as preventing any person or persons, residing in or adjacent, or near to any of the said streets, avenues, or public places, or parts thereof, from erecting, in or upon his or their own premises, any building or apparatus, to light with gas, his or their own house, store, or manufactory, or premises.

J. And it is hereby further agreed, that in case the said party hereto of the second part shall fail or neglect to keep the covenants herein contained, or any of them, or neglect to light, repair, paint, clean or fit up the public lamps as before mentioned, or any of them, it shall be lawful for the Commissioner of Public Works to cause such work to be performed by other parties, and to deduct the expense thereof from any moneys which may be due or may become due to the party of the second part, and to hold the party of the second part and its sureties liable for the amount thereof which may be in excess of the prices stipulated in this agreement.

K. And it is further provided, and these presents are upon the express condition, that if the said party of the second part, or its successors, shall not well and truly observe, perform, fulfill and keep all and singular the covenants and conditions hereinbefore mentioned and contained, on its part and behalf to be observed, performed, fulfilled and kept according to the true intent and meaning of these presents, then and in that case it shall and may be lawful for the Commissioner of Public Works, on the part of the said parties of the first part, to annul and vacate this contract, and thereupon it shall become null and void.

L. And it is further agreed, that on or after the first day of each and every month from the month of June, 1878, to the month of May, 1879, both months inclusive, the party of the second part shall furnish proof, to the satisfaction of the Commissioner of Public Works, that it has fully performed and fulfilled this contract in all the particulars and conditions aforesaid, during the preceding month, and particularly that it has furnished the illuminating material of the quality hereinbefore specified; upon so doing, the Commissioner shall certify the fact, and in his certificate state the amount to which the party of the second part shall be entitled for all the duties performed by it during such preceding month, and annex thereto a requisition upon the Comptroller to pay the party of the second part therefor the sum to which it shall be so entitled; and without such proof, to the satisfaction of the Commissioner of Public Works, he shall not make any certificate nor requisition on the Comptroller; and the party of the second part shall also furnish proof to the satisfaction of the Comptroller that it has fully performed and fulfilled this contract in all the particulars and conditions aforesaid, and without such proof the said party of the second part shall not be or become entitled to any payment in respect to services which were required to be done, or should have been done, in such preceding month. On the requisitions above provided being presented to the Comptroller of the City, he shall, within twenty days, pay to the party of the second part the amount thereof in lawful money.

M. And it is hereby expressly agreed and understood by and between the parties hereto, that the said parties of the first part, their successors and assigns, shall not, nor shall any department or officer of the City of New York be precluded or estopped by any return or certificate made or given by any Engineer, Inspector or other officer, agent, or appointee of said Department of Public Works or said parties of the first part, under or in pursuance of anything in this agreement contained, from at any time showing the true and correct amount and character of the work which shall have been done and materials which shall have been furnished by the said party of the second part, or any other person or persons under this agreement.

N. And the parties hereto declare that this contract is made with reference to the proposals hereto annexed, which are to be taken as part and parcel of these presents.

In witness whereof, the said Commissioner of Public Works, in conjunction with the Mayor and Comptroller, have hereunto set their hands and seals, on behalf of the said parties of the first part, and the said party of the second part has also set its hands and seals, and said parties hereto have executed triplicate copies hereof, one of which is to remain with the Commissioner of Public Works, one other to be filed with the Comptroller of the City of New York, and the third to be delivered to the said party hereto of the second part, the day and date herein first above written.

Witness:

JOHN S. ROUTH,

ALLAN CAMPBELL,

Commissioner of Public Works.

[SEAL].

Witness as to signature of Mayor,

S. McCORMICK.

SMITH ELY, JR.,

Mayor of the City of New York.

[SEAL].

Attest:

G. W. DOANE, Secretary.

JOHN KELLY,

Comptroller of the City of New York.

[SEAL].

THE NEW YORK GAS-LIGHT COMPANY,

THOMAS K. LEES, President.

[SEAL].

EXHIBIT "H."

Time Table for Lighting and Extinguishing the Public Lamps for the Year 1879.

DATE.	BEGIN TO LIGHT.	BEGIN TO EXTINGUISH.	DATE.	BEGIN TO LIGHT.	BEGIN TO EXTINGUISH.
January 1.....	H. M.	H. M.	July 1.....	H. M.	H. M.
" 8.....	4.45	6.20	" 8.....	7.45	3.15
" 15.....	5.00	6.20	" 9.....	7.45	3.15
" 22.....	5.00	6.20	" 10.....	7.40	3.15
" 29.....	5.15	6.15	" 23.....	7.40	3.15
February 5.....	5.30	6.00	" 30.....	7.25	3.30
" 12.....	5.40	5.45	August 6.....	7.25	3.40
" 19.....	5.45	5.40	" 13.....	7.10	3.50
" 26.....	6.00	5.30	" 20.....	7.10	3.50
March 5.....	6.00	5.30	" 27.....	6.45	4.15
" 12.....	6.15	5.15	September 3.....	6.30	4.15
" 19.....	6.15	5.00	" 10.....	6.20	4.30
" 26.....	6.30	5.00	" 17.....	6.15	4.30
April 2.....	6.30	4.45	" 24.....	6.00	4.45
" 9.....	6.40	4.20	October 1.....	5.45	4.45
" 16.....	6.45	4.15	" 8.....	5.40	5.00
" 23.....	7.00	4.00	" 15.....	5.30	5.00
" 30.....	7.00	4.00	" 22.....	5.15	5.15
May 7.....	7.15	3.30	" 29.....	5.00	5.15
" 14.....	7.20	3.30	November 5.....	5.00	5.30
" 21.....	7.30	3.15	" 12.....	4.45	5.45
" 28.....	7.30	3.15	" 19.....	4.40	5.45
June 4.....	7.40	3.15	" 26.....	4.35	6.00
" 11.....	7.40	3.15	December 3.....	4.35	6.00
" 18.....	7.45	3.15	" 10.....	4.35	6.00
" 25.....	7.45	3.15	" 17.....	4.35	6.00
			" 24.....	4.40	6.15
			" 31.....	4.40	6.20

Total Number of Hours, 3,833½.

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF LAMPS AND GAS,
NEW YORK, December 30, 1878.

The above table will show the time for lighting and extinguishing the public lamps during the year 1879. All the lamps to be lighted within one hour from the time of beginning.

S. McCORMICK,
Sup't of Lamps and Gas.

ALLAN CAMPBELL,
Commissioner of Public Works.

INSTRUCTIONS TO LAMP-LIGHTERS.

I. The lamps must be lighted and extinguished strictly in accordance with the time specified in this time-table, and all the lamps must be lighted within one hour from the time of beginning.

II. The lamps must be kept clean and in good condition; all the glass must be thoroughly cleaned at least twice in each week, and oftener if necessary. Lighters must bear in mind that with clean glass a greater brilliancy is obtained from the flame. In the winter season the snow must be brushed from the lanterns after each snowfall. Dirty and disordered lamps will be considered as evidence of a careless and incompetent lamp-lighter.

III. The glass street signs must be kept in their proper positions. The sign bearing the name of any avenue or a main street must face the roadway of such avenue or street. One of the signs bearing the name of a cross street must face the roadway of such street, and the other sign must be placed on the opposite side of the lantern. Be careful to observe that the name does not face the inside of the lantern.

IV. Advertising signs on the lamp-posts or lantern, or colored or ground glass in the lantern are a violation of a Corporation Ordinance, and must not be permitted.

V. If a lighter, on extinguishing the lamp, should find a glass broken, he must replace the same before lighting time of same day. If he should find a glass broken while lighting, he must replace the same before lighting time of the following day. If he should find the tin-work worn out or broken, he must take the lantern to his superintendent for repairs.

VI. The burners must be kept in condition to burn with a full, clear, steady flame, and not with a single or forked jet.

VII. If a lighter, when lighting, finds that a lamp will not burn, he will leave such lamp and finish his route. He must then return to the unlighted lamps and endeavor to get them in burning order. If he cannot make the lamp burn he must report the same on the following morning to the Superintendent of the gas company.

VIII. Lamp-lighters will not be permitted to climb the lamp-posts. The lamps must be lighted either by means of a torch or the use of a ladder.

IX. In case a lamp-post should be found broken or taken down, or requiring repairs, he must report the same at once to the Superintendent of the gas company, stating the correct location of the post and what repairs are required. If the post has been taken down, he must report by whom and for what purpose, and date when done. No excuse will be accepted from any lamp-lighter who fails to report lamp-posts taken down or broken.

X. Lighters must not break the lamp bottoms, nor the street sign slots. Lamps furnished with these slots should be placed on corner lamp-posts.

XI. Ladders must not be left tied to the lamp-posts.

S. McCORMICK, Superintendent of Lamps and Gas.

NEW YORK, January 6, 1879.

STEPHEN McCORMICK, Superintendent Lamps and Gas.

SIR—In accordance with the request of the Commissioner of Public Works, I herewith submit a short report on the history and present condition of the electric light.

The electric light in its present state of development is the outgrowth of experiments of this century. Sir Humphrey Davy first produced it in 1801, by means of a large galvanic battery. The electric current thus produced was made to terminate in two pieces of charcoal, which, when connected, gave a light of great brilliancy. Owing to the expense of maintaining a large battery, this method never has been used for the production of the electric light for industrial purposes. For the first 30 years of its existence, the electric light was little more than a toy; but in 1830 Faraday discovered that when a conductor, as copper wire, is made to move near a magnet, a current of electricity is produced in the wire; and from this discovery the electric current as an economical means of illumination became a possibility. For a long time, however, progress in this direction was very slow. Various machines were invented, and from time to time improvements were made, but not until within a comparatively few years have we had indications of the commercial production of this form of illumination.

This subject naturally divides itself into the discussion of, first, the means for producing the electric current, and second, the appliances for utilizing the current in the production of light.

The electricity is produced by magneto-electric machines, and without entering into a description of the earlier forms, which have only a historic interest, I will say that the Hockhausen, Alliance, Gramme, Siemens, Wallace, and Brush machines are those most prominently before the public. These machines either have a permanent magnet to induce the current of electricity, or it is induced by an electro-magnet, that is, a core of soft iron made a magnet by the passage of a current of electricity around it. This gives rise to the expressions "magneto" and "dynamo" electric machines.

