

Improvement and care of public buildings and grounds in and around Washington:	
For filling in and improving grounds south of Executive Mansion.....	\$15,000
For ordinary care of green-houses and nursery.....	1,500
For ordinary care of Lafayette Square.....	1,000
For care and improvement of reservation No. 3 (Monument grounds).....	1,000
For construction and repair of iron fences.....	500
For manure, and hauling the same.....	5,000
For painting iron fences, vases, lamps, and lamp-posts.....	1,500
For purchase and repair of seats.....	1,000
For purchase and repair of tools.....	500
For trees, tree-stakes, lime, whitewashing, and stock for nursery.....	3,000
For removing snow and ice.....	1,000
For flower-pots, twine, baskets, and lycopodium.....	1,000
For care and construction and repair of fountains in the public grounds.....	1,500
For abating nuisances.....	500
For improving various reservations.....	15,000
For improving Seward Place.....	5,000
For improving reservation on South Carolina avenue between Fourth and Sixth streets, east.....	5,000
For improving reservation on North Carolina avenue between Second and Third streets, east.....	4,000
For improving reservation on New Jersey avenue, northwest.....	4,000
For commencing improvement of reservation No. 17, and site of old canal northwest of same.....	20,000
For paving roadways to north front of Executive Mansion.....	8,000
For construction of iron conservatory at Executive Mansion.....	17,500
	\$112,500
Care of, and repairs, fuel, &c., Executive Mansion:	
Care and repairs of Executive Mansion.....	10,000
Refurnishing Executive Mansion.....	30,000
Fuel for the Executive Mansion and the greenhouses.....	2,000
Care and necessary repairs of greenhouses.....	5,500
	47,500
Care and repair of bridges:	
Ordinary care of Benning's, Anacostia and Chain Bridges, including fuel, oil, lamps, matches, &c.....	1,500
For replanking and painting Anacostia Bridge.....	4,000
	5,500
Lighting the Executive Mansion and the public grounds:	
Gas, pay of lamp-lighters, gas-fitters, plumbers, plumbing, lamps, lamp-posts, matches, and repairs of all kinds, fuel for office, watchmen's lodges, and for the greenhouses in the nursery.....	15,000
Repair of water-pipes and fire-plugs:	
Repairing and extending water-pipes, purchase of apparatus to clean them, and for cleaning the springs, and repairing and renewing the pipes of the same, that supply the Capitol, the Executive Mansion, and the building for State, War, and Navy Departments.....	2,500
Telegraph to connect the Capitol with the Departments and Government Printing Office:	
For care and repair of the same.....	1,500

Financial statement fiscal year ending June 30, 1879.

Title of appropriations.	Amounts available at beginning of fiscal year.	Amounts expended and pledged by contracts.
Contingent expenses public buildings and grounds.....		
Rent of Office Public Buildings and Grounds.....	\$500 00	\$500 00
Telegraph to connect the Capitol with the departments, &c.....	900 00	825 00
Repairs of Navy-Yard and Upper bridges.....	1,000 00	999 18
Repairs of water-pipes and fire-plugs.....	1,000 00	1,000 00
Lighting, &c., Executive Mansion.....	2,000 00	1,987 93
Salaries of employes public buildings and grounds.....	15,000 00	14,968 12
Repairs, fuel, &c., Executive Mansion.....	34,560 00	34,559 18
Improvement and care of public grounds.....	25,000 00	24,999 15
Pedestal for statue of General George H. Thomas.....	24,500 00	24,126 73
Adapting ponds in Monument Lot to culture of carp, &c. (act December 15, 1877)	7,905 15	7,905 15
	123 67	123 65

Very respectfully, your obedient servant,
 THOS. LINCOLN CASEY,
Lieutenant-Colonel of Engineers.
 Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

L L 2.

WASHINGTON AQUEDUCT.

OFFICE OF WASHINGTON AQUEDUCT,
 Georgetown, D. C., July 16, 1879.

GENERAL: I have the honor to submit herewith a report of operations upon the Washington Aqueduct for the fiscal year ending June 30, 1879.

On the 20th of June, 1878, the following appropriation was made by Congress:

For engineering, maintenance, and repairs, \$15,000.

In July, 1878, the work done was as follows:

At Great Falls the machinery in the gate-house was cleaned and oiled, the government grounds were kept in good order, and the telegraph was repaired. At the receiving reservoir the force-pump that supplies the gatekeeper's dwelling was repaired; the stop-planks of the connecting conduit were several times changed, in order to send the clearest water to the distributing reservoir; and the telegraph was repaired. At culvert No. 23, the ditches were cleaned out, and logs and branches that had been brought down during a freshet were cut and removed from the channel of the stream.

