

done, and I now recommend that for this year the rates will be as follows, namely:

- Steamboats and model barges, 6½ cents per ton.
- Square barges, flats, coal-boats, &c., 5 cents per ton.
- All empty square barges and coal-boats, 4 cents per ton.
- The other rates as at present.

I do not recommend a greater reduction, because there are a considerable number of permanent repairs and improvements yet to be made, and several already authorized by you, which will require a surplus. Besides, it is wise and prudent to keep a surplus on hand to provide for any accidents which are, more or less, liable to occur on all canal locks, and especially on large ones like these.

The rates proposed by me for the present year are less than one-eighth of those charged by the former management.

The total receipts on this canal from June 11, 1874, to December 31, 1878, during which period the government has had charge of it, amount to \$338,581.29, the total expenditures \$280,788.15, leaving the surplus of \$57,793.14.

The expenditures include about \$75,000 for permanent repairs or improvements.

By the use of the canal force and the machinery in the canal shops a saving of \$25,000 below fair contract prices has been effected in the work already done.

In conclusion I desire to commend Captain Lee and his assistants for the faithful and economical manner in which they have conducted this work.

Annexed hereto is the financial statement for the year.

Very respectfully, your obedient servant,

G. WEITZEL,
Major of Engineers.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers, U. S. A.

Financial statement for calendar year ending December 31, 1878.

Expenditures.		Deposits.	
Month.	Amount.	Month.	Amount.
1878.		1878.	
January	\$6,720 68	January	\$13,108 73
February	4,397 69	February	8,260 00
March	533 05	March	7,566 76
April	9,155 58	April	8,778 68
May	4,500 89	May	12,545 75
June	5,358 46	June	7,670 93
July	7,205 52	July	5,908 53
August	2,276 61	August	4,053 00
September	5,341 14	September	2,757 82
October	10,856 32	October	1,991 44
November	7,033 20	November	5,251 23
December	12,088 78	December	892 91
Total	75,467 92	Total	78,785 78
Balance in bank December 31, 1877			\$54,475 28
Surplus for 1878			3,317 86
Cash on hand December 31, 1878			57,793 14

REPORT OF CAPTAIN A. N. LEE, CORPS OF ENGINEERS.

OFFICE LOUISVILLE AND PORTLAND CANAL,
Louisville, Ky., January 1, 1879.

SIR: In accordance with your instructions, I have the honor to submit the following report upon the superintendence, management, and repair of the Louisville and Portland Canal for the calendar year ending December 31, 1878.

Work accomplished during the year.

NEW LOCKS.

A wagon-shed was built adjacent to the stable, and a large shed for the storage of tools, machinery, &c., which have hitherto been exposed to the weather, erected south of the shops. Old materials were principally used in the construction of these buildings and the cost was trifling.

New winding machinery was placed in position at lower gates. The anchors of the mast-guys at the middle and upper gates were fastened in solid stone, laid with cement mortar.

An incline was built in March, on the north bank near the middle gates, an engine from one of the boiler boats set up on the bank, and the work of removing sediment from lock-walls, and grading and sodding banks commenced.

The grading of the north bank is entirely completed and but little sodding on it remains to be done.

After the completion of the north bank the incline and engine were placed in position on the south bank and the grading of that bank is now about half done.

The material removed from the banks (about 10,326 cubic yards) has been used to fill in the ravine in rear and to the east of superintendent's office.

Concrete has been laid from the foot of the slopes of north and south banks, between upper and middle gates and the lock-walls, and a stone retaining wall built to protect the foot of the slope of the north bank at lower lock-chamber.

New chains were put in at lower gates.

The deck of bridge at the new locks was relaid, the iron work repainted, and the bridge generally put in thorough working order.

The masts, guys, and suspension rods of the gates were also painted, and the canal buildings and fences colored and whitewashed.

Wooden shelter sheds were placed over the capstans for protection of lock hands while working the gates.

At the upper gates two new suspension masts were put in and at the middle gates one.

The level near the capstans of the upper gates was paved with stone.

OLD LOCKS.

Owing to continued high-water the work on the improvement of the old locks could not be resumed till September 1. The work had to be discontinued on November 29.

The rock excavation in the lower and upper chambers has been finished, with the exception of about 400 cubic yards in the upper chamber.

The walls for both recesses have been carried up as high as the coping of the old walls.

The walls of the lower recess were in a very bad condition and had to be taken partly down; they have been rebuilt to within three courses of the top.

A wooden miter-sill for middle gates was built, but owing to the rock excavation in the upper chamber not being finished, it was not placed in position.

Roller ways for the lower gates were laid.

Two new sets of lift-gates have been built, and are ready to be hung when the masonry is completed.

The work was entirely done in canal shops, and at the reasonable cost of \$6,128.

