



"...the venerable Seneca chieftain..."

## Chapter 6

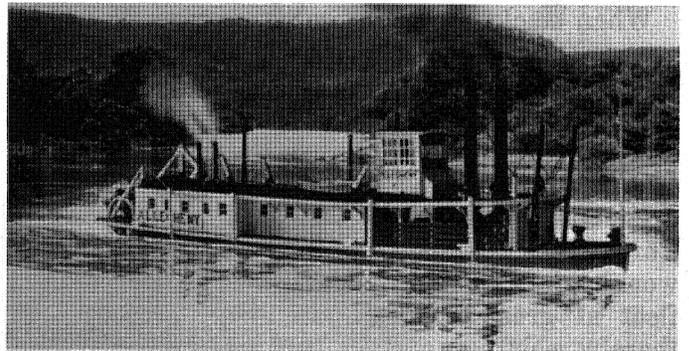
### ALLEGHENY, MONONGAHELA, AND YOUGHIOGHENY

The boisterous whitemen crowding into his cabin and disturbing his rest displeased the venerable Seneca chieftain, but his son explained the whites had ascended the Allegheny to Kinzua in a "fire canoe" and were anxious for the old warrior to see it. Chief Cornplanter pushed aside the buckskin covers, rose from his pineboard bed, and magnanimously left the rude comfort of his cabin to appease the whites, who seemed to think he would be amused by their new contraption.

After nearly a century of war and uneasy peace with the whites, Cornplanter preferred to be left undisturbed in his magnificent isolation. Born of a Dutch trader and the sister of Guyasuta, Chief of the Senecas, Cornplanter had reluctantly joined the British in war against George Washington and the Americans, had won great victories, even capturing his white father, and had suffered bitter defeats, once swimming the Allegheny to escape the vengeance of Captain Samuel Brady. George Washington had sent troops up the Allegheny in 1779 to lay waste the Seneca villages, and after that disaster Cornplanter had made peace with the

Americans, kept that peace during postwar conflicts, and established a model community for his people. But the perfidy of the whites alienated him and he burned the uniform, destroyed the medals, and broke the sword presented him by President Washington. In 1830 the aged chief cared little about the schemes of whitemen. Still...a "fire canoe"?

His tribe followed him to the riverbank to see the thunder-rumbling, smoke-puffing boat with two wheels at its stern. His son translated the clamor of the whites, who said they left Fort Pitt on May 14, 1830, six days before, in the *Allegheny*, first true sternwheel steamer on the inland rivers, with engines that pushed them up boulder-strewn rapids without human help. Cornplanter did not believe,

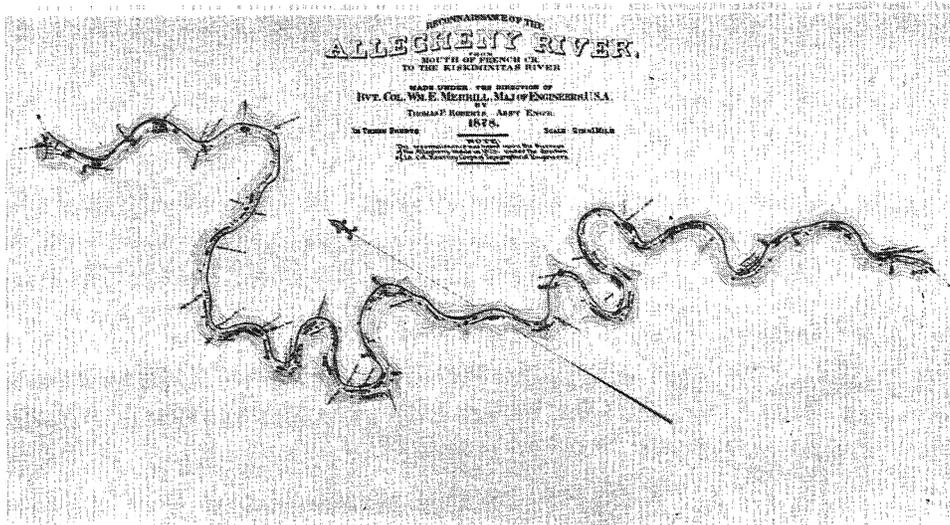


The *Allegheny*  
(Simulation; the boat pictured is a model)

Captain Fred Way

but boarded the "fire canoe" and rode upriver six miles, watching the wheels thrashing the river till he was convinced. "White men," he thought, as he boarded his canoe to return home, "will do anything to avoid using their muscles."

First steamboats on the Allegheny River had been the *Harriet*, a Monongahela boat tested against the Allegheny in 1816, the *Car of Commerce* built at Freeport in 1818, and the *Western Engineer* built by Colonel Long at Allegheny Arsenal in 1819, but regular steamboating on the river did not begin until 1827 when the *Albion* ascended to Kittanning and 1828 when Benjamin Crooks, later a snagboat captain for John Sanders, took the *William D. Duncan* to Franklin. Navigation against Allegheny currents



Map of upper Allegheny River prepared from 1828 survey by Lt. Col. James Kearney.

at the rapids presented such difficulties that David Dick of Meadville hired Thomas Blanchard, a Springfield Army Arsenal mechanic who had invented a special sternwheel steamboat, to build a boat to conquer the Allegheny. Blanchard built the *Allegheny*, 90 feet long, 18 feet wide, with 12-inch draft, and mounted twin paddlewheels twelve feet aft of the stern for increased power and mobility. This special boat was the first to ascend the Allegheny to Olean, where it landed "amidst the loud and constant rejoicing of the hospitable citizens of the village."

**Allegheny Rafting** "The Olean boys have scattered themselves in squads through the city," the Pittsburgh *Dispatch* reported in April 1856, "and knocked up rows at every point where four or five of them got together. On Prospect Street and Cherry Alley they mustered quite strong." Each spring the Allegheny raftsmen reached Pittsburgh on the first rise after the ice broke, sometimes a hundred rafts together filling the river from Herr's Island to the Point and often breaking their rafts into jumbles on the bridge piers. After a winter in the forests, the redjacketed raftsmen with coonskin caps and their Seneca companions were prone to carouse, searching the alleys of Pittsburgh for grogshops and snake-eye. Steamboat captains regretted the advent of the rafting season, for they had to haul the exhausted and ill-tempered raftsmen back to their upriver homes.

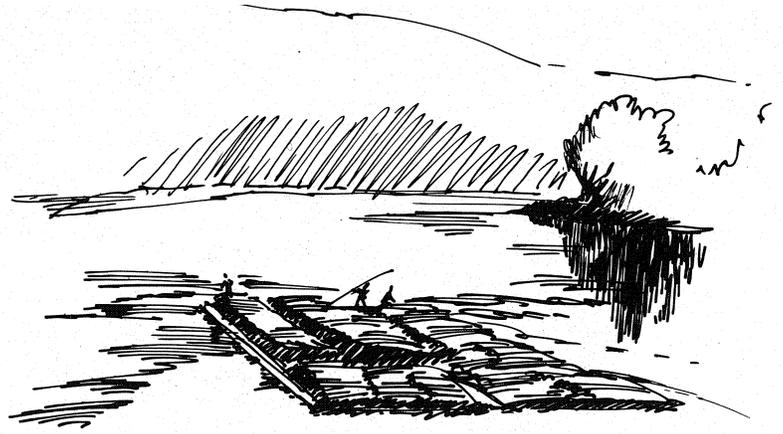
Logs and lumber comprised by far the greatest tonnage shipped via the Allegheny River in the 19th century. Cornplanter and the Senecas, Marcus Hulings of French Creek, and Daniel Jackson, Michael McKinney, and Daniel McQuay of Warren County began the Allegheny River rafting business before 1800. A hundred million board feet of forest products floated the Allegheny in 1838. Traffic

grew to two-thirds of a billion board feet in 1857, when more than 400 saw mills marketed their product down the Allegheny River.