The limits of this report will not allow a description of more than one or two of these machines. The Wallace-Farmer consists of two horseshoe electro-magnets (A, A, Fig. 1), so placed that the poles of opposite character face each other. Between these magnets there rotates the armature

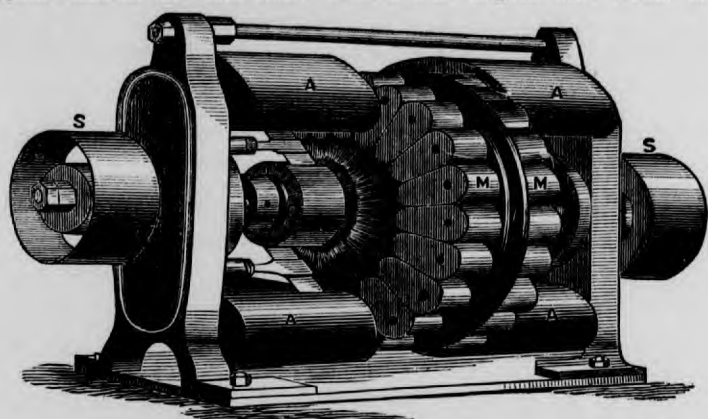


FIG. 1.

(M, M). This is made of a disk of iron, to either side of which are fastened iron cores (M), wound with insulated wire. These armature coils are connected, and wires from them pass to the commutators on the shaft (S, S).

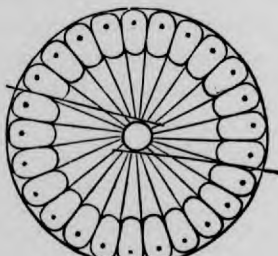


FIG. 2.

Figure 2 shows the arrangement of these coils and their connection with the commutator. When power is applied the armature revolves, making from 800 to 1,200 revolutions per minute, and the electric current is produced.

The Brush machine resembles the Wallace in many particulars. It consists of two horseshoe electro-magnets (A, A, Fig. 3). Unlike the Wallace machine these are so placed that their like poles oppose each other. Between these magnets the armature (M) is made to rotate. It is made of an iron ring, around which are wound eight coils of copper wire (C, C), and in which the current is generated. The current generated by the revolution of this armature is carried by the terminal

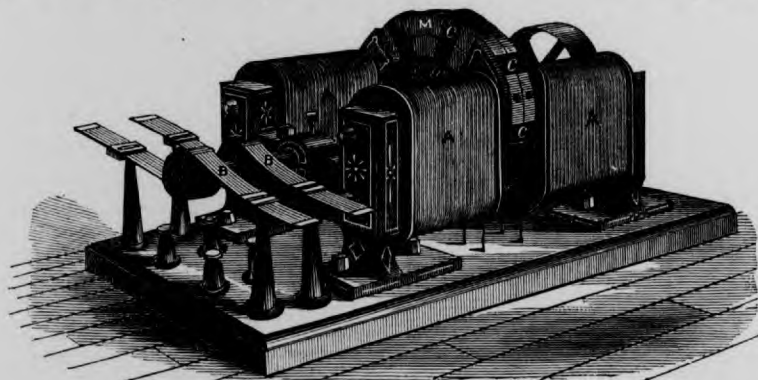


FIG. 3.

wires through the centre of the shaft to the commutator at the end of the magnets. B, B are the commutator brushes which rest upon rings of non-conducting material, to the circumference of which are fastened segments of brass. These rings are fastened to the shaft. The mechanical power necessary to drive one of these machines is quite an important factor in calculating cost, and not all engines are suited to give the best results. Uniformity of movement is most essential. From 3 to 10 horse-power is required, according to the size of the machine and number of lamps used.

The electric lamp or candle which is employed to produce the light is of even more importance than the machine itself. There are two modes of producing light, one by the voltaic arc and the other by the incandescence or intensely heating some conductor which is not large enough to carry the current. Both methods were tried in the early experiments of Davy. When the two terminal wires of a battery or machine are attached to rods of dense carbon, and these after being brought in close contact are slightly separated, the electric current passes from the positive pole to the negative, tearing off minute particles of the carbon and so intensely heating them as to produce a brilliant light. This is termed the "voltaic arc." A representation of it is given in Figure 4.

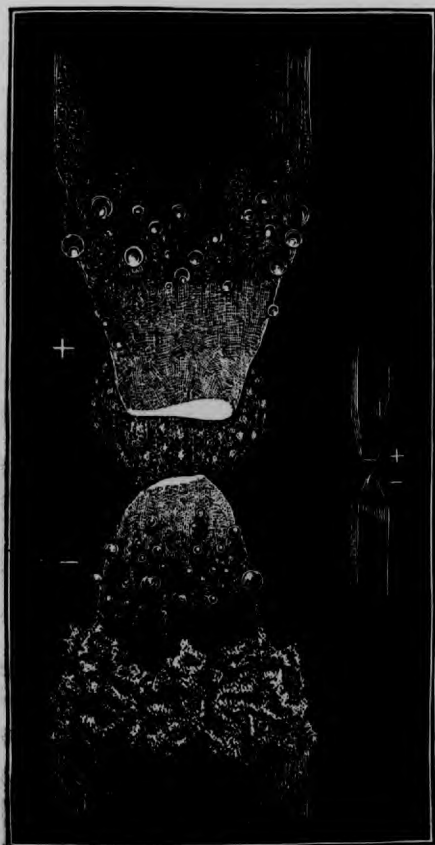


FIG. 4.

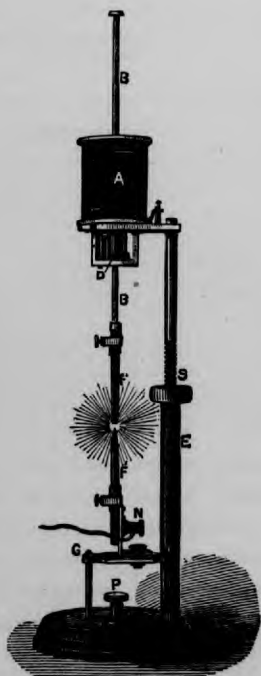


FIG. 5.

It is obvious that the tearing away of the carbon points will soon so far separate the poles that the electricity will refuse to pass and the light goes out. To obviate this difficulty "regulators" have been constructed in which, by clock-work or the action of a magnet, the distance between the carbons is adjusted. Duboscq, Foucault and Browning regulators are among the older forms, while the Serrin, Brush and Wallace are among the more recent ones. The Rapiéff & Werderman lamps and Joblochkoff candle also depend upon the voltaic arc.

Figure 5 represents the Brush lamp. It consists of a helix of insulated copper wire, A. Within the helix is the core D, and working freely in this is the rod B, to the end of which the upper carbon is attached. The helix is supported by the rod S within the tubular post E. Fastened to the lower extremity of S and working through the slot seen in E is the arm G, which carries an insulated holder for the lower carbon. The conducting wires from the machine are connected with P and N. The current passes from P, up the rod S, through the helix A, down the rod B and carbon F, where it meets the current from N and the carbon F'. It is hardly necessary here to enter into any further explanation of the working of the lamp, except to say that the helix as its magnetism is strengthened or weakened regulates the distance between the carbons and so tends to give a uniform light.

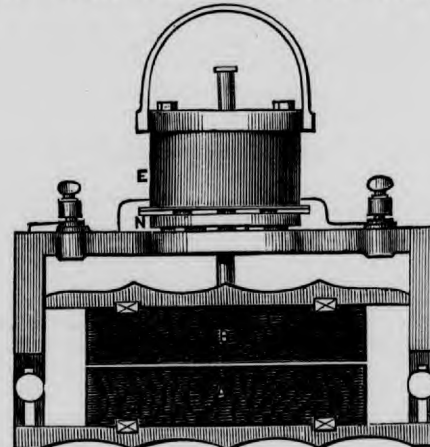


FIG. 6.

Figure 6 represents the Wallace lamp, whose chief merit is the length of time it will burn—about 100 hours. In place of the carbon rods of the Brush lamps, we have here two horizontal plates of carbon, A, B. A is fixed, while B is attached to a rod working within the electro-magnet E. As the carbons wear away the current travels from one end to the other and the consumption of the material is uniform. Regarding regulators it is to be said that although improvements have been made they are still very far from perfection. Not one of them can be relied upon to give a perfectly uniform light. There is always more or less "blinking," and while regulators are constructed on the present plan perfection is hardly to be hoped for.

The Joblochkoff candle has attracted a great deal of attention on account of its simplicity, and the recent trials made with it in Paris. It consists of two parallel rods of carbon, separated by a strip of some non-conducting material, as kaolin or plaster-of-paris. The current passes up the carbons, and the arc is produced at the top. The great heat fuses the interposed material as the carbons are consumed. Certain improvements have been made in the original form of the candle, but it is not what is desired yet. The rapid consumption, 3 to 4 inches per hour, necessitates the placing of two or more in a single lamp, a second being lighted as the first is consumed. In Paris four candles were placed in each lantern.

If the dividing of the electric current and the production of many small lights from one powerful current ever becomes a reality, the light will doubtless be produced by incandescence, or heating conductors to such a high temperature that they will emit light. Carbon and platinum are the two substances generally employed for this purpose. The Sawyer-Mon light involves the use of a small pencil of carbon, properly supported in a closed vessel of nitrogen gas. This arrangement, it is claimed, prevents the wearing away of the carbon. The idea, however, is not new, for in 1845 a lamp was invented by a Mr. Starr, sometimes called the King Lamp, in which carbon or platinum was rendered incandescent in an exhausted and sealed vessel; and in 1873 Lodigian invented a lamp based on the same principle, which subsequently was improved by Konn.

This line of investigation is said to be the one which Edison is following in devising an electric lamp. He proposes using a compound of platinum and iridium. With this metal it will be necessary to have the current under perfect control, as too high a temperature would fuse it. Lights produced in this way are much softer in tone and better fitted to replace a gas-burner.

It is claimed by many, interested in one or more of the various systems of electric lighting, that the dividing of the electric current is already an accomplished fact. This, however, is not the case. Some systems allow of 10 to 20 lights being taken from one current, but something more than this division must be effected before the electric light in private dwellings becomes a possibility. Then, too, the great loss in light experienced when the current is divided even into a few lights, whether those lights are produced by the voltaic arc or incandescence, leads to the conviction that new laws of electric force must be discovered before the desired end is reached.