At the distributing reservoir, the government grounds were kept in good order, the telegraph was repaired, and the stopcocks in the effluent pipe vault were cleaned and oiled. They were also cleaned and oiled in the pipe-vault at Foundry Branch.

At Rock Creek Bridge, the floor of the footways was repaired, and the government grounds were kept in good order.

In August, at Great Falls, the Potomac dam was thoroughly exam-

ined during low-water, and it was found that a large portion of the ripraps composing the back filling had been carried over the dam during freshets, and that a number of blocks of stone had been carried away from the top course of masonry. The ripraps were replaced behind the dam, and the blocks of stone, which were found about 30 feet below the dam, were raised and placed on top. The force-pump that supplies the gatekeeper's dwelling was repaired, and the road from Great Falls to the junction with the conduit road was regraded and widened where necessary, and its ditches cleaned out. Between the junction and Cabin John bridge, the embankments over the conduit were repaired, and the ditches cleaned out. At the receiving reservoir, the fences and the wooden bridge over the waste channel were lime washed, and the road leading to the gatekeeper's dwelling was repaired. The embankments between Cabin John bridge and the receiving reservoir were also repaired.

In waste-weir No. 2 the plank foot-walk was carried out by highwater from Powder Mill Branch; the planks were replaced and secured in position by iron bands, which were clamped around the iron cross-beams and bolted to the planks. Between the receiving and distributing reservoirs the embankments were repaired. Twice during the month the storm waters from the hillsides filled up the ditches and culverts and flowed over the roadway. The *débris* was removed from the culverts and the ditches were cleaned out.

At the distributing reservoir the long ditch in front of "Drover's Rest" was thoroughly cleaned. It had been filled up during the great storm of August 10, when over 3 inches of rain fell in 24 hours.

Between the distributing reservoir and Foundry Branch the pipe-line embankments were repaired where they had been damaged by the storm. The telegraph line was also thoroughly repaired from Great Falls to Georgetown.

In September repairs were commenced upon the Potomac dam. The Maryland channel of the river immediately above the head of the conduit was cleaned out, the stop-planks were removed and the surface of water in the river was lowered so that stones could be set on top of the dam, and the repairs to the back filling were finished. Between Great Falls and Georgetown the embankments and the macadam road over the conduit and pipe-line were repaired.

In October the work of repairing the Potomac dam was continued until all the stones that had been washed off the dam during the flood of November, 1877, were reset in cement mortar. The joints of the masonry above low-water were all repointed.

Between Great Falls and Georgetown the roadway over the conduit and pipe-line was repaired where necessary, washes were filled in embankments, and the ditches were cleaned out. At the receiving reservoir a quantity of broken stone that was purchased in June was used in macadamizing a part of the road on top of the reservoir dam.

At the high-service reservoir in Georgetown a hedge of arbor vitæ was set on the east boundary of the government land in place of a wooden fence that had decayed and fallen down.

In November between Great Falls and Bridge No. 3 the conduit embankments were repaired and the ditches were cleaned out. The telegraph line was repaired and the batteries and instruments were put in good order at each station. Between the receiving and distributing reservoirs the embankments were repaired, and near waste-weir No. 3 the macadam road was repaired.

At College Pond Bridge a leak was repaired in the United States 30-inch main. At Rock Creek bridge the floor was repaired.

In December, at Great Falls, the machinery in the gate-house was cleaned and oiled, and the roof of the gatekeeper's dwelling was painted.

At the distributing reservoir a new copper-wire screen was made and placed in the effluent screen well-house.

At the distributing reservoir pipe-vault and at Foundry Branch pike-vault the spindles of the large stop-valves were cleaned and oiled. The roof of the Washington Aqueduct office was repaired, and new down-spouts were set in place and painted.

In January, 1879, the pipe-line road was repaired, and at Rock Creek bridge the floor was repaired. An approximate estimate was made of the cost of furnishing and laying a 36-inch main from the distributing reservoir to Capitol Hill, for the use of the Senate Committee on the District of Columbia.

In February slight repairs were made to the conduit embankments and roads.

At Foundry Branch the pipe-line was protected with ripraps where it had been uncovered by freshets. In March the conduit-feeder at Great Falls was cleaned out. Between Great Falls and the junction with the conduit the road was repaired, and two wooden culverts were rebuilt. Between the junction and receiving reservoir the road was repaired, and the channels of culverts Nos. 4, 9, and 10 were cleaned out. At culverts Nos. 13 and 19 the embankments were repaired. Between the receiving and distributing reservoirs the road was repaired, washes in embankments were filled up, and the channel of the stream at culvert No. 23 was cleaned out.