Small rafts from the upper river jumped the milldams and shot the rapids into Warren each spring, where twelve of the small rafts were coupled into "Pittsburgh fleets." Raft fleets not sold at Pittsburgh were joined in threes, covering better than an acre of water and containing 1.2 million board feet of timber, to continue their voyage to Cincinnati or Louisville. Charles Chase of Warren, as one instance, made two, sometimes three, rafting trips annually to Cincinnati or Louisville.

Though flatboats carrying salt, pig iron, farm produce, and even ice cut from French Creek went to southern markets each year from the Allegheny, forest products constituted the chief cargo of Allegheny River flatboats. The most notable trade of this variety consisted of pails, tubs, furniture, window sash, and wooden wares manufactured in the Lake Chautauqua and Jamestown area and loaded in flatboats that floated the Chadakoin River and Cassadaga and Conewango creeks, jumping milldams at high water and passing through crude locks at low, to reach markets at Pittsburgh and below. Commodore Nathan Brown, between 1843 and 1885, floated out 156 flatboats with aggregate cargo value of a half million dollars by this route and peddled his wares, known as "Yankee notions," from Pittsburgh to Paducah.

**The Allegheny Surveys** "The connexion of the waters of the Ohio River with those of Lake Erie is considered as an object of great national importance," reported the House Committee on Roads and Canals. As a result of that report, General Simon Bernard and Colonel Joseph Totten led Army Engineers survey parties during the summer of



1824 to the Beaver and Allegheny River valleys to examine potential routes for a canal from the Ohio River to Lake Erie.

Colonel Joseph Totten personally examined the Allegheny and reported it obstructed by forty-four falls or ripples below the mouth of French Creek. He thought cutting a canal and towpath through the precipitous bluffs bordering the Allegheny would be very costly and such a canal would be subject to repeated flood damages. He therefore suggested that improving the river navigation might be preferable to the construction of a parallel canal.

Pennsylvania sent two engineers to study building a canal alongside the Allegheny to connect the Pennsylvania Canal, which was to strike the Allegheny at Freeport, with the French Creek Canal, planned to link Franklin with Conneaut Lake and the Erie Extension Canal. James Geddes, Dean of Erie Canal engineers, examined the Allegheny in 1826 and concurred with Colonel Totten: a canal cut through bluffs along the river would cost nearly two million dollars and would be



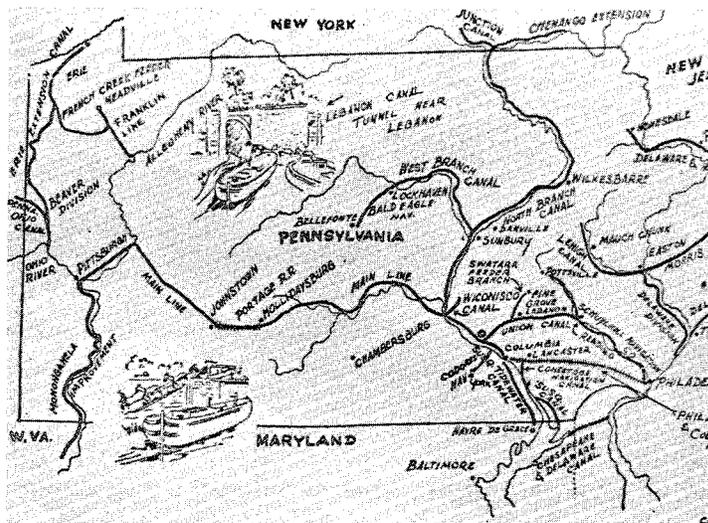
General Simon Bernard

devastated by floods. Edward F. Gay reported in 1828 that locks and dams for slackwater navigation could be built at half the cost of a canal parallel to the Allegheny.

Edward Gay proposed construction of eighteen dams with locks to furnish slackwater navigation on the Allegheny from the mouth of the Kiskiminetas River to that of French Creek. He recommended the locks be 120 feet long and 26 feet wide to pass 60-ton steamboats towing two canalboats in a single lockage. He pointed out that Allegheny raftsmen would violently oppose dams that might impede their trade, but thought it best to leave settlement of their objections to the "wisdom of the legislature." He also warned that building dams on the Allegheny would be hazardous and expensive, so only the most "prudent and energetic" contractors should be selected for the job.

On December 9, 1828, after steamboats had ascended to Kittanning and Franklin, Congress directed the Corps of Engineers to make its second survey of the Allegheny below French Creek and the task was assigned to Colonel James Kearney. Kearney began his survey in 1829 and prepared detailed maps and profiles showing stream width and depth, obstructions and islands, stream gradient, foundation conditions, and normal flood elevations. He was one of the first engineers to recognize the value and economy of building dams of rock and other materials available near the construction sites. "Of this method of construction," he said, "we have examples exhibiting great power of resistance, and which, although displaying little of the elegance of finished masonry, yet, where water is abundant, fulfilling all the useful purposes for which they designed." He recommended dams of stone and gravel with a base width twelve times their height, which should be no more than five feet in order that rafters might cross in safety at high water. Such dams, together with masonry locks of a size sufficient to pass 85-ton steamboats, could canalize the Allegheny to the mouth of French Creek at a cost of a half million dollars, about a quarter the cost of a canal for that distance.

The Pennsylvania canals  
Historic Pennsylvania Leaflet No. 1



The Pennsylvania and French Creek Canals Spurred by the threat that the Erie Canal might deliver western commerce to New York, Pennsylvania launched a vast civil works program in 1826, with its first efforts concentrated on building a combined rail and canal system linking Philadelphia with Pittsburgh. Rails were laid from Philadelphia to Columbia, a canal built from Columbia up the Susquehanna and Juniata rivers to Hollidaysburg, a railroad put down to portage boats across the mountains to Johnstown, and a canal built down the Conemaugh and Kiskiminetas rivers to Freeport. From Freeport, the canal followed the west bank of the Allegheny to Pittsburgh, where it recrossed the river by aqueduct and passed through a tunnel under Grant's Hill to a basin on the Monongahela River. The principal engineers on the western division of the canal from Johnstown to Pittsburgh were Abner Lacock, Sylvester Welch, and Alonzo Livermore, who supervised the work of 125 contractors and thousands of workmen building 64 locks, 16 aqueducts, 10 river dams, 2 tunnels, 64 culverts, 152 bridges, and the canal itself, 40 feet wide and 4 feet deep.

The Pittsburgh to Johnstown and Hollidaysburg to Columbia canal sections were open to traffic by 1830, but the problem of moving the canalboats over the mountains remained. Stephen H. Long of the Corps of Engineers participated in early railroad project planning during periods when his river work was interrupted. In the process, he devised systems of inclined planes for moving freight over steep grades, patented improved bridge structures, and designed steam locomotives. The Chief Engineer of the Corps sent Long to assist Moncure Robinson, Sylvester Welch, and W. Milnor Roberts in planning the rail portage section of the Pennsylvania Canal. These engineers devised and built a railway and ten inclined planes on which canalboats on railcars were pulled over the mountains between Hollidaysburg and Johnstown by horses, with extra power supplied at the inclined planes by stationary steam engines and cables.