In the Werderman lamp, which promises as well as anything now before the public, when the current is converted into a single lamp the light equals from 700 to 800 candles, but when divided into ten lamps, each one gives the light of only 40 candles, or 400 in all, a loss of nearly one-half. Moreover, when one is turned out, the others increase in intensity. It is impossible to obtain the same amount of light when the current is divided that could be obtained if put into a single light. The electric force is converted into other modes of motion and so lost as light. The same holds true here as in gas, one five-foot burner will give more light than two burners consuming 2½ feet each.

The question often arises, Will electricity ever replace gas as an illuminating agent? Except in the lighting of large, unobstructed spaces, there is no probability that it will. Each has a sphere of its own. In lighthouses, where the object is to make itself visible, not to illuminate other objects, the electric light can be employed with the best possible results. The Cape La Heve lighthouses, at Havre, have employed the electric light since 1863. The South Foreland lighthouse, near Dover, first used it in 1859, and regularly since 1871. The South Point Light has been going continuously for eight years, with only two stoppages.

For the lighting of streets electricity cannot readily be utilized. First, it is too expensive, then such an intensity of light is not needed, and the possibility of sudden extinction is a risk which large cities cannot afford to run. No experiment in street lighting by electricity can be called a success. The recent trial in Paris with the Joblochkoff candle was the most extensive ever made. It was to continue during the six months of the Exhibition, but has been extended to the 15th of January, professedly to allow time to consider the basis of a contract for lighting. So much has been written regarding the electric light in Paris that little need be said here.

Of the many places where the light was exhibited, none has attracted more attention than the Avenue de l'Opera, including the Place de l'Opera at one end, and the Place du Théâtre Français. It is nearly three-fourths of a mile in length, and about 100 feet wide. This is lighted by 64 Joblochkoff candles, and the point of principal interest here is the expense connected with it. The City of Paris pays about \$7.50 per hour for the total number of electric lamps. The original gas illumination consisted of 344 gas-burners, costing about \$1.50 total. The electric illumination is considered equal to about twice that by gas, or 688 gas-burners. To produce gas-light equal in intensity to that of electricity, would cost about \$3 per hour against \$7.50 for the electric light. The electric lights were extinguished at midnight and gas substituted. It must be borne in mind, however, that in most cases where electricity has been tried for illuminating, the lamps have been surrounded by opal shades, which cut off about 50 per cent. of the light. Electric lighting would be intolerable without something of this kind to tone it down.

In factories and large halls where the light can be placed at considerable elevation, this is not so decided an objection; but the best plan is to throw the light against a whitened ceiling, by mirrors, and so have the building lighted by reflection. This obviates also all objection to deep shadows being cast. This plan has been introduced very extensively into factories both in this country and abroad, and here we find the most promising field for the electric light.

In France there were in 1874 but four applications of the electric light, while in 1878 there were about 500, and these, in the majority of cases, where the object was to light large spaces, as halls and factories.

With the division of the electric current an accomplished fact, many objections still remain. One person will want the light all day, another all night; one will want a single burner, another 500 burners, and so on. Consequently, plant must be provided to supply the greatest demand of the winter months, to say nothing of extra plant in case of accident.

As to the actual cost of the electric light, there is difficulty in obtaining correct figures, for everything is still experimental. Some trials make the cost of the electric light less and others more than gas, but from a majority of the experiments made, we are led to the conclusion that when one or more large lights can be employed, electricity is more economical than gas, while in the general applications of artificial illumination, gas is still the more economical of the two.

In a progressive age like our own, and with thousands of intelligent minds working toward this one object, it would be unwise to predict the future of the electric light; but from the present condition of the science we have little hope of its universal application.

Respectfully,

E. G. LOVE, Ph. D., Gas Examiner.

NEW YORK, January 3, 1879.

Hon. ALLAN CAMPBELL, Commissioner of Public Works:

SIR—I herewith transmit statement of moneys received for water rents, penalties, and taps for the quarter ending December 31, 1878.

	Principal.	Penalties.	Taps.
October	\$133,418 92	\$2,943 75	\$813 00
November	73,736 31	2,571 45	668 00
December	87,698 68	1,745 85	516 00
Total	\$294,853 91	\$7,261 05	\$1,997 00
Total	\$304,111 96		

Also for rent of meters, and placed to "Special Meter Deposit Fund," for the quarter ending December 31, 1878:

October	\$0 00
November	0 00
December	110 00
Total	\$110 00

Also for meters, and placed to "Special Meter Stock Fund," for the quarter ending December 31, 1878.

October	\$34 00
November	43 19
December	0 00
Total	\$77 19

Herewith will be found a statement for the year 1878, showing the number of permits issued for taps, the receipts for the same, and for building purposes and street openings:

Permits for taps	1,573
Amount received for taps	\$6,734 50
Permits for building purposes	917
Amount received for building purposes	\$17,571 80
Permits for opening streets	3,421

In submitting this report, I beg leave to call attention to the practical working of the system by which the charge for extra persons in tenements, was altered to a charge for families, in 1877 (the first year of trial), great difficulty was experienced in executing the change; many who had never paid anything for extra persons being obliged to pay for extra families, while those who had always paid were in many cases compelled to pay a trifle more than heretofore. For the past year less difficulty has been experienced, and I have reason to believe that as the fairness of the charge has become evident to the tax-payers, very little trouble is anticipated hereafter. The adoption in May, 1878, of the plan by which houses were charged for street-washers, according to frontage on streets, and making no charge where they were not used, has produced a revenue of \$8,895.50 up to this time. This change has, as a general rule, given satisfaction, although the receipts have not quite equaled the amount formerly received for street-washers. I have no doubt that the result desired (checking waste of water), has, to a considerable extent, been attained.

During the past year meters have been applied to many of the livery and sales-stables, and while at first some opposition to them was manifested by the stable-owners, as a general rule the order has been complied with. The general collections from May 1, 1878, to December 31, 1878, inclusive, amount to \$1,419,988.80, showing an increase for the same period of the preceding year of \$95,088.78. Considering the prostration of many branches of business where extra water is used for manufacturing purposes, and the entire stoppage of many important works in the city, we have every reason to believe that the receipts at the end of the water-year (April 30, 1879) will show a very gratifying result.

Very respectfully submitted,
J. H. CHAMBERS, Water Register.

APPROVED PAPERS.

Resolved, That permission be and is hereby given to James A. Hearn & Son to place and keep bay-windows in front of Nos. 30 and 32 West Fourteenth street, as shown on the annexed diagram, the work to be done under the direction and supervision of the Commissioner of Public Works, and the permission hereby granted to continue only during the pleasure of the Common Council.

Adopted by the Board of Aldermen, February 25, 1879.
Approved by the Mayor, February 26, 1879.

Whereas, This Board has learned, with profound sorrow, of the death of Jacob A. Westervelt, ex-Mayor of this city, and who was, at the time of his death, President of the Department of Docks. He died in this city on the 21st inst., at the advanced age of eighty years; and

Whereas, In the general sorrow for the death of this distinguished man, it is fitting that the municipal authorities should bear a part. He had been intimately identified with the city and its interests for more than half a century, and in every relation he held towards his fellow-man, integrity of word and act were his chief characteristics. During his lifetime he implicitly, and with simple faith, followed the teaching and example of Him who commanded His disciple to "love thy neighbor as thyself," and he was taken from this life, full of years and full of honors, lamented by all who knew him, to enjoy the rewards promised the faithful servant by the Great Master; be it therefore

Resolved, That this preamble and resolution be entered in full in the minutes of this Board, as an evidence of the estimation in which the deceased was held by the corporate authorities of this city, and as an expression of our sorrow for his death; that an engrossed copy thereof be transmitted to his family, and that as a further mark of respect for the memory of the deceased, the Board do now adjourn.

Adopted by the Board of Aldermen, February 25, 1879.
Approved by the Mayor, February 28, 1879.

Whereas, Two petitions signed by a large number of the residents and taxpayers of the upper wards, doing business in the lower part of the city, have been presented to this Board for its consideration; and

Whereas, These petitions recite facts and arguments in behalf of a speedy extension of rapid transit and steam railways into the upper wards, which arguments seem to be unanswerable; now, therefore,

Resolved, That it is the sense of this Board that the prayer of said petitioners should be granted at the earliest practicable day;

Resolved, That his Honor the Mayor be respectfully requested to promote this most important object in every way consistent with the requirements of chapter 606 of the Laws of 1875.

Adopted by the Board of Aldermen, February 18, 1879.

Received from his Honor the Mayor, March 4, 1879, without his approval or objections thereto; therefore, as provided in section 11, chapter 335, Laws of 1873, the same became adopted.

DEPARTMENT OF PUBLIC PARKS.

Abstract of the Proceedings of the Department of Public Parks for the week ending Saturday, March 1, 1879.

MEETING HELD FEBRUARY 29, 1879.

At a meeting of the Board held on the 29th February, 1879, Messrs. Nicholas H. Decker and Geo. W. Quintard, contractors for the "Improvement and Construction of Riverside Avenue," were ordered to proceed with that work.

The Director of the Menagerie was authorized to exchange a zebu bull and some sheep for a young ram and a tiger. The latter being now on exhibition in the Park.

Appointments.

Edward P. Barker, Secretary.
Wm. I. McAlpine, Superintending Engineer of Improvement and Construction of Riverside Avenue.

Transfer.

Thos. Franklin, Superintending Engineer Riverside Avenue, transferred to the position of First Assistant Engineer of Construction.

EDWARD P. BARKER, Secretary D. P. P.

METEOROLOGICAL OBSERVATORY

OF THE

DEPARTMENT OF PUBLIC PARKS.

CENTRAL PARK, NEW YORK.

Latitude 40° 45' 58" N. Longitude 73° 57' 58" W. Height of Instruments above the Ground, 53 feet; above the Sea, 97 feet.

ABSTRACT OF REGISTERS FROM SELF-RECORDING INSTRUMENTS

For the Week Ending March 1, 1879.

Barometer.