Most all the work referred to above, in addition to numerous minor improvements, ordinary repairs, and regular duties, has been carried on under the immediate direction of the superintendent, and as far as possible the work has been done by regular employed mechanics and laborers.

The work done by towboat and dredges, and by lock-hands in passing boats, is given in tables annexed.

Present condition of canal and accessories.

NEW LOCKS.

The new locks, although in serviceable condition, will soon need extensive repairs. The lift-gates should be replaced by new and lighter ones, and a different system of suspension be adopted. Plans have already been submitted to you for approval, in which the present weak and perishable wooden masts and light suspension rods are replaced by iron columns and rods and guys of greater strength. The form of the proposed new gates has not yet been determined upon. They should be made much lighter, however, and some arrangement for either letting the mud pass under the miter-sill or catching it in a basin above the gates be adopted. The replacing of the old rotten masts by new ones, which has been done at some of the gates, has been attended with good results, and the easier working of the gates shows that much can be expected by the adoption of a more rigid system of suspension.

The question of operating gates by steam has been considered, but I am not prepared at present to make any suggestions on this matter, and I think that whatever experiments are tried had better be deferred until we have new gates securely hung.

The change in the winding machinery has worked well, and although the time required for opening and closing the gates is entirely too long and can and will be shortened, I do not recommend any very extensive experiments until we are sure we will not close the canal by their possible failure.

The engine-house and watch-houses at the middle gates should be replaced by brick or stone structures.

The grading and sodding of the banks and concreting the space between the foot of slopes and lock-walls will obviate to a great extent, I think, the trouble arising from removing the deposit of mud from lock-walls.

OLD LOCKS.

Closed for repairs.

DRY-DOCK.

The dry-dock is in a serviceable condition, but having been built to accommodate only such boats and barges as could pass the old canal, it should be enlarged as soon as possible to receive boats of such size as the new locks can pass.

DREDGES AND SCOWS.

The dredges and scows are in good condition. It will be necessary, however, during next season to build a new hull for dredge No. 2, and also to replace the crane on dredge No. 1.

RATES OF TOLL AND REGULATIONS.

The reduction in rates of toll recommended in the report for the last calendar year having been approved by the proper authorities, the new rates took effect February 4, 1878.

They are as follows:

Steamboats and model barges, 8 cents per ton.

Square barges, flats, coal-boats, &c., 6 cents per ton.

All empty square barges and coal-boats, 5 cents per ton.

Small boats, \$4 each.

Rafts of logs, &c., measurements and rates the same as for coal-boats.

Boats belonging to or chartered by the United States, free.

Towing, harbor rates.

Use of dredge, \$2.50 per hour.

Use of steam-pump, \$2.50 per hour.

Use of dry-dock, \$15 for the first day and \$10 for each subsequent day.

With this reduction the receipts of tolls show a considerable increase in the business of the canal, and that a still further reduction of toll can be made at some future time.

The regulations recommended by Captain Mackenzie in his report for 1875, having been approved by the Secretary of War, went into effect May 9.

NUMBER AND SALARY OF EMPLOYÉS.

The regular canal force remains the same as given in my report for the fiscal year ending June 30, 1878. It has been necessary, however, to employ extra laborers in

grading and sodding the banks and other work of permanent improvement. The monthly pay-roll of the regular canal employés now amounts to \$3,210.

RECEIPTS AND EXPENDITURES.

The receipts for the year amount to \$78,510.60, which is \$3,042.68 in excess of expenditures.

The expenditures for the year have been as follows:

Ordinary superintendence, management, and repairs	\$44,354 32
Permanent improvements to both banks of new canal below bridge, such as grading, sodding, concreting	9,481 62
Building new gates for old locks	6,254 42
Improvement of old locks	12,128 64
Minor improvements	3,248 92

During the year 15,141,500 bushels of coal, 174,460 barrels of salt, and 39,880 tons of iron ore passed through the canal.

WORK PROJECTED FOR NEXT YEAR.

Continuing the work on the improvement of the old locks.

Finishing building gates for the same.

Changing the method of suspending the gates at new locks.

Building a sufficient number of cottages on south bank to accommodate the lock hands.

Removing the old brick house east of office now occupied by families of lock hands.

Continuation of grading and sodding both banks of canal below bridge.

Replacing frame engine-house and watch houses on lock-walls with stone or brick structures.

Replacing crane on dredge No. 1.

Building a new hull for dredge No. 2.

Ordinary superintendence, management, and repairs.

In conclusion, I would say that the duties of the superintendent, his assistants, and the employés of the canal generally have been performed in a faithful and efficient manner, and I take pleasure in so stating

Very respectfully, your obedient servant,

A. N. LEE,
Captain of Engineers.

Maj. G. WEITZEL,
Corps of Engineers, U. S. A.

Financial statement for calendar year ending December 31, 1878.