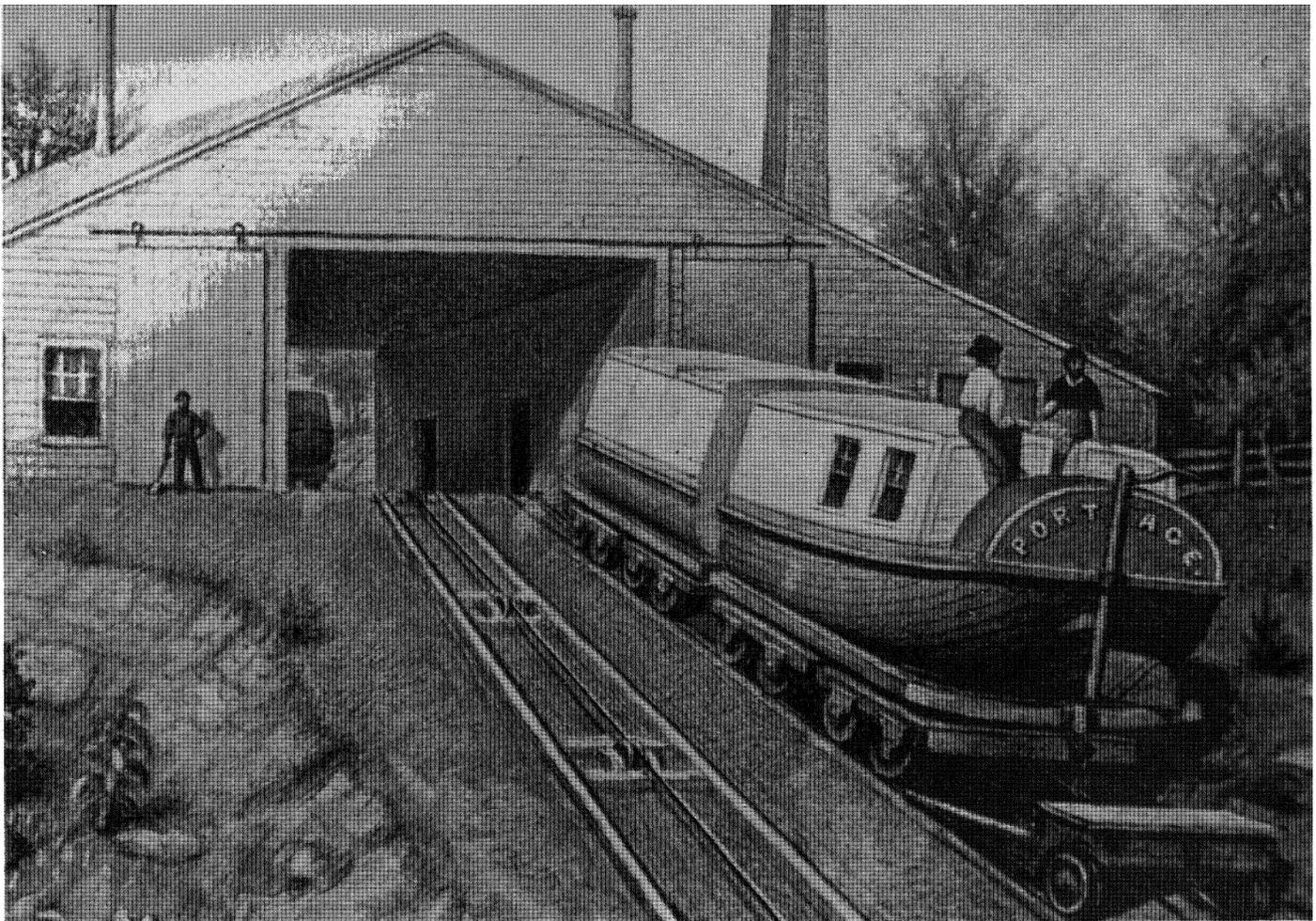
First canalboat across the portage railroad was the *Hit or Miss* that crossed in October 1834. It was

followed by many others, and as traffic mushroomed, so did the population of Johnstown, Blairsville, and other communities along the canal line. At one time, the western canal section was navigated by 121 canalboats with 900 crewmen moving thousands of tons of commodities.

Engineers trained on the Pennsylvania Canal scattered to other projects in the Ohio River basin and throughout the nation. Sylvester Welch, Abner Lacock, and Alonzo Livermore designed and built slackwater navigation projects on rivers in Kentucky. Livermore had two towns named for him: one on the Pennsylvania canal line and a second in Kentucky on Green River. W. Milnor Roberts became chief engineer on the Monongahela slackwater project and in 1866 established the Engineer office in Pittsburgh that became the Pittsburgh Engineer District.

Pennsylvania began construction of the French Creek Canal in 1827 and opened it to traffic in 1834. French Creek was dammed in eleven places to furnish slackwater from Franklin to Meadville; the 120 feet of slope was overcome by 16 masonry lift-locks, each 122.5 feet long and 21.5 feet wide. A feeder canal was built from Meadville to Conneaut Lake to divert flow from French Creek to the lake for supply of the Erie Extension Canal, which linked the Ohio River with Lake Erie via the Beaver and Shenango River valleys. Major commerce never developed on the French Creek Canal, but the slackwater was useful to the flatboat and keelboat traffic on the stream, and in 1853 Captain David Edgar ran the 9-ton steamboat *Major Adrain*, transporting fifty passengers, in regular excursions between Pittsburgh and Meadville.

The Hughes Survey of the Allegheny, 1837 "If the Allegheny River is improved from Olean to Pittsburgh, a water communication is opened for a distance of more than 12,000 miles, extending into the heart of one of the most fertile regions of the globe, on which Europe might comfor-



"Portage"

Carnegie Library of Pittsburgh

tably rest all her nations," commented Major George Hughes of the Corps in his report on the Allegheny. Though he had learned that keelboats sometimes ascended the Allegheny to Coudersport, Major Hughes began his survey on July 11, 1837, at the mouth of Potato Creek in McKean County. He examined the river to Franklin, where he arrived September 15, 1837, at the point where Colonel Kearney had begun in 1828.

During the survey, Hughes saw the *New Castle*, 115 feet long and loaded with 80 passengers and 60 tons of freight, that ascended the Allegheny in 1837 to Olean, second and last steamer to make the trip. Captain Joshua Leech also steamed the *New Castle* in 1838 up the Kiskiminetas River to his family home at Leechburg, the only steamer of record to make that trip. Hughes also learned that construction of the Genesee Valley Canal from Rochester to Olean had begun in 1837. That 104-mile long canal, linking the Erie Canal with the Allegheny River, took twenty years to complete. Because of railroad competition, the canal never realized the expectations of its promoters; yet, its construction stimulated greater public support for the improvement of Allegheny River navigation.

Major Hughes recommended in 1837 that the river above Olean be cleared of snags and that millowners be required to burn mill refuse instead

of dumping it into the river, where it collected and obstructed traffic. "The general plan of improvement," Hughes said of the river below Olean, "is to concentrate the water into a single channel, by low dams, uniting the islands together when there are several of them, and with the main land; the partial removal of the bars, which are generally formed of gravel and pebbles, thus producing a plane of descent nearly parallel to that which the river assumes in time of high water; the removal of snags, driftwood, sunken boats, and loose rocks." Project costs would be insignificant, he said, when "compared with the vast importance of the great interests which it is calculated to subserve."

The Hughes report was well received by proponents of improvements to the Allegheny, who used it as ammunition in their campaign to secure state or federal funding for the project. One widely reprinted letter came from an Allegheny raftsman, who took a 350-foot raft from above Olean downriver in 1841 and wrote:

*When Congress does its duty by improving the navigation of one of the most beautiful rivers in the country, and the road and canal are completed, both this [Port Allegany] and Olean must become important points. That the river may be made navigable, the report of a survey by Congress [Major Hughes] clearly shows;*

*and even the eye, without the aid of any instrument, can plainly see that such is the case. Indeed, had not those nuisances called dams obstructed the channel, boats might have traded several weeks from Pittsburgh to Olean, the last spring. They have ascended over the dams in high water, and carried freight to Olean. You of New York should move in this matter, since it is the only means of securing a large share of Western commerce.*

The Pennsylvania legislature urged its congressmen in 1845 to support federal improvement of the Allegheny to Olean, and in 1846 resolved that waterway improvements were clearly the duty of Congress, which should give special attention to those rivers leading from Olean to New Orleans, "the great interior highway of the nation, indispensable to its defense, and essential to its commerce." But the question of constitutionality and divisive political factionalism that disrupted the Army Engineer project for the Ohio River also prevented federal improvement of streams tributary to the Ohio, and the Allegheny River, without improved navigation, never developed a waterborne commerce as extensive as that on the Monongahela, where slackwater navigation was available by 1844.