DATE.		7 A. M.		2 P. M.		9 P. M.		Mean for the Day.	MAXIMUM.			MINIMUM.		
		Observed Height.	Reduced to Freezing.	Observed Height.	Reduced to Freezing.	Observed Height.	Reduced to Freezing.		Reduced to Freezing.	Observed Height.	Reduced to Freezing.	Time.	Observed Height.	Reduced to Freezing.	Time.
Sunday,	23	29.676	29.685	29.576	29.543	29.540	29.515	29.581	29.684	29.677	9 A. M.	29.538	29.500	4 P. M.
Monday,	24	29.722	29.745	29.744	29.751	29.808	29.823	29.773	29.888	29.903	12 P. M.	29.584	29.577	0 A. M.
Tuesday,	25	29.944	29.959	29.900	29.901	29.792	29.793	29.884	29.990	30.002	9 A. M.	29.784	29.788	12 P. M.
Wednesday,	26	29.706	29.707	29.666	29.607	29.822	29.788	29.701	29.880	29.849	12 P. M.	29.658	29.601	3 P. M.
Thursday,	27	30.142	30.160	30.250	30.257	30.448	30.474	30.297	30.490	30.527	12 P. M.	29.880	29.849	0 A. M.
Friday,	28	30.600	30.654	30.596	30.619	30.620	30.643	30.638	30.654	30.705	9 A. M.	30.480	30.517	0 A. M.
Saturday,	1	30.598	30.624	30.446	30.428	30.358	30.337	30.475	30.616	30.645	0 A. M.	30.308	30.293	12 P. M.

Mean for the week..... 30.047 inches.
Maximum " at 9 A. M., February 28..... 30.705 "
Minimum " at 4 P. M., February 23..... 29.500 "
Range " 1.205 "

Thermometers.

DATE. FEBRUARY AND MARCH.		7 A. M.		2 P. M.		9 P. M.		MEAN.		MAXIMUM.				MINIMUM.				MAX- IMUM.				
		Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Time.		Wet Bulb.	Time.		Dry Bulb.	Time.		Wet Bulb.	Time.		In Sun.
Sunday,	23	25	24	41	34	38	35	34.7	31.0	44	5 P. M.	37	5 P. M.	22	2 A. M.	22	2 A. M.					102
Monday,	24	20	20	26	22	23	22	23.0	21.3	31	0 A. M.	30	0 A. M.	20	8 A. M.	20	8 A. M.					89
Tuesday,	25	23	22	28	27	28	28	26.3	25.7	29	8 P. M.	28	8 P. M.	23	5 A. M.	21	5 A. M.					38
Wednesday,	26	28	28	51	46	41	38	40.0	37.3	52	6 P. M.	49	6 P. M.	27	5 A. M.	27	5 A. M.					106
Thursday,	27	22	22	26	23	19	18	22.3	21.0	40	0 A. M.	35	0 A. M.	15	12 P. M.	14	12 P. M.					91
Friday,	28	9	9	20	17	20	19	16.3	15.0	22	6 P. M.	20	6 P. M.	9	7 A. M.	9	7 A. M.					89
Saturday,	1	19	18	35	32	36	33	30.0	27.6	39	4 P. M.	35	4 P. M.	18	4 A. M.	17	4 A. M.					85

Mean for the week..... 27.5 degrees.
Maximum for the week, at 6 P. M., 26th..... 52. " at 6 P. M., 26th..... 49. "
Minimum " at 7 A. M., 28th..... 9. " at 7 A. M., 28th..... 9. "
Range " 43. " 40. "

Wind.

DATE.	FEBRUARY AND MARCH.	DIRECTION.			VELOCITY IN MILES.			Distance for the Day.	FORCE IN POUNDS PER SQUARE FOOT.				
		7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.		7 A. M.	2 P. M.	9 P. M.	Max.	Time.
Sunday,	23	WSW	S	SW	46	46	46	138	0	1/2	1/2	4	11 P. M.
Monday,	24	WNW	WSW	WNW	86	71	56	213	1/4	3/4	1/4	4	11.20 A. M.
Tuesday,	25	ENE	ENE	NE	27	62	60	149	1 1/4	1/2	1	3	10.50 A. M.
Wednesday,	26	NE	SE	W	69	25	61	155	3/4	1/2	0	2 1/2	6.30 P. M.
Thursday,	27	WNW	WNW	NNW	105	87	77	269	3/4	2	2	4 1/2	5 A. M.
Friday,	28	NNE	NNE	E	89	60	32	181	2 1/4	1	0	3	10 A. M.
Saturday,	1	NE	SE	SSW	28	47	57	132	0	1/4	1/4	1 1/4	6.15 P. M.

Distance traveled during the week..... 1,237 miles.
Maximum force " 4 1/2 pounds.

DATE. FEBRUARY AND MARCH.	Hygrometer.						Clouds.			Rain and Snow.					
	FORCE OF VAPOR.			RELATIVE HUMIDITY.			CLEAR, O. OVERCAST, 10.			DEPTH OF RAIN AND SNOW IN INCHES.					
	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Time of Beginning.	Time of Ending.	Duration.	Amount of Water.	Depth of Snow.	
												H. M.			
Sunday, 23	.117	.105	.165	87	41	72	7 Cu.	8 Cir. Cu.	0	.....	.....	....	..	..
Monday, 24	.108	.072	.107	100	51	86	1 Cu.	2 Cir.	3 Cir.	.....	.....	....	..	..
Tuesday, 25	.107	.136	.153	86	88	100	9 Cu. Fog. 10	10	8 Cir.	11 A. M.	5 P. M.	6 00	.17	1½	
Wednesday, 26	.153	.245	.190	100	65	74	0	9 Cu.	10	4.15 P. M.	10 P. M.	5 45	.17	..	
Thursday, 27	.118	.089	.087	100	63	84	0	1 Cu.	0	1 A. M.	5 A. M.	4 00	.06	1	
Friday, 28	.065	.060	.092	100	56	85	0	0	0	.....	.....	....	..	..
Saturday, 1	.087	.142	.149	84	70	70	9 Cu.	8 Cu.	8 Cu.	.....	.....	....	..	..

Total amount of water for the week..... .40 inch.

DANIEL DRAPER, Director.

OFFICIAL DIRECTORY.

STATEMENT OF THE HOURS DURING WHICH all the Public Offices in the City are open for business, and at which each Court regularly opens and adjourns, as well as of the places where such offices are kept and such Courts are held; together with the heads of Departments and Courts.

EXECUTIVE DEPARTMENT.

Mayor's Office.
No. 6 City Hall, 10 A. M. to 3 P. M.
EDWARD COOPER, Mayor; JAMES E. MORRISON, Secretary.

Mayor's Marshal's Office.
No. 7 City Hall, 10 A. M. to 3 P. M.
JOHN TYLER KELLY, First Marshal.

Permit and License Bureau Office.
No. 1 City Hall, 10 A. M. to 3 P. M.
DANIEL S. HART, Registrar.

LEGISLATIVE DEPARTMENT.

Office of Clerk of Common Council.
No. 8 City Hall, 10 A. M. to 4 P. M.
JORDAN L. MOTT, President; Board of Aldermen.
JACOB M. PATTERSON, JR., Clerk Common Council.

DEPARTMENT OF PUBLIC WORKS.

Commissioner's Office.
No. 19 City Hall, 9 A. M. to 4 P. M.
ALLAN CAMPBELL, Commissioner; HUBERT O. THOMPSON, Deputy Commissioner.

Bureau of Water Register.
No. 10 City Hall, 9 A. M. to 4 P. M.
JOHN H. CHAMBERS, Register.

Bureau of Incumbrances.
No. 13 City Hall, 9 A. M. to 4 P. M.
JOSEPH BLUMENTHAL, Superintendent.

Bureau of Lamps and Gas.
No. 21 City Hall, 9 A. M. to 4 P. M.
STEPHEN MCCORMICK, Superintendent.

Bureau of Streets.
No. 19 City Hall, 9 A. M. to 4 P. M.
JAMES J. MOONEY, Superintendent.

Bureau of Sewers.
No. 21 City Hall, 9 A. M. to 4 P. M.
STEVENSON TOWLE, Engineer-in-Charge.

Bureau of Chief Engineer.
No. 11½ City Hall, 9 A. M. to 4 P. M.

Bureau of Street Improvements.
No. 11 City Hall, 9 A. M. to 4 P. M.
GEORGE A. JEREMIAH, Superintendent.

Bureau of Repairs and Supplies.
No. 18 City Hall, 9 A. M. to 4 P. M.
THOMAS KEECH, Superintendent.

Bureau of Water Purveyor.
No. 4 City Hall, 9 A. M. to 4 P. M.
DANIEL O'REILLY, Water Purveyor.

Keeper of Buildings in City Hall Park.
JOHN F. SLOPER, City Hall.

FINANCE DEPARTMENT.

Comptroller's Office.
Nos. 19 and 20 New County Court-house, 9 A. M. to 4 P. M.
JOHN KELLY, Comptroller; RICHARD A. STORRS, Deputy Comptroller.

Auditing Bureau.
No. 19 New County Court-house, 9 A. M. to 4 P. M.
DANIEL JACKSON, Auditor of Accounts.

Bureau of Arrears.
No. 5 New County Court-house, 9 A. M. to 4 P. M.
ARTEMAS CADDY, Clerk of Arrears.

Bureau for the Collection of Assessments.
No. 16 New County Court-house, 9 A. M. to 4 P. M.
EDWARD GILON, Collector.

Bureau of City Revenue.
No. 6 New County Court-house, 9 A. M. to 4 P. M.
EDWARD F. FITZPATRICK, Collector of City Revenue.

Bureau of Markets.
No. 6 New County Court-house, 9 A. M. to 4 P. M.
JOSHUA M. VARIAN, Superintendent of Markets.

Bureau for the Collection of Taxes.
First floor, Brown-stone building, City Hall Park.
MARTIN T. MCMAHON, Receiver of Taxes; ALFRED VREDENBURG, Deputy Receiver of Taxes.

Bureau of the City Chamberlain.
No. 18 New County Court-house, 9 A. M. to 4 P. M.
J. NELSON TAPPAN, City Chamberlain.

LAW DEPARTMENT.

Office of the Counsel to the Corporation.
Staats Zeitung Building, third floor, 9 A. M. to 4 P. M.
WILLIAM C. WHITNEY, Counsel to the Corporation.
ANDREW T. CAMPBELL, Chief Clerk.