At Rock Creek Bridge six of the cast-iron ornamental wreaths had dropped off, and nine were loose and ready to drop; they were all reset and secured to the arches of the bridge with wrought-iron yolks and bolts.

In April, at Great Falls, trees and ornamental shrubs were planted in the government grounds. Between Cabin John Bridge and the receiving reservoir 1,200 feet of the macadam road were repaired, and between the receiving and distributing reservoir 2,000 feet were repaired. The stones were loosened with picks, broken smaller, and respread.

At the receiving reservoir the wood-work of the government house was partly painted, and the old stone barn at this place, being liable to fall, was taken down.

In May, at Great Falls, the fence around the government grounds was repaired and lime-washed. Between Great Falls and the receiving reservoir the embankments were repaired, ditches were cleaned out, 650 feet of the macadam road was picked up, the stones were broken smaller and respread, and 400 feet of the road was repaired with freshly-broken stone. At the receiving reservoir the painting of the government building was finished, the iron-work of the gate-house was painted, and the inside walls were lime-washed. The lumber that was obtained from the old barn taken down in April was used in building a stable and driving-shed.

Between the receiving and distributing reservoirs the embankments were repaired, ditches were cleaned out, and 1,250 feet of macadam road was picked up, the stones broken smaller and respread. At the distributing reservoir the gate-houses and fences were lime-washed.

In Georgetown, the floor of Rock Creek bridge was repaired, a part of

the fence around the government grounds was rebuilt, and the whole was lime-washed.

In June, the pipe-vault at Foundry Branch, the several pipe-vaults in Georgetown and Washington, and the gallery under the high-service reservoir were cleaned and lime-washed.

During the past fiscal year the government lands at Great Falls, distributing reservoir, and Georgetown were kept in good order, and the general distribution of Potomac water in the conduits, reservoirs, and pipe-lines was properly attended to.

The government mains were regularly flushed, and great care was taken to supply them with the clearest water.

On June 24 the conduit was shut off from the distributing reservoir for 24 consecutive hours. The elevation of the water-surface of the reservoir was recorded each hour, and the quantity of water drawn from the reservoir was as follows:

	Gallons.
From 6 a. m. to 9 a. m.	3,486,716
From 9 a. m. to 12 m.	3,202,989
From 12 m. to 3 p. m.	3,476,304
From 3 p. m. to 6 p. m.	3,332,150
From 6 p. m. to 9 p. m.	3,327,152
From 9 p. m. to midnight.	3,322,154
From midnight to 3 a. m.	2,624,928
From 3 a. m. to 6 a. m.	3,175,249

Total quantity in 24 hours 25,947,642

The estimates for which appropriations should be made for the next fiscal year are as follows:

For engineering, maintenance, and general repairs.....	\$20,000
For commencing the construction of the dam at Great Falls across the Virginia channel of the Potomac	50,000
For improving grounds around gatekeeper's dwelling at the receiving reservoir.....	1,000
For building wooden fence around the government land at the receiving reservoir	7,000
For soiling, sodding, and seeding the embankment and excavation slopes of the distributing reservoir and conduit.....	15,000
For building a wrought-iron and masonry bridge over the waste-channel at the receiving reservoir.....	11,000
For building an overfall over the connecting conduit for the waste-channel of the receiving reservoir.....	2,000
For continuing the macadamizing of the conduit road	10,000
Total.....	116,000

The following is a financial statement for the fiscal year ending June 30, 1879:

Act of June 20, 1878.

For engineering, maintenance, and repairs:	
Available July 1, 1878.....	\$15,000
Expended in 1878 and 1879	15,000

The following is copied from my last annual report:

The Potomac dam at Great Falls remains in an unfinished condition. No work, except slight repairs, has been done upon it since December, 1867. It should be built entirely across the river to the Virginia shore.

The conduit road is macadamized from the distributing reservoir to culvert No. 6. The remainder of the road should also be macadamized.

The embankment and excavation slopes of the conduit and pipe-line, and the embankment slopes of the distributing reservoir, should be protected with sods, or soiled and seeded with grass.

The government land at the receiving reservoir should be protected with a substantial wooden fence. The grounds surrounding the gate-keeper's dwelling should

be improved by grading and tree-planting. Powder Mill Branch, which empties into the receiving reservoir, is liable to sudden freshets; at times the waters have risen beyond the control of the gate-keeper, and caused considerable damage by overflowing the conduit at the waste-channel, and at waste-weirs Nos. 2 and 3. A stone overfall should be built over the connecting conduit, across the waste-channel, for the passage of the storm waters.