**Monongahela Navigation Surveys** The Monongahela River was the cradle of the inland river steamboat. The first river steamers were built at Pittsburgh and Brownsville, and others were soon sliding down the ways and splashing into the Monongahela at Elizabeth, McKeesport, Monongahela, Webster, Belle Vernon, Fayette City, California, and other ports along the river of falling banks. Monongahela boatyards were launching fifty new steamers a year by 1846; and from 1811 to 1888 they turned out more than 3,000 steamers, aggregating a million tons and valued at fifty million dollars.

Steamboat traffic on the Monongahela itself, however, grew slowly because of the difficulties of navigating the unimproved stream. The little *Enterprise*, commanded by Captains Israel Gregg

and Henry Shreve, in 1814 and 1815 first ascended the Monongahela to Brownsville; the *Reindeer* in 1826 was first to ascend to Morgantown; and the *Plowman* first reached West Newton on the Youghiogheny in 1835; but not until February 1850 did the steamboat *Globe* cross the milldams and obstructions on the upper river to reach Fairmont at the head of the Monongahela, and that to collect a thousand dollar prize offered for the feat. First Pittsburgh to Brownsville packet was the *America*, that began its run in 1825, but steamboating on the Monongahela did not thrive until after slackwater opened to Brownsville in 1844.

The Pennsylvania legislature on March 28, 1814, just after the first steamboats were built on the Monongahela, directed the Governor to appoint a commission to survey the river; and he appointed Henry F. Pearson, John Crawford, and Israel Gregg. Gregg, a river pilot who took the flatboat *Blackbird* with a cargo of flour from Brownsville to New Orleans in 1805, was co-captain with Henry Shreve aboard the steamboats *Enterprise* and *Dispatch*. The commissioners surveyed the Monongahela during the summers of 1814 and 1815 and reported: "There is no way of making said river navigable at all seasons but by erecting dams and locks." To build the necessary locks and dams, Pennsylvania chartered the Monongahela Navigation Company on March 14, 1817, and set aside state funds to purchase stock in the company. The company planned to supply slackwater through construction of sixteen low dams, averaging about four feet high, and adjacent locks, but did not begin construction before its charter expired.

A week after the first Monongahela Navigation Company charter expired, the Pennsylvania General Assembly on April 2, 1822, transferred \$10,000 of the funds appropriated for company stock to a commission charged with creating a "slope or inclined navigation" from the Virginia state line to the mouth of the Monongahela: The purpose of the project was to divert traffic from the National Road and Wheeling to the Monongahela and Pittsburgh. Commissioners Solomon Kripps, Joseph Eneix, and William Leckey employed

laborers, cleared the Monongahela of snags and boulders and dredged its bars with teams of horses pulling plows, completing their work in 1825. Apparently the project was beneficial, for in 1825 the steamboat *America* began regular runs from Pittsburgh to the National Road at Brownsvills, and in 1826 the *Reindeer* was able to get upstream to Morgantown.

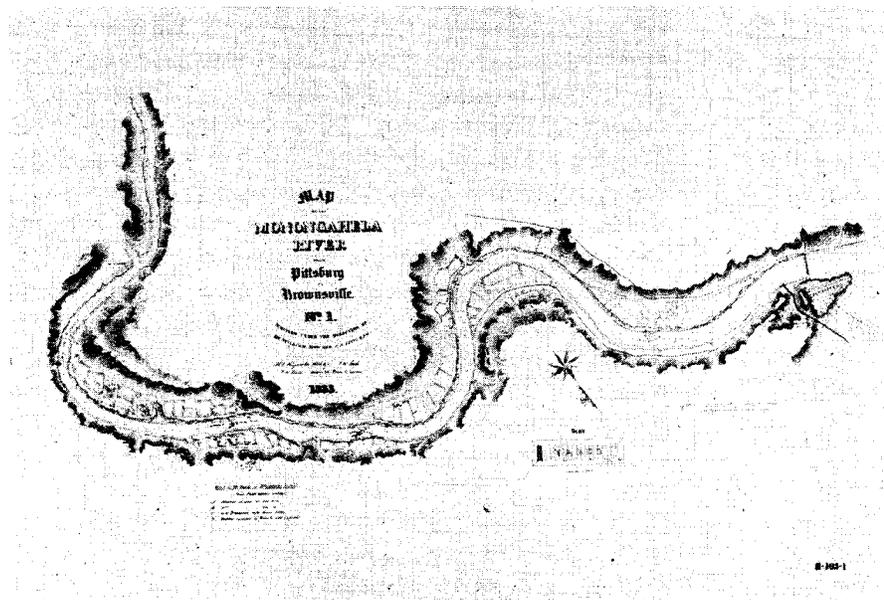
Pennsylvania engineer Edward F. Gay resurveyed the Monongahela in 1828 to determine whether either a parallel canal or slackwater navigation was feasible. When he saw the “slippery” character of the banks of the Monongahela, he rejected a canal and recommended a four-foot slackwater project with eight dams and ten locks to overcome a slope of about 75 feet between the state line and Pittsburgh. Gay proposed construction of timber-crib dams, filled with loose stone and capped with planking, and of stone masonry locks with chambers 120 feet long and 26 feet wide. The entire project, he estimated, could be built for slightly more than \$300,000.

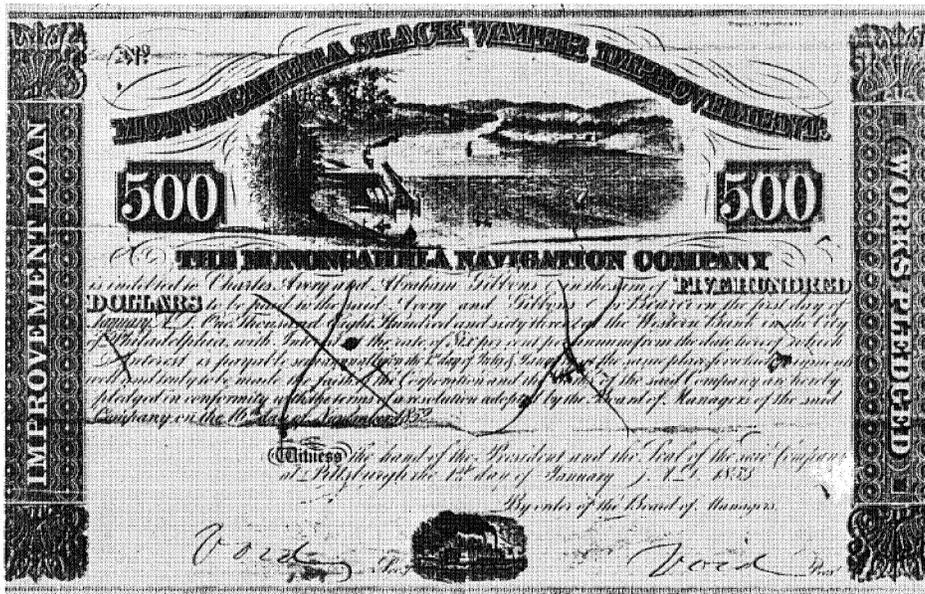
Congressman Andrew Stewart of Uniontown had fought desperately in 1824 for inclusion of the

Monongahela below Brownsville in the first federal inland river navigation project but had failed. He and Congressman Philip Doddridge of Wellsburg, (West) Virginia, continued the efforts to secure federal improvement of Monongahela navigation. In 1830, Doddridge sponsored a resolution asking federal improvement of navigation on the Monongahela and its West Fork as far upstream as Clarksburg. That resolution failed, but on July 3, 1832, Congress approved an Engineer survey of the Monongahela below Brownsville.