Office of the Public Administrator.
No. 49 Beekman street, 9 A. M. to 4 P. M.
ALGERNON S. SULLIVAN, Public Administrator.

Office of the Corporation Attorney.
No. 49 Beekman street, 9 A. M. to 4 P. M.
WILLIAM A. BOYD, Corporation Attorney.

Attorney to Department of Buildings Office.
Corner Cortland and Church streets.
JOHN A. FOLEY, Attorney.

POLICE DEPARTMENT.

Central Office.
No. 300 Mulberry street, 9 A. M. to 4 P. M.
WILLIAM F. SMITH, President; SETH C. HAWLEY, Chief Clerk.

DEPARTMENT OF CHARITIES AND CORRECTION.

Central Office.
Third avenue, corner Eleventh street, 9 A. M. to 4 P. M.
TOWNSEND COX, President; JOSHUA PHILLIPS, Secretary.

FIRE DEPARTMENT.

Headquarters.
Nos. 153, 155, and 157 Mercer street, 9 A. M. to 4 P. M.
VINCENT C. KING, President; CARL JUSSEN, Secretary.

HEALTH DEPARTMENT.

No. 301 Mott street, 9 A. M. to 4 P. M.
CHARLES F. CHANDLER, President; EMMONS CLARK, Secretary.

DEPARTMENT OF PUBLIC PARKS.

No. 36 Union square, 9 A. M. to 4 P. M.
JAMES F. WENMAN, President; EDWARD P. BARKER, Secretary.

Civil and Topographical Office.
Arsenal, 64th street and 5th avenue, 9 A. M. to 5 P. M.

Office of Superintendent of 23d and 24th Wards.
Fordham, 9 A. M. to 5 P. M.

DEPARTMENT OF DOCKS.

Nos. 117 and 119 Duane street, 9 A. M. to 4 P. M.
JACOB A. WESTERVELT, President; EUGENE T. LYNCH, Secretary.

DEPARTMENT OF TAXES AND ASSESSMENTS.
Brown-stone building, City Hall Park, 9 A. M. to 4 P. M.
JOHN WHEELER, President; ALBERT STORER, Secretary.

BOARD OF ASSESSORS.

Office, No. 114 White street, 9 A. M. to 4 P. M.
THOMAS B. ASTEN, President; WM. H. JASPER, Secretary.

DEPARTMENT OF BUILDINGS.

No. 2 Fourth avenue, 8:30 A. M. to 4 P. M.
HENRY J. DUDLEY, Superintendent.

BOARD OF EXCISE.

Corner Mulberry and Houston streets, 9 A. M. to 4 P. M.
RICHARD J. MORRISON, President; J. B. ADAMSON, Chief Clerk.

SEALERS OF WEIGHTS AND MEASURES.

No. 236 West Forty-third street.
ELIJAH W. ROE.

SHERIFF'S OFFICE.

Nos. 3 and 4 New County Court-house, 9 A. M. to 4 P. M.
BERNARD REILLY, Sheriff; JOHN T. CUMMING, Under Sheriff.

COMMISSION FOR THE COMPLETION OF THE NEW COUNTY COURT-HOUSE.

No. 28 New County Court-house, 9 A. M. to 5 P. M.
WYLLIS BLACKSTONE, President; ISAAC EVANS, Secretary.

REGISTER'S OFFICE.

East side City Hall Park, 9 A. M. to 4 P. M.
FREDERICK W. LOEW, Register; AUGUSTUS T. DOCHARTY, Deputy Register.

COMMISSIONERS OF ACCOUNTS.

No. 27 Chambers street, 9 A. M. to 4 P. M.
WM. PITT SHEARMAN, ROBERT F. HATFIELD.

COMMISSIONER OF JURORS.

No. 17 New County Court-house, 9 A. M. to 4 P. M.
THOMAS DUNLAP, Commissioner; ALFRED J. KEEGAN, Deputy Commissioner.

COUNTY CLERK'S OFFICE.

Nos. 7 and 8 New County Court-house, 9 A. M. to 4 P. M.
HENRY A. GUMBLETON, County Clerk; J. FAIRFAX McLAUGHLIN, Deputy County Clerk.

DISTRICT ATTORNEY'S OFFICE.

Second floor, Brown-stone building, City Hall Park, 9 A. M. to 4 P. M.
BENJAMIN K. PHELPS, District Attorney; MOSES P. CLARK, Chief Clerk.

THE CITY RECORD OFFICE.

And Bureau of Printing, Stationery, and Blank Books.
No. 2 City Hall, 8 A. M. to 6 P. M.; Saturdays, 8 A. M. to 5 P. M.
THOMAS COSTIGAN, Supervisor; R. P. H. ABELL, Book-keeper.

CORONERS' OFFICE.

No. 40 East Houston street.
HENRY WOLTMAN, MORITZ ELLINGER, RICHARD CROKER, and RICHARD FLANAGAN, Coroners.

SUPREME COURT.

Second floor, New County Court-house, 10½ A. M. to 3 P. M.
General Term, Room No. 9.
Special Term, Room No. 10.
Chambers, Room No. 11.
Circuit, Part I, Room No. 12.
Circuit, Part II, Room No. 13.
Circuit, Part III, Room No. 14.
Judges' Private Chambers, Room No. 1.
NOAH DAVIS, Chief Justice; HENRY A. GUMBLETON, Clerk.

SUPERIOR COURT.

Third floor, New County Court-house, 11 A. M. to 4 P. M.
General Term, Room No. 29.
Special Term, Room No. 30.
Chambers, Room No. 33.
Part I, Room No. 34.
Part II, Room No. 35.
Part III, Room No. 36.
Judges' Private Chambers, Room No. 30.
Naturalization Bureau, Room No. 32.
Clerk's Office, 9 A. M. to 4 P. M., Room No. 31.
WILLIAM E. CURTIS, Chief Judge; THOS. BOESE, Chief Clerk.

LEGISLATIVE DEPARTMENT.

OFFICE CLERK OF THE COMMON COUNCIL.
No. 8 City Hall, New York, January 16, 1879.

THE COMMITTEE ON PUBLIC WORKS OF the Board of Aldermen will meet in Room No. 8 City Hall, every Thursday, at 1 o'clock, P. M.

By Order of the Committee,
HENRY C. PERLEY,
TERENCE KIERNAN,
JOSEPH P. STRACK,
FREDERICK FINCK,
THOMAS CARROLL,
Committee on Public Works.

JACOB M. PATTERSON, JR.,
Clerk.

THE COMMITTEE ON LAW DEPARTMENT of the Board of Aldermen will meet every Monday in the City Library, Room No. 12 City Hall, at 1 o'clock P. M.

By Order of the Committee,
J. GRAHAM HYATT,
Chairman.

HEALTH DEPARTMENT.

HEALTH DEPARTMENT.
No. 301 MOTT STREET,
New York, March 7, 1879.

AT A MEETING OF THE BOARD OF HEALTH of the Health Department of the City of New York, held at its office on the 4th day of March, 1879, the following resolution was adopted:

Resolved, That under the power conferred by law upon the Health Department, the following additional sections

to the Sanitary Code, for the security of life and health, be and the same are hereby adopted and declared to form a portion of the Sanitary Code.

Section 202. Any cattle, meat, birds, fowl, fish, fruits, or vegetables, found by any inspector or officer of this Department in a condition which is, in his opinion, unwholesome or unfit for use as human food, shall, upon the order of the Sanitary Superintendent, be removed from any market, street, or public place, and the owner or person in charge thereof, when so directed by the said inspector or by such order of the Sanitary Superintendent, shall remove, or cause the same to be removed, to the place designated by the Sanitary Superintendent, or to the offal dock, and shall not sell, or offer to sell, or dispose of the same, for human food. And when, in the opinion of the Sanitary Superintendent, any such meat, fish, fruits, or vegetables shall be unfit for human food, or any such animal, cattle, sheep, swine, or fowls, by reason of disease, or exposure to contagious disease, shall be unfit for human food, and improper or unfit to remain near other animals or to be kept alive, the Board of Health may direct the same to be destroyed, as dangerous to life and health, and may order any such animals, sheep, swine, or fowls, to be removed by any inspector, police officer, officer, or agent of this Department, and to be killed and taken to the offal dock.

Section 203. That hereafter no person shall gather, collect, accumulate, store, expose, carry, or transport in any manner through the streets and public places of this city, or in or to any tenement-house, cellar, or house in said city, any bones, refuse, or offensive material, without a special permit in writing from the Board of Health, in accordance with the conditions and subject to the limitations thereof, and in such manner as not to cause offensive odors or any nuisance whatsoever.

[L. S.] CHARLES F. CHANDLER,
President.
EMMONS CLARK, Secretary.

DEPARTMENT OF PUBLIC CHARITIES AND CORRECTION.

DEPARTMENT OF PUBLIC CHARITIES AND CORRECTION.
No. 66 THIRD AVENUE,
New York, March 8, 1879.

PROPOSALS FOR DRY GOODS, GROCERIES, LEATHER, ETC.

PROPOSALS, SEALED AND INDORSED AS above, will be received by the Commissioners of Public Charities and Correction, at their office, until 9 o'clock A. M., of Friday, March 21, 1879, at which time they will be publicly opened and read by the head of said Department, for furnishing and delivering at the foot of East Twenty-sixth street, free of all expense to the Department—

DRY GOODS.
1,000 yards Linen Diaper.
200 Rubber Blankets.

GROCERIES, ETC.
10,000 pounds Butter.
10,000 " Crushed Sugar.
10,000 " Granulated Sugar.
10,000 " Barley.
20,000 " Rice.
2,500 gallons Syrup.
1,000 pounds Roasted Maracibo Coffee.
1,000 gallons Vinegar.
500 bushels Rye.
50 barrels Mess Pork.
24 dozen Canned Corn.
1,000 bales Straw.
250 bags Fine Yellow Meal.

HARDWARE.
20 kegs 3d Fine Nails.
20 kegs 8d Nails.
25 gross Table Spoons.

LEATHER.
10,000 feet Waxed Kip Leather.

LUMBER.
10,000 feet Shelving.

COAL.
50 tons Cumberland Coal.

The quality of the goods furnished must conform in every respect to the samples of the above to be seen at this office, and bidders must examine specifications for particulars of goods required before making their proposals.