Receipts.		Expenses.	
Tolls	\$77,737 60	Lockage department	\$31,754 52
Use of dry-dock	234 00	Dredge department	12,599 80
Towage	108 50	Improvements	31,113 60
Use of dredge	101 25		
Rents	329 25		
Total	78,510 60	Total	75,467 92

Bank balance December 31, 1877	\$54,475 28
Cash on hand, being receipts for December 31, 1877	275 18
	54,750 46
Surplus for year 1878	3,042 68
Balance on hand December 31, 1878	57,793 14

Statement of the cost of superintendence, management, &c., for calendar year ending December 31, 1878.

Month.	Lockage department.				Dredging department			Repairs and improvements.	Grand totals	
	Labor.	Purchases and repairs.	Lights.	Office expenses.	Total.	Labor.	Purchases and repairs.			Total.
January	\$2,639 66	\$197 37	\$23 35	\$95 80	\$2,956 18	\$820 00	\$271 75	\$1,091 75	\$3,041 32	\$7,689 25
February	2,552 25	70 01	16 83	33 00	2,672 09	835 00	373 91	1,208 91	81 17	3,962 17
March	2,601 43	139 74	8 68	.....	2,749 85	835 00	192 37	1,027 37	614 49	4,391 71
April	2,375 00	174 57	7 40	.....	2,556 97	835 00	300 70	1,135 70	1,071 20	4,763 87
May	2,375 00	226 01	15 36	12 50	2,628 87	861 75	178 99	1,040 74	1,855 34	5,524 95
June	2,375 00	218 68	7 56	.....	2,601 24	835 00	172 00	1,007 00	3,806 33	7,414 57
July	2,375 00	215 06	7 68	11 90	2,609 64	835 00	137 26	972 26	2,820 07	6,401 97
August	2,375 00	60 95	6 50	24 69	2,467 14	835 00	180 29	1,015 29	1,774 55	5,256 98
September	2,375 00	105 17	6 31	17 10	2,503 58	795 00	193 57	988 57	2,334 92	5,827 07
October	2,375 00	339 34	12 34	.....	2,726 68	795 00	247 82	1,042 82	2,522 44	6,291 94
November	2,375 00	178 86	10 35	2 50	2,566 71	795 00	151 48	946 48	3,012 40	6,525 59
December	2,375 00	306 15	7 02	27 40	2,715 57	802 33	320 58	1,122 91	7,579 37	11,417 85
Total	29,168 34	2,231 91	129 38	224 89	31,754 52	9,879 08	2,720 72	12,599 80	31,113 60	75,467 92

Work of dredging department and expenditures in it for the calendar year ending December 31, 1878.

Dredging	154 days.
Time lost:	
By ice	9 days.
By high water	24 days.
By employment at the improvement of the falls and of old locks	90 days.
By Sundays and national holidays	59 days.
By assisting operating gates and other labor	29 days.
Work:	
Cubic yards excavated during the year	67,526
Cubic yards excavated per working day	378.36
Salaries:	
For the year	\$9,879 08
Per working day	64 15
Repairs:	
For the year	2,720 72
Per working day	17 66
Total:	
For dredging	5,316 08
Per working day	34 51
Per cubic yard excavated	12.7

Statement of boats passed through the canal during calendar year ending December 31, 1878, with number and cost of lockages and amount and cost of dredging.

Months.	Passenger-boats.		Towboats.		Motel barges.		Square barges.		Number and undertonnage of steamboats, barges, small boats, &c., passed through the canal.		Number of lockages.		Cost of lockage, excluding dredging.		Total cost.	
	Number.	Undertonnage.	Number.	Undertonnage.	Number.	Undertonnage.	Number.	Measured capacity.	Number.	Undertonnage.	Number.	Undertonnage.	Dollars.	Cents.	Dollars.	Cents.
January	71	28,477	51	8,773	59	14,801	399	129,801	501	181,852	208	14,222	3.00	1.57	19.46	9.00
February	49	22,408	43	4,934	29	7,777	232	72,288	362	107,407	146	18.30	7.38	6.85	10.72	5.69
March	58	21,569	39	6,482	29	19,283	239	79,105	422	136,409	165	16.76	6.55	8.98	8.00	8.83
April	97	38,773	50	7,368	87	22,158	186	46,370	436	114,665	181	13.36	6.00	8.43	3.22	3.61
May	77	30,903	60	9,651	105	27,373	368	117,390	620	183,317	228	11.57	4.24	8.92	3.22	3.61
June	86	35,417	46	7,116	90	24,400	193	46,023	435	182,066	183	14.05	6.12	8.49	3.22	3.61
July	104	40,908	33	3,332	52	13,272	86	18,875	357	172,067	160	16.31	9.09	8.49	3.19	3.19
August	98	28,926	21	3,319	45	10,782	77	18,151	250	69,178	133	18.20	9.87	12.48	4.69	4.69
September	64	18,510	30	2,080	12	2,814	44	8,482	162	51,836	103	24.30	4.10	21.56	5.79	5.79
October	70	18,946	38	2,258	4	644	32	4,160	162	26,908	114	23.92	10.48	33.00	10.97	10.97
November	93	32,909	41	3,637	52	12,265	100	14,739	332	66,570	137	16.35	7.73	23.27	14.49	14.49
December	15	5,920	9	655	6	1,100	6	625	47	8,303	28	96.98	57.77	137.08	6.60	6.60
Total	882	323,666	461	58,595	612	156,669	1,960	556,012	4,086	1,094,942	1,820	1,820	1,820	1,820	1,820	1,820