The Monongahela survey was assigned to Dr. William Howard of Baltimore, a U.S. Civil Engineer and an assistant to General Simon Bernard and Colonel Joseph Totten on canal surveys. Dr. Howard began the survey in late 1832, and, after interruptions resulting from high water and a cholera epidemic, completed the study in the summer of 1833. He learned that Monongahela boatyards had launched sixteen new steamboats in 1832 and that many flatboats carried the products of Monongahela coal mines and glass factories to Ohio and Mississippi ports. The open-channel “sluice” project completed by the Pennsylvania commissioners in 1825 had so increased current

Map of Monongahela River prepared from 1833 survey by Dr. William Howard





velocities at ripples, however, that ascending keelboats and steamboats had to be towed by oxen and horse teams.

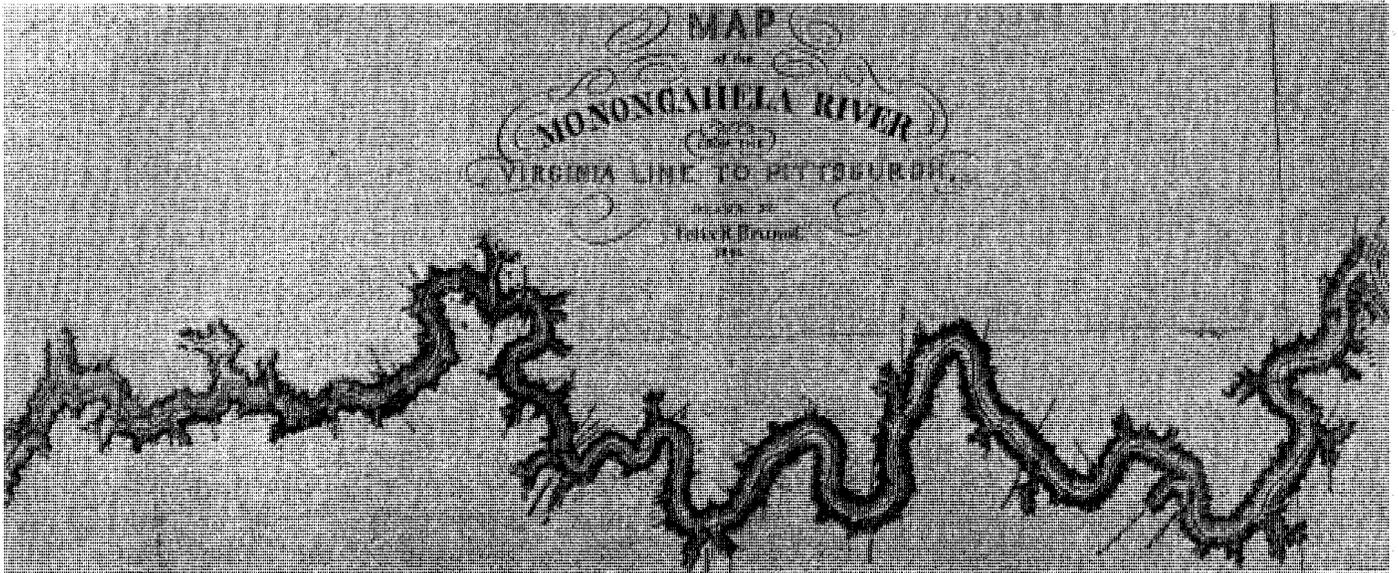
Dr. Howard recommended construction of a slackwater lock and dam project suitable for year-round navigation by 100-ton steamboats to Brownsville. Because Monongahela flatboatmen opposed anything that might interfere with open-channel navigation at high water, he proposed building eight dams between Pittsburgh and Brownsville, all with a lift of 4.5 feet except No. 1 near Pittsburgh that would have a 6-foot lift but with an open sluice in its center to be closed by planks during periods of low flow. Low dams could be jumped at high water by flatboats, and as another concession to flatboatmen Dr. Howard suggested the dams be built in an arch with the apex pointing upsteam to reduce the hydraulic jump or wave below the center of the dam and allow flatboats to go over without plunging their bows underwater. He proposed stonemasonry locks, with chambers 160 feet long and 40 feet wide, and he estimated total project costs at \$258,720.

With the Howard survey in hand, Congressman Stewart redoubled his efforts to secure federal funding for the Monongahela project, or, as he preferred to put it, extending the Ohio and Mississippi project upstream to the National Road at Brownsville, cutting off 57 miles of land carriage to Wheeling. His efforts were furthered by conventions meeting at Greensboro and Brownsville in 1833 and 1835, which asserted in petitions to Congress that the Monongahela was worthy of federal attention because its coal propelled the machinery and fired the boilers at communities throughout the Ohio and Mississippi valleys and because its improvement would permit "speedy transportation of troops, ammunition, and arms."

Proponents of the Monongahela improvement, despairing of federal assistance, turned to state government and on March 31, 1836, secured a charter for a new Monongahela Navigation Company to build locks and dams to the state line and as much farther as Virginia would permit. About \$80,000 of company stock was subscribed by individuals, \$5,000 by the Bank of Brownsville, \$50,000 by the Bank of the United States, and \$125,000 by the Commonwealth of Pennsylvania, permitting organization of the company in early 1837 and employment of W. Milnor Roberts as chief engineer.

**Monongahela Slackwater** "The first time I saw Old Slackwater," W. Milnor Roberts recalled, "he was standing in a river in water to his neck. I asked if he were not a bit wet, and he replied that while other contractors might go under no river would get the best of him." Colonel Roberts had become acquainted with General James K. Moorhead, "Old Slackwater," on the Pennsylvania canal project where Moorhead was a contractor and Roberts an engineer. After completion of the Pennsylvania Canal main line in 1834, Roberts had transferred to the Erie Extension Canal building up the Beaver and Shenango valleys to Lake Erie and Moorhead had continued his contracting, building several dams including one for Captain Sanders on the Ohio River project. Moorhead became a director of the Monongahela Navigation Company that employed Roberts as chief engineer in 1837.

Roberts surveyed the Monongahela during the record drought of 1838, gaging river flow at Brownsville at 4500 cubic feet per minute (75cfs), and that was one of the reasons he recommended construction of dams 8 feet high instead of 4.5 feet as planned by Dr. Howard. Higher dams, Roberts argued, would increase water storage and reduce



Probably based on detailed survey by W. Milner Roberts in 1838

interruption to navigation resulting from low water to perhaps thirty days a year. The higher dams would also reduce construction costs by a quarter of a million dollars, because 10 instead of 17 dams would furnish slackwater to the Virginia line, saving an additional \$5,000 a year in maintenance cost, furnishing deeper pools for navigation, and eliminating about 3.5 hours lockage time between Pittsburgh and the state line. He recommended that lock dimensions be 190 feet by 50 feet in the chambers, the same as the Louisville and Portland Canal locks, then the largest in the world, which had been completed in 1831 by a private company at the Falls of the Ohio (Louisville, Ky.).

Because people of the Monongahela valley feared the eight-foot high dams would increase flood heights and damages, Roberts conferred with Sylvester Welch, who was building slackwater projects on the Green and Kentucky rivers, and with Pennsylvania engineer Edward Gay. Welch and Gay declared that eight-foot dams were completely drowned out at flood time and had negligible effects of flood flows.