The award of the contract will be made as soon as practicable after the opening of the bids.
No proposal will be considered unless accompanied by the consent, in writing, of two householders or freeholders of the City of New York, with their respective places of business or residence, to the effect that, if the contract be awarded under that proposal, they will, on its being so awarded, become bound as sureties in the estimated amount of fifty per cent. for its faithful performance, which consent must be verified by the justification of each of the persons signing the same for double the amount of surety required. The sufficiency of such security to be approved by the Comptroller.

The Department of Public Charities and Correction reserve the right to decline any and all proposals if deemed to be for the public interest, and to accept an offer for the whole bid or for any single article included in the proposal, and no proposal will be accepted from, or a contract awarded to, any person who is in arrears to the Corporation upon debt or contract, or who is defaulter, as security or otherwise, upon any obligation to the Corporation.

Blank forms of proposals and specifications, which are to be strictly complied with, can be obtained on application at the office of the Department, and all information furnished.

TOWNSEND COX,
THOMAS S. BRENNAN,
ISAAC H. BAILEY,
Commissioners.

DEPARTMENT OF PUBLIC CHARITIES AND CORRECTION.
No. 66 THIRD AVENUE,
New York, March 5, 1879.

IN ACCORDANCE WITH AN ORDINANCE OF the Common Council, "In relation to the burial of strangers or unknown persons who may die in any of the public institutions of the City of New York," the Commissioners of Public Charities and Correction report as follows:

At Workhouse, Blackwell's Island—Mary Calahan; aged 34 years. Committed February 11, 1879. Nothing known of her friends or relatives.
At Hart's Island Hospital—Frederick Eberts; aged 53 years; 5 feet 4 inches high; dark hair and eyes. Had on when admitted, black coat, gray pants, black cardigan jacket, white shirt. Nothing known of his friends or relatives.

By Order,
JOSHUA PHILLIPS,
Secretary.

DEPARTMENT OF PUBLIC CHARITIES AND CORRECTION.
No. 66 THIRD AVENUE,
New York, February 26, 1879.

IN ACCORDANCE WITH AN ORDINANCE OF the Common Council, "In relation to the burial of strangers or unknown persons who may die in any of the public institutions of the City of New York," the Commissioners of Public Charities and Correction report as follows:

At Charity Hospital, Blackwell's Island—Edward Russell; aged 70 years; 5 feet 5½ inches high; gray hair; dark brown eyes. Had on when admitted, black coat, vest and pants. Nothing known of his friends or relatives.

By Order,
JOSHUA PHILLIPS,
Secretary.

COLLEGE OF THE CITY OF NEW YORK.

A STATED SESSION OF THE BOARD OF TRUSTEES of the College of the City of New York will be held at the Hall of the Board of Education (No. 146 Grand street), on Tuesday, March 18, 1879, at 4 o'clock P. M.

LAWRENCE D. KIERNAN,
Secretary.

POLICE DEPARTMENT.

PROPERTY CLERK'S OFFICE.
POLICE DEPARTMENT OF THE CITY OF NEW YORK,
No. 300 MULBERRY STREET, ROOM NO. 39,
NEW YORK, March 3, 1879.

OWNERS WANTED BY THE PROPERTY Clerk of the Police Department, City of New York, 300 Mulberry street, Room 39, for the following property now in his custody without claimants: Male and female clothing, tin ware, silver plated ware, mats, buttons, revolvers, barrel oil, three barrels molasses, and small amount money taken from prisoners and found.

C. A. ST. JOHN,
Property Clerk.

POLICE DEPARTMENT OF THE CITY OF NEW YORK.
No. 300 MULBERRY STREET,
New York, February 28, 1879.

PUBLIC NOTICE IS HEREBY GIVEN THAT a horse, the property of this Department, will be sold at public auction, on Friday, March 14, 1879, at 10 o'clock A. M., at the stables of Vantassell & Kearney, 110 East Thirteenth street.

By order of the Board
S. C. HAWLEY,
Chief Clerk.

JURORS.

NOTICE IN RELATION TO JURORS FOR STATE COURTS.

OFFICE OF THE COMMISSIONER OF JURORS.
NEW COUNTY COURT-HOUSE,
New York, June 1, 1877.

APPLICATIONS FOR EXEMPTIONS WILL BE heard here, from 9 to 4 daily, from all persons hitherto liable or recently serving who have become exempt, and all needed information will be given.

Those who have not answered as to their liability, or proved permanent exemption, will receive a "jury enrollment notice," requiring them to appear before me this year. Whether liable or not, such notices must be answered (in person, if possible, and at this office only) under severe penalties. If exempt, the party must bring proof of exemption; if liable, he must also answer in person, giving full and correct name, residence, etc., etc. No attention paid to letters.

Persons "enrolled" as liable must serve when called or pay their fines. No mere excuse will be allowed or interference permitted. The fines, received from those who, for business or other reasons, are unable to serve at the time selected, pay the expenses of this office, and if unpaid will be entered as judgments upon the property of the delinquents.

All good citizens will aid the course of justice, and secure reliable and respectable juries, and equalize their duty by serving promptly when summoned, allowing their clerks or subordinates to serve, reporting to me any attempt at bribery or evasion, and suggesting names for enrollment. Persons between sixty and seventy years of age, summer absentees, persons temporarily ill, and United States and District Court jurors are not exempt.

Every man must attend to his own notice. It is a misdemeanor to give any jury paper to another to answer. It is also punishable by fine or imprisonment to give or receive any present or bribe, directly or indirectly, in relation to a jury service, or to withhold any paper or make any false statement, and every case will be fully prosecuted.

THOMAS DUNLAP, Commissioner,
County Court-house (Chambers street entrance)

SUPREME COURT.

In the matter of the application of the Department of Public Parks, for and in behalf of the Mayor, Aldermen, and Commonalty of the City of New York, relative to the opening of Eighty-first street, from the Boulevard to the New avenue, and from Twelfth avenue to Hudson river, in the City of New York.

PURSUANT TO THE STATUTES IN SUCH cases made and provided, the Department of Public Works, for and on behalf of the Mayor, Aldermen, and Commonalty of the City of New York, hereby give notice that the Counsel to the Corporation will apply to the Supreme Court, in the First Judicial District of the State of New York, on Thursday, the third day of April, 1879, at eleven o'clock in the forenoon of that day, or as soon thereafter as counsel can be heard thereon, for the appointment of a Commissioner of Estimate and Assessment in the above-entitled proceeding in the place and stead of James Bagley, deceased.

New York, March 8, 1879.
WM. C. WHITNEY,
Counsel to the Corporation.

In the matter of the application of the Department of Public Parks, for and in behalf of the Mayor, Aldermen, and Commonalty of the City of New York, relative to the opening of One Hundred and Thirty-eighth street, from Harlem river to Long Island Sound; and to the opening of One Hundred and Forty-ninth street, from Harlem river to the Southern Boulevard; and to the opening of Westchester avenue, from Third avenue to the city line at the Bronx river; and to the opening of Cliff street, from Third avenue to Union avenue; and to the opening of One Hundred and Sixty-first street, from Jerome avenue (late Central avenue) to Third avenue; and to the opening of One Hundred and Sixty-fifth street, from Boston avenue to Union avenue; and to the opening of Tinton avenue, from Westchester avenue to One Hundred and Sixty-ninth street; and to the opening of Prospect avenue, from One Hundred and Fifty-sixth street to the Southern Boulevard; and to the opening of Willis avenue, from One Hundred and Forty-seventh street to Third avenue; and to the opening of One Hundred and Forty-eighth street, from Third avenue to St. Ann's avenue; and to the opening of One Hundred and Fifty-sixth street, from Third avenue to Elton avenue; and to the opening and widening of Morris avenue, from Third avenue to Railroad avenue at One Hundred and Fifty-sixth street, in the Twenty-third Ward of the City of New York.

NOTICE IS HEREBY GIVEN THAT THE BILL of the costs, charges and expenses incurred by reason of the proceedings in the above entitled matter will be presented for taxation to one of the Justices of the Supreme Court, in the New Court-house, in the City Hall, in the City of New York, on the nineteenth day of March, 1879, at eleven o'clock in the forenoon.

MEYER BUTZEL,
HENRY LEWIS,
JOSEPH BLUMENTHAL,
Commissioners

Dated New York, March 1, 1879.

FINANCE DEPARTMENT.

DEPARTMENT OF FINANCE,
BUREAU FOR COLLECTION OF ASSESSMENTS,
No. 16 NEW COURT-HOUSE, CITY HALL PARK,
NEW YORK, February 27, 1879.

NOTICE TO PROPERTY-HOLDERS.

PROPERTY-HOLDERS ARE HEREBY NOTIFIED that the following assessment lists were received this day in this Bureau for collection:

CONFIRMED AND ENTERED FEBRUARY 24, 1879.

65th street, paving, from 1st to 3d avenue.
75th street, paving, from 4th to Madison avenue.
84th street, paving, from Boulevard to Riverside drive.
Goerck street, sewer, from Houston to 3d street.
10th avenue, sewer, between 116th and Manhattan streets.

57th street, flagging, (north side), between Lexington and 3d avenues.

85th street, fencing, between 1st avenue and Avenue A and southwest corner of 86th street.

74th street, fencing, between 4th and Madison avenues.

All payments made on the above assessments on or before April 28, 1879, will be exempt (according to law) from interest. After that date interest will be charged at the rate of seven (7) per cent. from the date of entry.

The Collector's office is open daily, from 9 A. M. to 2 P. M., for the collection of money, and until 4 P. M. for general information.

EDWARD GILON,
Collector of Assessments.

DEPARTMENT OF FINANCE,
BUREAU FOR COLLECTION OF ASSESSMENTS,
No. 16 NEW COURT-HOUSE, CITY HALL PARK,
NEW YORK, January 21, 1879.

NOTICE TO PROPERTY-HOLDERS.

PROPERTY-HOLDERS ARE HEREBY NOTIFIED that the following assessment lists were received this day in this Bureau for collection:

CONFIRMED AND ENTERED JANUARY 15, 1879.

78th street, regulating, grading, etc., from 9th avenue to Boulevard.

112th street, regulating, grading, etc., from Madison avenue to 175 feet east, etc.

76th street, sewer, between Boulevard and 11th avenue.

6th avenue, sewer, between 10th and 101st streets, etc.