The wooden bridge over the waste-channel was built in 1863. Its timbers are old and decayed; it should be removed and a wrought-iron truss-bridge should be erected in its place.

Observations of the comparative clearness of the water at Great Falls, the receiving reservoir, and the distributing reservoir, were taken and recorded daily. The results are shown in the following table:

Name of source.	Number of days that the water was—			
	Clear.	Slightly turbid.	Turbid.	Very turbid.
Great Falls	107	67	71	120
Receiving reservoir	152	72	67	74
Distributing reservoir.....	195	38	94	88

The iron mains leading to Washington have been supplied with water directly from the distributing reservoir, and the condition of the water delivered in Georgetown and Washington has, consequently, been similar to that in this reservoir.

The experience of the past few years has shown that the distributing reservoir is entirely too small for the purpose for which it was built; which was, to afford the Potomac water ample time to deposit its sediment before entering the iron mains.

Its area at the flow-line (+145 feet above datum) is 1,873,080 square feet; its average bottom is 135 feet above datum, giving a minimum depth of 10 feet. At this depth it contains 136,366,384 gallons, which, at the present rate of consumption, is equal to about five days' supply.

It will, therefore, readily be seen that when the Potomac is turbid at the head of the aqueduct, it must, unless shut off, soon displace the clear water in the reservoir; and if it should be shut off for five days, the reservoir would be practically emptied. In order to always have clear water in the mains, the area of the distributing reservoir should be enlarged.

The consumption of Potomac water is yearly increasing, and has reached nearly the maximum quantity that can be supplied by the present system of iron mains. By referring to previous reports, it will be seen that for a series of years the average daily consumption has been as follows:

	Gallons.
1874	17,554,848
1875	21,000,000
1876	24,177,797
1877	23,252,932
1878	24,885,945
1879	25,947,642

To increase the supply speedily and economically, it is recommended that another main be laid from the distributing reservoir to Capitol Hill. It should be 3 feet in diameter, and located on a route to be determined

from a careful survey. It should be connected with the present system of pipes only on Capitol Hill and other points of Washington of equal or higher altitude. It would convey to Capitol Hill, at an elevation of 115 feet above datum, 12,000,000 gallons in 24 hours.

The furnishing of the additional quantity of water in the manner herein recommended would render the completion of the Potomac dam a necessity. The dam is built only across the Maryland channel of the Potomac River, and for several years past the consumption of water has exceeded the minimum flow of the Maryland channel.

During the season of drought, when the river is at its lowest stage, the supply of water to Washington cannot be materially increased until the Potomac dam is completed or extended so as to raise the surface of water at the head of the aqueduct.

The conduit of the Washington Aqueduct from Great Falls to the distributing reservoir is 60,922 feet long and 9 feet diameter. The intrados of the conduit in the gate-house at Great Falls is 151 feet above datum; in the influent gate-house at the distributing reservoir it is 141.87 feet above datum, making the total fall of the conduit 9.13 feet; but as the flow-line of the distributing reservoir is generally kept at from 144 to 145 feet above datum, this total fall is consequently reduced to about 6 feet. Its maximum discharge when running full with the surface of water in the distributing reservoir drawn down to the level of the intrados, or to + 141.87, is 67,259,800 gallons in 24 hours. Its minimum discharge when running full and with the surface of the water in the distributing reservoir raised to + 144.75, is 54,832,464 gallons in 24 hours.

In practice, the actual discharge into the distributing reservoir is equal to the quantity drawn from the reservoir by the iron mains, except during the season of drought, when the discharge is less than the consumption, and the water-surface of the reservoir lowers.

The present elevation of the crest of the dam is 148 feet above datum, and when the water in the river falls to this level the depth of water in the head of the conduit is 6 feet. It can then discharge into the distributing reservoir at + 145 27,113,616 gallons and at + 144 31,608,144 gallons in 24 hours.

The discharge of the conduit might be increased to 80,000,000 gallons in 24 hours by completing the Potomac dam to the level of + 154, or 6 feet above its present height, and lowering the surface of the water in the distributing reservoir to + 141.87.

The total fall would then be about 12 feet, but the conduit would be run under a head at its upper end, and would, it is feared, render the strengthening of its embankments and a modification of its waste-weirs and bridges a necessity.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,
Lieutenant-Colonel of Engineers.

Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

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