Robert's proposals, nevertheless, were greeted by howls of protest from Monongahela flatboatmen and coal shippers who objected to the destruction of free navigation on the river, argued that consumers

must inevitably pay the tolls "merely to aid a chartered monopoly," and declared the dams would destroy valuable bottom lands and create stagnant pools that would become sources of epidemic disease.

"No work in the country has ever encountered greater obstacles than this," said one company of-



General James K. Moorhead

Carnegie Library of Pittsburgh



First cast iron bridge in the United States over Dunlap Creek at Brownsville, Pennsylvania, built in 1836; officer in charge, Captain Richard Delafield, Corps of Engineers

ficial. "Instead of being, as it ought to have been, fostered by our citizens, and hailed by the inhabitants of the Monongahela valley, as a blessing to themselves, it met with nothing but the most chilling regards from the one, and with either the most violent prejudice or the most determined hostility from the other." The company won approval from the Pennsylvania legislature for the eight-foot dams in 1839, but to appease flatboatmen the legislature directed that the company not collect tolls from traffic originating above Millsboro until Dam No. 5 was completed.

The company let the contracts for locks and dams 1 and 2 in late 1838; James Moorhead took the contract for No. 1 nearest Pittsburgh, and Corey and Adams took No. 2, located just above the mouth of Turtle Creek. The contractors purchased lumber for the timber cribs of the dams from Allegheny raftsmen, purchased random stone for dam fill and cut stone for masonry from quarries along the Youghiogheny, and began construction. The company let contracts for construction of locks and dams 3 and 4 in late 1840 and employed George W. Cass as assistant to Milnor Roberts to supervise the work at Nos. 3 and 4. Cass was a former Engineer officer who had built the first cast iron bridge in the United States across Dunlap Creek on the National Road near Brownsville; he later founded Adams Express Company and served as president of the Pittsburgh and Brownsville Packet Company.

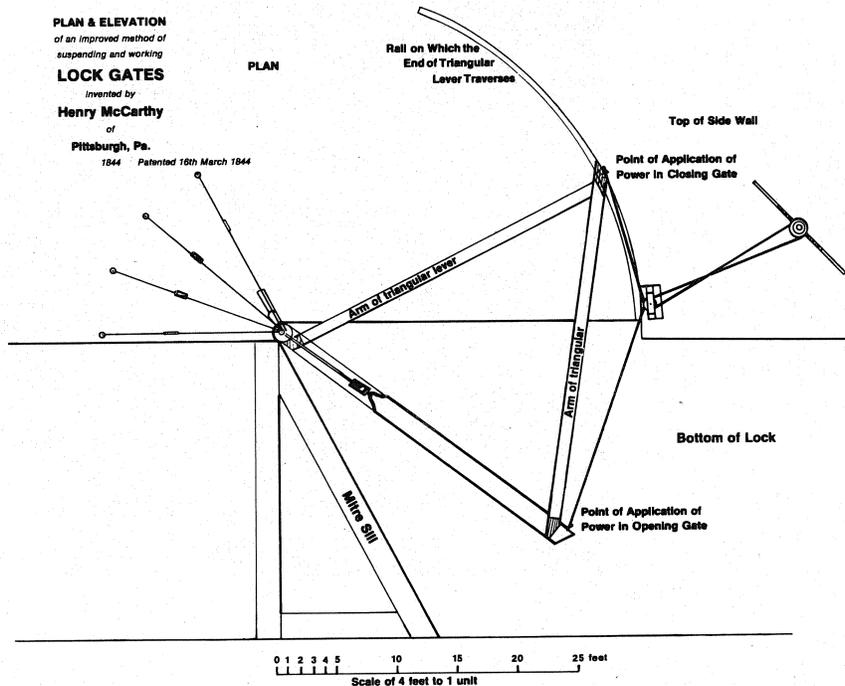
Locks 1 and 2 opened to navigation on October 18, 1841, and in their first eight weeks locked 38 steamboats, 155 keelboats, and 354 flatboats downstream and 34 steamboats and 355 other craft upstream. But headaches were just beginning for the company: rivermen willfully damaged the structures and used "violent means to effect a passage through the locks without paying the established tolls;"

owners of milldams on the Youghiogheny, flooded by Dam No. 2, sued for damages; and worse yet, a national economic depression eroded company capital and nearly put it out of business.

**Crisis on the Monongahela** General Moorhead, with set jaw, waded back into the Monongahela in the spring of 1844. He was in up to his neck because he stood to lose more than \$130,000 if he could not repair Dam 1 and complete locks and dams 3 and 4. And soon! By 1844 the Monongahela project had become a mortification to its friends, a nuisance to navigation, and General Moorhead was determined to end that embarrassing situation and open the project into Brownsville by the end of the year.

Company directors in 1841 noticed that individuals, squeezed by hard times, were defaulting their stock pledges; then in 1842 the Bank of the United States defaulted its \$50,000 dollar pledge and Pennsylvania purchased its stock in the company with state bonds, worth only 50% of par value. Without capital funds, the company had been forced to pay creditors from tolls, end repairs and maintenance at Dams 1 and 2, and stop construction at Locks 3 and 4 where cofferdams were already in place. The final blow had come in July 1843, when the river washed a hundred-foot wide, forty-foot deep hole through Dam 1 and its foundation, ending revenue from tolls.

It appeared the Monongahela Navigation Company and its property would fall under the hammer of the sheriff at public auction in the autumn of 1843, and, at the same time, Pennsylvania was so hard-pressed financially that the sale of all state corporation stock was ordered. Old Slackwater and his friends went to Harrisburg, purchased company stock owned by the state at a few cents on the dollar, and General Moorhead then contracted to save the



Henry McCarty's lockgate

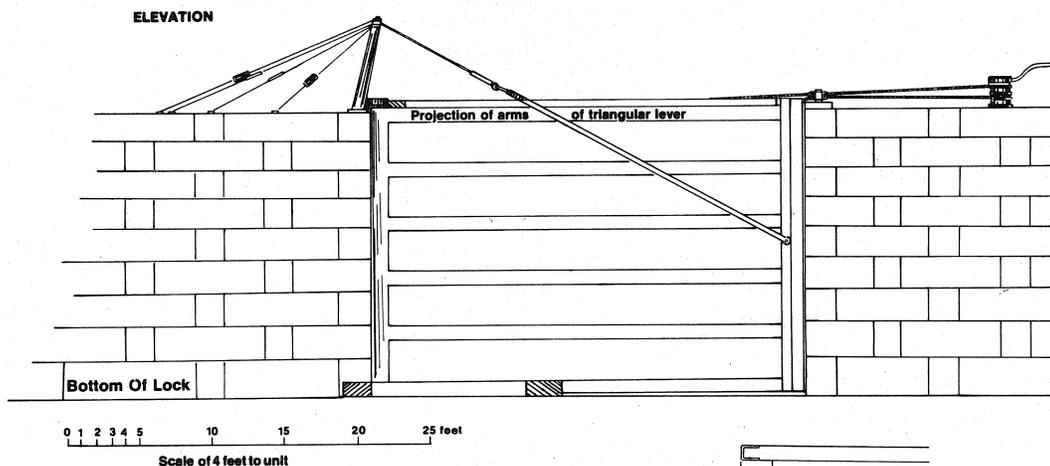
Redrawn from original plans National Archives