Greenwich street, sewer between West Houston and Clarkson streets.

East Broadway or Chatham square (east side), sewer between Oliver and Catherine streets.

4th avenue (west side), sewer, between 123d and 125th streets.

104th street, sewer, between 4th and 5th avenues.

10th avenue, sewer, between 110th and 114th streets.

57th street (north side), basin, between Madison and 4th avenues.

65th street, basin, northwest corner 5th avenue.

70th street, paving crossing at 4th avenue.

82d street, paving between 3d and Madison avenues.

34th street, flagging in front of No. 411 E.

40th street, flagging (south side), between 1st and 2d avenues.

Madison avenue, flagging (east side), between 56th and 57th streets.

85th street, flagging between 1st avenue and Avenue A.

57th street (south side), fencing vacant lots, between 5th and 6th avenues.

All payments made on the above assessments on or before March 22, 1879, will be exempt (according to law) from interest. After that date interest will be charged at the rate of seven (7) per cent. from the date of entry.

The Collector's office is open daily, from 9 A. M. to 2 P. M., for the collection of money, and until 4 P. M. for general information.

EDWARD GILON,
Collector of Assessments.

REAL ESTATE RECORDS

THE ATTENTION OF LAWYERS, REAL Estate Owners, Monetary Institutions engaged in making loans upon real estate, and all who are interested in providing themselves with facilities for reducing the cost of examinations and searches, is invited to these Official Indices of Records, containing all recorded transfers of real estate in the City of New York from 1653 to 1875, prepared under the direction of the Commissioners of Records.

Grantees, grantees, suits in equity, insolvents' and Sheriffs' sales, in 61 volumes, full bound, price, \$100 00
The same, in 25 volumes, half bound, price, 50 00
Complete sets, folded, ready for binding, 15 00
Records of Judgments, 25 volumes, bound, 10 00
Orders should be addressed to "Mr. Stephen Angell, Comptroller's Office, New County Court-house."

JOHN KELLY,
Comptroller

THE CITY RECORD.

COPIES OF THE CITY RECORD CAN BE obtained at No. 2 City Hall (northwest corner basement). Price three cents each.

DEPARTMENT OF DOCKS.

NOTICE.

DEPARTMENT OF DOCKS,
Nos. 117 and 119 DUANE STREET,
NEW YORK, February 28, 1879.

JAMES M. OAKLEY & CO., AUCTIONEERS,
will sell at Public Auction, at the Exchange Sales-room, No. 111 Broadway, on

THURSDAY, MARCH 13, 1879.

at 12 o'clock M., the right to collect and retain all wharfage which may accrue for the use and occupation by vessels of more than five tons burthen, of the following-named Piers and Bulkheads, to wit:

ON NORTH RIVER.

For and during the term of one year, from 1st May, 1879:

Lot 1. Pier, old 42, and Bulkhead adjoining southerly side, at Hoboken street.

Lot 2. Pier at West Twenty-eighth street (except reservation on southerly side for berth for night-boat).

Lot 3. Pier at West Thirty-fifth street (except reservation on northerly side for berth for public bath, during summer season).

Lot 4. Pier at West Fifty-fifth street. (These premises will not be repaired or dredged by the Department, and the purchaser of this lot will be required to take the premises in the condition in which they may be on 1st May, 1879.)

Lot 5. Pier at West Fifty-seventh street. (No dredging will be done at these premises by the Department.)

For and during the term of three years, from 1st May 1879:

Lot 6. Pier at West Eleventh street, and Bulkhead extending easterly from southerly side thereof to west line of West street.

Lot 7. Pier at Gansevoort street.

Lot 8. Bulkhead at West Nineteenth street.

Lot 9. Pier at West Seventy-ninth street, except reservation of northerly half when required for landing material for City Departments. (No dredging will be done at these premises by the Department.)

For and during the term of five years, from 1st August, 1879:

Lot 10. Pier 13 and one-half of Bulkhead adjoining southerly side. (These premises will not be repaired or dredged by the Department, and the purchaser of this lot will be required to take the premises in the condition in which they may be on 1st August, 1879.)

Lot 11. Northerly half of Pier 12 and one-half of Bulkhead adjoining. (These premises will not be repaired or dredged by the Department, and the purchaser of this lot will be required to take the premises in the condition in which they may be on 1st August, 1879.)

ON EAST RIVER.

For and during the term of one year, from 1st May, 1879:

Lot 12. Pier or bulkhead at East Eighty-sixth street.

For and during the term of three years, from 1st May, 1879:

Lot 13. Bulkhead between Piers 20 and 21.

Lot 14. Outer half of easterly side of Pier 22.

Lot 15. One undivided ninth-part of Pier 42. (These premises will not be repaired or dredged by the Department, and the purchaser of this lot will be required to take the premises in the condition in which they may be on 1st May, 1879.)

Lot 16. Easterly half of Pier 51 and westerly half of Pier 52, and Bulkhead and small Pier between (except reservation at outer end of easterly side of Pier 51, for berth for public bath during summer seasons).

Lot 17. Easterly half of Pier 53.

Lot 18. Bulkhead at Corlears street.

Lot 19. Northerly half of Pier 56, and southerly half of Pier 57, and Bulkhead between.

Lot 20. Pier at Third street (except reservation on southerly side for berth for Police Boat).

Lot 21. Pier at Fifth street (except reservation on northerly side for berth for public bath during summer seasons, and on southerly side for dumping-board).

Lot 22. Bulkhead at East Sixteenth street.

Lot 23. Bulkhead at East Twentieth street.

Lot 24. Pier and dump at East Twenty-second street.

Lot 25. Pier at East Twenty-third street (except reservation of outer end and on southerly side for berth for school-ship).

Lot 26. Pier at East Twenty-fifth street.

Lot 27. Pier at East Twenty-eighth street.

Lot 28. Bulkhead extension (stone dump) at East Forty-fifth street. (No dredging will be done at these premises by the Department.)

Lot 29. Pier at East Fifty-fourth street. (No dredging will be done at these premises by the Department.)

For and during the term of five years, from 1st May, 1879:

Lot 30. Easterly half of Pier 18.

Lot 31. Easterly half of Pier 25 and westerly half of Pier 26 and Bulkhead between.

For and during the term of three years, from 1st June 1879:

Lot 32. About 211 feet of outer end of westerly half of Pier 23.

For and during the term of three years, from 1st November, 1879:

Lot 33. Southerly half, except outer end, of Pier 55 and about 54 feet of Bulkhead adjoining.

ON HARLEM RIVER.

For and during the term of three years from 1st May, 1879:

Lot 34. Pier at East One Hundred and Ninth street. (No dredging will be done at these premises by the Department.)

Lot 35. Pier at East One Hundred and Seventeenth street. (No dredging will be done at these premises by the Department.)

Lot 36. Pier or Platform at East One Hundred and Twentieth street. (No dredging will be done at these premises by the Department.)

TERMS AND CONDITIONS OF THE SALE.

The Department will make, prior to the commencement of the term of lease in each case, such repairs to any of the above-named premises, in the judgment of the Commissioners, needing them, as they may consider necessary to place the premises in suitable condition for service during the term for which leases are to be sold, except that no repairs will be made to any of the above-named premises where it is stated that they will not be repaired by the Department; but all the premises may be taken in the condition in which they may be on the date of commencement of said terms, respectively; and no claim that the property is not in suitable condition at the commencement of the lease, will be allowed by the Department; and all repairs and rebuilding required and necessary, during the terms leased, are to be done at the expense and cost of the lessees.

Purchasers will be allowed three months, from date of commencement of their leases, in which to notify the Department that dredging is required at the premises leased; and the Commissioners guarantee to do all possible dredging, as soon after being notified of the necessity thereof, as the work of the Department will permit, except that no dredging will be done at any of the above-named premises where it is stated that they will not be dredged by the Department; but in no case will the Department dredge where a depth of ten feet at mean low water already exists, nor after that depth shall have been obtained by dredging; and no claim will be received or considered by the Department, for loss of wharfage or otherwise, consequent upon any delay in doing the work of such dredging, or consequent upon the premises being occupied for dredging purposes. All dredging required at any of the above premises, of which the purchaser of the lease thereof shall neglect or omit to notify the Department during the first three months of the term of the lease, and all dredging necessary during the remainder of such term, is to be done at the expense and cost of the lessee.

The up-set price for each of the above-named premises will be fixed by the Department of Docks, and announced by the auctioneer at the time of the sale.

Each purchaser of a lease will be required, at the time of the sale, and in addition to the auctioneer's fees, to pay to the Department of Docks twenty-five per cent. of the amount of annual rent bid, as security for the execution of the lease, and which twenty-five per cent. will be applied to the payment of the rent first accruing under the lease, when executed, or forfeited if the purchaser neglects or refuses to execute the lease and bond within five days after being duly notified that the lease is prepared and ready for signature. The Commissioners reserve the right to resell the leases bid off by those failing to comply with these terms; the party so failing to be liable for any deficiency which may result from such resale.

Lessees will be required to pay their rent quarterly, in advance, in compliance with a stipulation therefor in the form of lease adopted by the Department.

Two sureties, each a freholder and householder in the City of New York, and to be approved by the Commissioners of Docks, will be required, under each lease, to enter into a bond jointly with the lessee in the sum of an amount double the annual rent for the faithful performance of all the covenants of the lease; and each purchaser will be required to submit, at the time of the sale, the names and address of his proposed sureties.

Each purchaser will be required to agree that he will, upon being notified so to do, execute a lease prepared upon the printed form adopted by the Department, which can be seen upon application to the Secretary, at the office, 119 Duane street.

No person will be received as lessee or surety who is delinquent on any former lease from the Corporation; and no bid will be accepted from any person who is in arrears to the Corporation upon debt or contract, or who is a defaulter, as surety or otherwise, upon any obligation to the Corporation.

HENRY F. DIMOCK,
JACOB VANDERPOEL,
Commissioners of Docks.

NOTICE.

DEPARTMENT OF DOCKS,
117 and 119 DUANE STREET,
NEW YORK, March 6, 1879.