Comparative general statement of receipts, expenses, &c., since the government assumed charge of the canal.

Year.	Receipts.					Total boats and tonnage.		Number of days closed.	Number of lockages.	Cost per ton, including total expense of management.
	Source.					Number.	Tonnage.			
	Tolls.	Dry-docks.	Towing.	Dredge.	Rents.						Totals.
1874*	\$19,000 25	\$464 28	\$45 00		\$20,395 53	1,164	274,265	93	1,401	9.12
1875	68,664 75	599 21	350 00		70,175 61	2,881	757,695 75	59	1,694	6.14
1876	79,854 31	220 96	275 00		80,762 27	3,264	871,446 50	60	1,664	5.60
1877	87,907 78	195 00	146 00	\$77 50	88,737 28	3,881	899,610 80	33	1,820	4.97
1878	77,737 60	234 00	108 50	101 25	78,510 60	4,086	1,094,942. 0			4.05
Total	333,770 69	1,713 45	924 50	178 75	338,581 29	15,276	3,998,060. 05	245	6,489	.....

Expenses.

Year.	Lockage department.				Dredge department.				Total superintendent, eng., management, and repairs.	Permanent improvement.	Grand total.
	Labor.	Repair.	Miscellaneous.	Office expenses.	Labor.	Repair.	Miscellaneous.	Total.			
1874*	\$15,099 78	\$420 43	\$405 09	\$35 45	\$6,830 00	\$459 96	\$1,775 45	\$9,065 41	\$25,026 16	\$115 95	\$25,142 11
1875	28,265 57	700 63	513 13	39 08	12,873 19	884 22	3,309 56	17,066 87	46,585 38	3,174 11	49,759 49
1876	57,169 86	1,141 74	560 75	173 43	12,025 42	797 87	2,196 62	15,019 91	44,065 69	25,410 52	69,476 21
1877	28,608 77	2,020 65	1,988 02	139 48	10,869 31	378 86	2,245 61	13,493 78	45,350 60	15,591 82	60,942 42
1878	29,168 34	1,563 17	1,798 12	224 89	9,979 08	666 81	2,053 91	12,599 80	44,354 32	31,113 60	75,467 92
Total	128,312 32	5,846 62	3,365 11	612 23	52,477 00	3,187 72	11,581 15	67,245 87	205,382 15	75,406 00	280,788 15

* From June 11th to end of year.

APPENDIX V.

ANNUAL REPORT OF MAJOR WILLIAM E. MERRILL, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

UNITED STATES ENGINEER OFFICE,
Cincinnati, Ohio, August 12, 1879.

GENERAL: I have the honor to submit herewith the annual reports on the works under my charge, for the fiscal year ending June 30, 1879. Respectfully, your obedient servant,

WM. E. MERRILL,
Major of Engineers.

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

V I.

IMPROVEMENT OF THE OHIO RIVER.

The following is a statement of the work done on this river from July 1, 1878, to June 30, 1879. The localities are named in the order of natural succession, beginning at Pittsburgh.

DAVIS ISLAND DAM.

(5 miles below Pittsburgh.)

Authority to begin active operations on this important work was received on the 24th of July, and on the 30th Lieut. F. A. Mahan, Corps of Engineers, to whom the local charge had been assigned, arrived at Pittsburgh. Actual work began on the 19th of August, on which day a small party commenced clearing away the brush on the site of the dam.

As rapidly as possible a large working force was gathered together, tools and plank were purchased, quarries were opened, and the work was put into active operation.

At the end of the fiscal year the work was in the following condition: All the excavations for the land wall and its two gate recesses had been made and the following walls had been built:

- Upper recess. { Upper wall.
Lower wall.
Back wall of filling culvert.
Half of arch of filling culvert.
- Lower recess. { Upper wall.
Back wall of emptying culvert.
- Land-wall, about one-fifth completed.

The amount of masonry in these walls is 515 cubic yards of cut stone, and 2,693 cubic yards of rubble, being a total of 3,208 cubic yards.