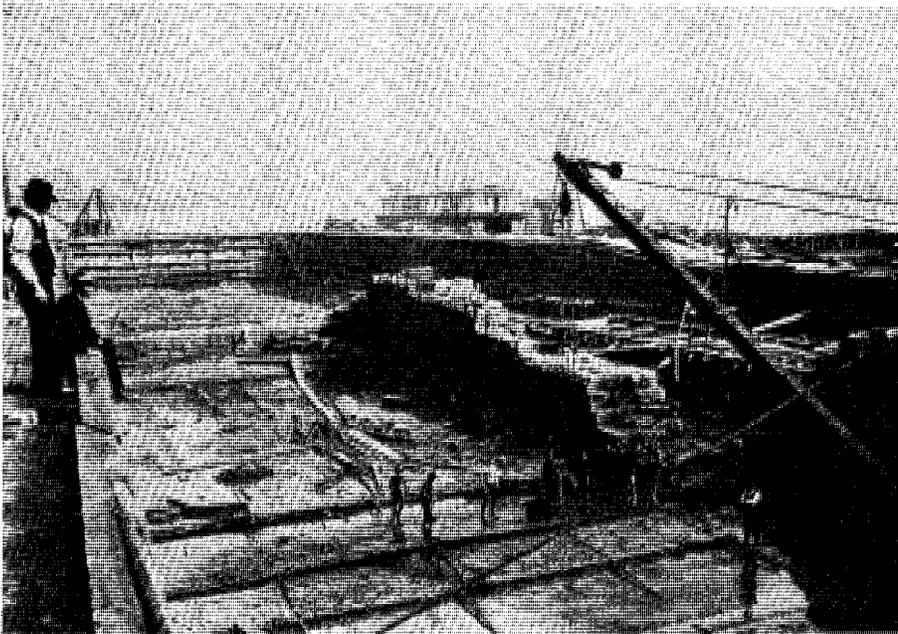
company by repairing Dam 1 and building Nos. 3 and 4, taking instead of cash payment a ten-year mortgage on company property to be retired with toll revenues, if any were to be had. He risked his personal fortune on the gamble that he could finish the project and that it would be financially successful, reimburse his expenditures for construction and return his near worthless company stock to par value.

When the company ran out of funds in 1841, Milnor Roberts left for Canada to work on the Welland Canal. General Moorhead selected Sylvanus Lothrop as his new chief engineer. Lothrop had been a contractor on the Pennsylvania Canal for locks and dams and for the aqueducts over the Conemaugh at Lockport and over the Allegheny at Pittsburgh. He had become engineer for the Ninth and Sixteenth Street bridges at Pittsburgh and for slackwater projects on the Wabash River in Indiana and the Duck River in Tennessee.

Lothrop directed the emergency repairs to Dam 1, which were accomplished by floating timber-crib frameworks into position across the breach in the dam and quickly filling the frameworks with stone. Old Slackwater, in the meantime, placed log cribs around the sites of locks 3 and 4, filled the cribs with stone and clay to serve as cofferdams holding out the river, and began pumping water from the interior of the cofferdams.

During the construction of Nos. 1 and 2, cofferdams had been "dewatered" with screw pumps, which were wooden cylinders with wooden screws turning eleven times in the length of the cylinders and powered by horses walking in circles. General Moorhead was racing to finish the project before high water in late 1844, however, so he cut the horses free and attached steam engines to the wooden pumps and moved 2,100 gallons per minute out of the nine-foot deep lockpits.





Old bear trap at Lock 1  
(1909 photograph)

Since solid rock foundation was seldom available, General Moorhead built the lockwalls on a grillage of timbers laid on gravel, just as railroad ties are laid on rock ballast. The General moved cut stone for the masonry in scows from the Youghiogheny to the lock sites, swung the massive blocks from the scows to their place in the lock walls with timber A-frame derricks, and laid them symmetrically in hydraulic cement. Each lock wall was about 252 feet long, 25 feet high, and 10 to 12 feet thick, containing 5,300 perches (roughly 4,900 cubic yards) of stone.

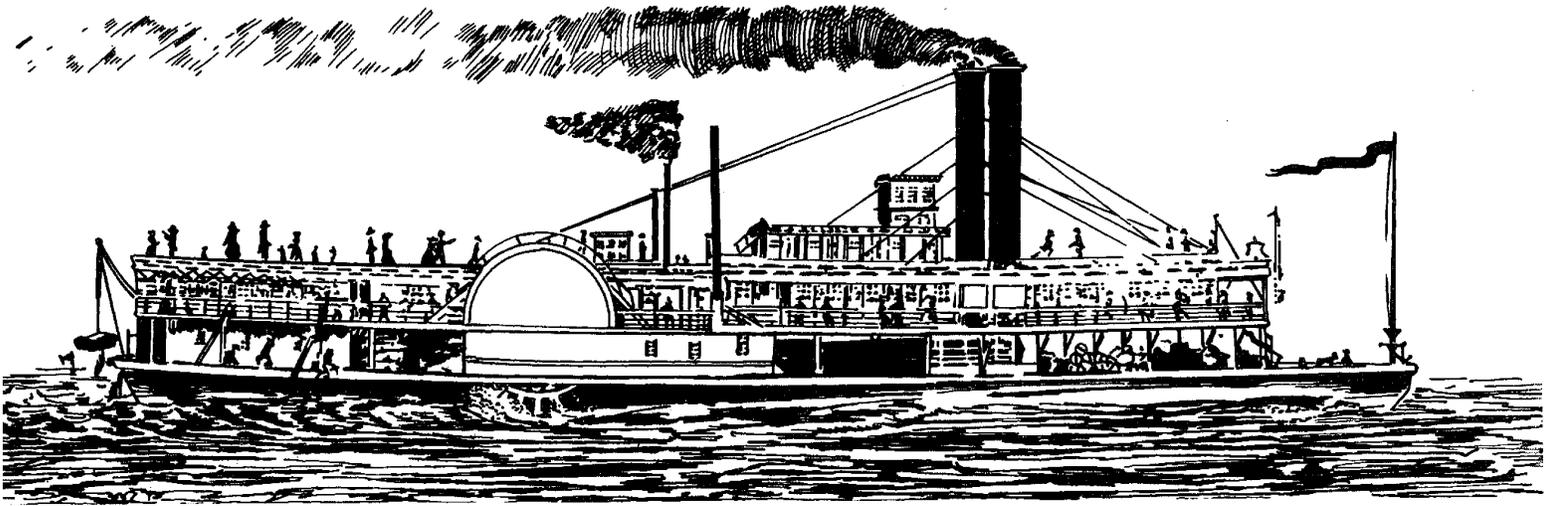
Milnor Roberts originally planned installation of beartrap gates in the middle of the lock chambers, with the idea of using these easily raised and lowered gates to flush debris and silt from the lock and its approaches, but Moorhead and Lothrop abandoned the idea because of construction fund shortages. The General rested the lockgates on rollers running on a rail track laid on a segment of a circle on the floor of the lock. He soon learned, however, that the system did not work well and purchased the method patented by Henry McCarty, assistant to John Sanders at the Pittsburgh Engineer office, for suspending the lockgates from posts on the lock walls, allowing them to swing open and closed like common house doors.

While the locks were under construction, General Moorhead had men at work building timber cribs for the dams. Logs, squaring at least a foot, were laid in alternate courses, much as log cabins were built, with long iron bolts through the corners to clamp the logs securely in place. The completed cribs were moved into place along the line of the dam, filled

with rock and sunk in place without much concern about foundation conditions. The tops of the cribs were planked over with oak timbers, wooden sheet piles were driven vertically along the upstream face of the dam into the bed of the river to deter undermining, gravel dumped in upstream of the dam to further stabilize the structure, and the job was done. It was a cheap but effective system; none of the dams failed from undermining, though their crests were cut down and breached by heavy ice and floods.

**Success on the Monongahela** "Our aim is to make known to our fellow citizens throughout the Union who may have occasion to travel Eastward or Westward between the seaboard and the Mississippi Valley," wrote Charles A. Fuller of the Corps of Engineers and Lieutenant John Rodgers of the Navy, "that a new avenue has just been opened which presents great advantage on the score of economy, comfort and speed." Fuller and Rodgers had joined Old Slackwater and a host of dignitaries aboard the steamboat *Consul* on its triumphant trip to Brownsville on November 13, 1844, in celebration of completion of the Monongahela slackwater project. "Trade and travel for Baltimore will now take a new course, and instead of making Wheeling a place of transshipment," proclaimed the *Pittsburgh Post*, "those who have heretofore taken that town in their route, or sent their goods through it, will find it to their advantage to come directly to this city."