JAMES M. OAKLEY & CO., AUCTIONEERS,
will sell at Public Auction, at the Exchange Sales-room, No. 111 Broadway, on

TUESDAY, MARCH 18, 1879.

at 10 o'clock M., the right to use and occupy as a Fish Market, for and during the term of ten years from May 1, 1879, the premises now used and occupied as a Fish Market, situate at the slip on the East river, in the City of New York, next northeasterly of the slip at foot of Fulton street, including the easterly one-half of Pier No. 23 and the westerly one-half of Pier No. 23, on either side of said slip, for the distance of one-half of the said piers in length from the bulkhead of said slip on South street, together with said bulkhead, with the appurtenances; and with the right to collect and retain all wharfage which may accrue for the use and occupation by vessels of more than five tons burthen of the aforesaid parts of piers and bulkhead.

TERMS AND CONDITIONS OF SALE.

The said premises, piers and bulkhead shall be used for the purposes of a public Fish Market, in the same manner as they are now used, during the continuance of said term.

The said market shall be subject to the laws, ordinances and regulations of the City of New York relating to public markets, so far as the same are not inconsistent with chapter two hundred and seventy-seven, of the Laws of 1869.

The purchaser will be required, within three days after the sale, to execute a bond in the sum of \$75,000 in the form prescribed by the Department of Docks, and approved by the Counsel to the Corporation, with two or more sufficient sureties to be approved by the Commissioners of Docks, conditioned to pay to the present tenants of said premises on or before May 1, 1879, and before he shall be entitled to the possession thereof, the appraised value of the building and improvements now existing upon said premises and erected by said tenants under the lease thereof, executed to them and dated May 6, 1869, such appraisal to be made by appraisers appointed by said Department and said tenants, who, in case of disagreement, shall be authorized to appoint an umpire, said bond being also conditional to indemnify and hold harmless the said Department of Docks, the Mayor, Aldermen, and Commonalty of the City of New York, and the Commissioners of the Sinking Fund of said city, of and from all claim that may be made against them by the present tenants of said market and the holders of stands therein.

The Department will make, prior to the 1st May, 1879, such repairs to any of the above premises, but not to buildings, in the judgment of the Commissioners, needing them, as they may consider necessary to place them in suitable condition for service during the term for which the lease is to be sold; but all the premises must be taken in the condition in which they may be on the date of commencement of said term; and no claim that the property is not in suitable condition at the commencement of the lease will be allowed by the Department; and all repairs and rebuilding required and necessary, during the term leased, are to be done at the expense and cost of the lessee.

The purchaser will be allowed three months, from date of commencement of the lease, in which to notify the Department that dredging is required at the premises leased; and the Commissioners guarantee to do all possible dredging, as soon after being notified of the necessity thereof, as the work of the Department will permit; but in no case will the Department dredge where a depth of ten feet at mean low water already exists, nor after that depth shall have been obtained by dredging; and no claim will be received or considered by the Department, for loss of wharfage or otherwise, consequent upon any delay in doing the work of such dredging, or consequent upon the premises being occupied for dredging purposes. All dredging required at the above premises, of which the purchaser of the lease thereof shall neglect or omit to notify the Department during the first three months of the term of the lease, and all dredging necessary during the remainder of such term, is to be done at the expense and cost of the lessee.

The up-set price for the above-named premises will be fixed by the Department of Docks, and announced by the auctioneer at the time of the sale.

The purchaser will be required at the time of the sale, and in addition to the auctioneer's fees, to pay to the Department of Docks twenty-five per cent. of the amount of annual rent bid, as security for the execution of the lease, and which twenty-five per cent. will be applied to the payment of the rent first accruing under the lease when executed, or forfeited if the purchaser neglects or refuses to execute the lease and bond within five days after being duly notified that the lease is prepared and ready for signature. The Commissioners reserve the right to resell the lease should the purchaser fail to comply with the terms of sale; the party so failing to be liable for any deficiency which may result from such resale.

The lessee will be required to pay the rent quarterly, in advance, in compliance with a stipulation therefor in the form of lease adopted by the Department.

Two sureties, each a freholder and householder in the City of New York, and to be approved by the Commissioners of Docks, will be required, under the lease, to enter into a bond jointly with the lessee, in the sum of an amount double the annual rent, for the faithful performance of all the covenants of the lease; and the purchaser will be required to submit, at the time of the sale, the names and address of his proposed sureties.

The purchaser will be required to agree that he will, upon being notified so to do, execute a lease prepared and adopted by the Department, which can be seen upon application to the Secretary, at the office, 119 Duane street.

No person will be received as lessee or surety who is delinquent on any former lease from the Corporation; and no bid will be accepted from any person who is in arrears to the Corporation, upon debt or contract, or who is a defaulter as surety or otherwise upon any obligation to the Corporation.

HENRY F. DIMOCK,
JACOB VANDERPOEL,
Commissioners of the Department of Docks.

DEPARTMENT OF TAXES AND ASSESSMENTS

DEPARTMENT OF TAXES AND ASSESSMENTS,
No. 32 CHAMBERS STREET,
NEW YORK, January 9, 1879.

NOTICE IS HEREBY GIVEN THAT THE BOOKS of Annual Record of the assessed valuation of Real and Personal Estate of the City and County of New York for the year 1879, will be opened for inspection and revision, on and after Monday, January 13, 1879, and will remain open until the 30th day of April, 1879, inclusive, for the correction of errors and the equalization of the assessments of the aforesaid real and personal estate.

All persons believing themselves aggrieved must make application to the Commissioners during the period above mentioned, in order to obtain the relief provided by law.

By order of the Board.

ALBERT STORER,
Secretary

FIRE DEPARTMENT.

HEADQUARTERS
FIRE DEPARTMENT, CITY OF NEW YORK,
155 and 157 MERCER STREET,
NEW YORK, November 7, 1878.

NOTICE IS HEREBY GIVEN THAT THE Board of Commissioners of this Department will meet daily at 10 o'clock A. M., for the transaction of business.

By order of the Board.

VINCENT C. KING, President,
JOSEPH L. PERLEY,
JOHN J. GORMAN, Treasurer,
CARL JUSSEN, Secretary,
Commissioners.

CORPORATION NOTICE.

PUBLIC NOTICE IS HEREBY GIVEN TO THE owner or owners, occupant or occupants, of all houses and lots, improved or unimproved lands affected thereby, that the following assessments have been completed and are lodged in the office of the Board of Assessors for examination by all persons interested, viz:

No. 1. Paving Eleventh avenue, from Fifty-ninth to Sixty-fifth street, with Belgian pavement.

No. 2. Planting elm trees on Sixth avenue, from One Hundred and Tenth to One Hundred and Forty-fifth street.

No. 3. Regulating, grading, setting curb and gutter stones and flagging in Eighty-eighth street, between First avenue and Avenue A.

No. 4. Regulating, grading, setting curb and gutter stones and flagging in One Hundredth street, between the Bloomingdale road and the Boulevard.

No. 5. Sewer in Ninety-fourth street, between Third and Fourth avenues, and in Fourth avenue, east side, between Ninety-third and Ninety-fourth streets.

No. 6. Sewer in Seventieth street, between First and Second avenues.

No. 7. Paving One Hundred and Eighth street, from Fourth to Madison avenue, with Belgian pavement.

No. 8. Paving One Hundred and Twentieth street, between Second and Third avenues, with Belgian pavement.

No. 9. Regulating, grading, setting curb and gutter stones and flagging in Ninety-sixth street, between the Boulevard and the Hudson river.

No. 10. Sewer in West street, between Barclay street and Park place.

The limits embraced by such assessments include all the several houses and lots of ground, vacant lots, pieces and parcels of land situated on—

No. 1. Both sides of Eleventh avenue, between Fifty-ninth and Sixty-fifth streets, and to the extent of half the block at the intersecting streets.

No. 2. Both sides of Sixth avenue, between One Hundred and Tenth and One Hundred and Forty-fifth streets.

No. 3. Both sides of Eighty-eighth street, between First avenue and Avenue A, and to the extent of half the block at the intersection of First avenue.

No. 4. Both sides of One Hundredth street, between the Bloomingdale road and the Boulevard.

No. 5. Both sides of Ninety-fourth street, between Third and Fourth avenues, and the east side of Fourth avenue, between Ninety-third and Ninety-fourth streets, and the north side of Ninety-third street, between Lexington and Fourth avenues.

No. 6. Both sides of Seventieth street, between First and Second avenues.

No. 7. Both sides of One Hundred and Eighth street, between the Fourth and Madison avenues, and to the extent of half the block at the intersecting avenues.

No. 8. Both sides of One Hundred and Twentieth street, between the Second and Third avenues, and to the extent of half the block at the intersecting avenues.

No. 9. Both sides of Ninety-sixth street, between the Boulevard and the Hudson river, and to the extent of half the block at the intersecting avenues.

No. 10. East side of West street, between Barclay street and Park place.

All persons whose interests are affected by the above-named assessments, and who are opposed to the same, or either of them, are requested to present their objections in writing to the Board of Assessors, at their office, No. 114 White street, within thirty days from the date of this notice.

The above described lists will be transmitted as provided by law to the Board of Revision and Correction of Assessments for confirmation, on the 27th day of March ensuing.

THOMAS B. ASTEN,
JOHN MULLALLY,
EDWARD NORTH,
DANIEL STANBURY,
Board of Assessors.

OFFICE BOARD OF ASSESSORS,
No. 114 WHITE STREET (CORNER CENTRE),
NEW YORK, February 26, 1879.

PUBLIC NOTICE IS HEREBY GIVEN TO THE owner or owners, occupant or occupants, of all houses and lots, improved or unimproved lands, affected thereby, that the following reassessment, in accordance with an order of the Supreme Court, has been completed and is lodged in the office of the Board of Assessors for examination by all persons interested, viz:

No. 1. Regulating, grading, setting curb and gutter stones, and flagging in Fifth avenue, from One Hundred and Thirtieth to One Hundred and Thirty-eighth street.

The limits embraced by such reassessment include all the several houses and lots of ground, vacant lots, pieces and parcels of land, situated—

East of Fifth avenue, between One Hundred and Thirty-fifth and One Hundred and Thirty-eighth streets, in the Twelfth Ward of the City and County of New York, known and distinguished upon the maps of said City and County as follows:

Ward Nos. 1, 2, 3, 4, 6, 65, 66, 67, 68, 69, 70, 71, and 72, in Block No. 520, and by the Ward Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 64, 65, 66, 67, 68, 69, 70, 71, and 72, in Block No. 521; and by the Ward Nos.