Doubtless General Moorhead, aboard the *Consul*, watched with immense satisfaction the placement of the last stone in Lock 4 that day, for it finished his job of opening 60 miles of five-foot slackwater to Brownsville, and he had done the job a month ahead



Pittsburgh and West Newton Daily Packet

of contract schedule. In September 1844, when he saw he would get the river open to the National Road on time, along with engineer George Cass and river pilot Adam Jacobs, he organized the Pittsburgh and Brownsville Packet Company and purchased the steamboat *Consul*, later adding the packets *Josephine* and *Louis McLane*. The *Consul* picked up passengers arriving via the National Road at Brownsville on its first trip up and delivered them to Pittsburgh. The Monongahela slackwater did divert trade from Wheeling to Pittsburgh; in 1847 the packet company transported 45,825 through and 39,777 way passengers. But it was coal rather than passenger traffic that made the Monongahela the most successful slackwater project of the 19th century.

Coal shipment down the Monongahela to Pittsburgh began in the 1780's, and in 1793 Quartermaster Isaac Craig began shipping coal down the Ohio to supply the blacksmiths and armorers of General Wayne's army. David Bradford, leader of the Whiskey Rebellion, escaped down the Ohio in 1794 in a coalboat. Zachariah Reno made the first commercial coal shipment down the Ohio, sending two flatboats in 1814 with 5,000 bushels of coal to foundries at Louisville. By 1830, Monongahela coal was boated to New Orleans for use by sugar refineries.

Coal from hillside mines along the Monongahela was run out wooden inclines in wheelbarrows and mule carts and dropped through hoppers into large flatboats known as coalboats, or sometimes as French Creeks because they had been built on that

stream. Coalboat size varied at first but became standardized at a maximum 175 feet in length, width of 24 feet, and 10-foot high gunnels, with a capacity of 25,000 bushels or 1,000 tons (25 bushels roughly equalled 1 ton). Two such coalboats, lashed together, completely filled lock chambers on the Monongahela.

Crews for each pair of coalboats numbered fifteen, three men to handle each of the four oars, two pilots, and one cook, all living in a shanty in the center of the boats. They lived rough and dangerous lives during their downriver trips. In 1854, for instance, 120 coalboats sank in a storm on the Ohio and at least 17 crewmen drowned.

Though they strenuously opposed payment of the tolls, coal shippers found the Monongahela slackwater beneficial because it permitted loading the boats during any season of the year and regular supply to the plants and foundries at Pittsburgh. Coal shipments bound for Cincinnati, Louisville, and New Orleans were harbored in the pool of Lock and Dam 1 at Pittsburgh, where they were able to catch the first ten-foot rise on the Ohio to proceed to market. In their first full year of operation, 1845, the Monongahela locks passed through 4.6 million bushels of coal; the total rose to 22.2 million bushels in 1855, 37.9 million bushels in 1860, and to 65.8 million bushels in 1874, after the barge towing system had fully developed.

Tolls collected from the coalboats enabled the Monongahela Navigation Company to repay General Moorhead the construction costs by 1853,

and in that year the company began paying dividends to its stockholders, but headstrong coalboat captains caused operations problems. Except for preference given passenger packets, the rule was first come, first served, at the locks, and the result was races to the locks, immense jams at the lock approaches with no captain willing to give an inch, verbal pyrotechnics and brawls over the tops of the coalboats and on the lock walls, and assaults on lockmasters. In 1854 the Pennsylvania legislature established a \$25 fine for violation of locking regulations, but most pilots were willing to pay the fine to get down to the Ohio River in time to catch a flood. Company officials said the fine ought to be \$500 and imprisonment to at least "restrain the reckless and desperate and protect the more moderate."

**Youghiogheny Slackwater** Construction of the Monongahela project generated interest in building a companion project on the Youghiogheny. The pool of Dam 2 on the Monongahela furnished slackwater on the lower seven miles of the "Yough," the little steamboat *Ploughman* (or *Plowman*) had navigated the Youghiogheny to West Newton in 1835, and coal and coke shipped down the river from West Newton, Connellsville, and above was of such high quality that even coal from the Monongahela was marketed at New Orleans as "Youghiogheny Coal."

Youghiogheny river captains and mill and mine owners organized the Youghiogheny Navigation Company to construct a project extending slackwater up to West Newton, 18.5 miles from the mouth of the stream, and secured a state charter on April 18, 1843. Financial problems prevented any construction, however, until 1848, when General William Larimer, like James Moorhead on the Monongahela, came to the rescue by funding construction in return for a mortgage on company assets and tolls.

Construction of tow timber-crib dams and masonry locks began in 1848 under direction of

engineer James E. Day and General Larimer, the "Columbus of West Newton." Lock 1 at Boston and Lock 2 at Buena Vista, 5.5 and 12 miles above the mouth of the Youghiogheny, had 180 feet by 50 feet chamber dimensions and lifts of 13 and 15 feet, respectively. They opened to navigation on October 31, 1850, supplying four feet of slackwater up to West Newton.

Thousands of spectators gathered at the West Newton wharf, military companies paraded, bands played, and cannon salutes rent the air, as the steam packets *Atlantic*, *Shipper*, and *Youghiogheny* packed with celebrating passengers, landed at the wharf on November 5, 1850, to formally open Youghiogheny slackwater. After speeches by dignitaries, including the "Columbus" himself, the crowd adjourned to a huge warehouse for dinner.

The project began with great promise. Travelers via the Cumberland and West Newton Plank Road boarded steamboats such as the *Genesee* and *Shriver* at West Newton to continue their westward trips by water, and Youghiogheny coal and coke moved through the locks to market. West Newton even became a steamboat construction center: the 75-ton *Justice* and the 59-ton *Aquilla* were built there in 1851 and 1854. But the tolls collected were insufficient to repair frequent damages to the locks and dams by swift Youghiogheny ice and floods.

The navigation company was insolvent by 1858, and General Larimer lost \$14,000 dollars invested in the work, and went west to make a new fortune in railroad construction and found the city of Denver, Colorado. The company and its property were offered for sale in 1861, there being some hope the Monongahela Navigation Company would purchase and maintain it, but there were no buyers, for in 1861 the Pittsburgh and Connellsville Railroad was completed, robbing the Youghiogheny of all except its coalboat traffic. An ice gorge in January 1865 cut down the crests of the navigation dams; coal shippers led by William N. Robbins repaired the dams and acquired the navigation company, not for

cash but in exchange for funds expended for repairs. Coal shippers operated the project for two years until an ice gorge and flood on the night of February 17, 1867, broke the dams beyond repair. The locks and dams on the Youghiogheny were never rebuilt, though support for such a project continued for a century after the original project was destroyed.

**Slackwater to Virginia?** "The trade of the Monongahela Valley is rapidly increasing, the banks of the river are fast becoming lined with manufacturing villages, the coal business is just beginning to be developed," reported directors of the Monongahela Navigation Company in 1847, "and from the great extent of the Ohio and Mississippi Valleys, which must receive their main supply from thence, may expect its continued and rapid increase." The burgeoning coal traffic and boat jams at the locks forced the company to build second and larger locks adjacent to the first locks at dams 1 and 2 less than ten years after the first locks had been completed. Chief Engineer Sylvanus Lothrop designed and directed construction of the second locks, finishing the lock at dam 1 in 1851 and the lock at dam 2 in 1853. He built the new locks with chambers 250 feet long and 56 feet wide, dimensions sufficient to pass two of the largest coalboats simultaneously; at completion, the new locks were the largest in the world.

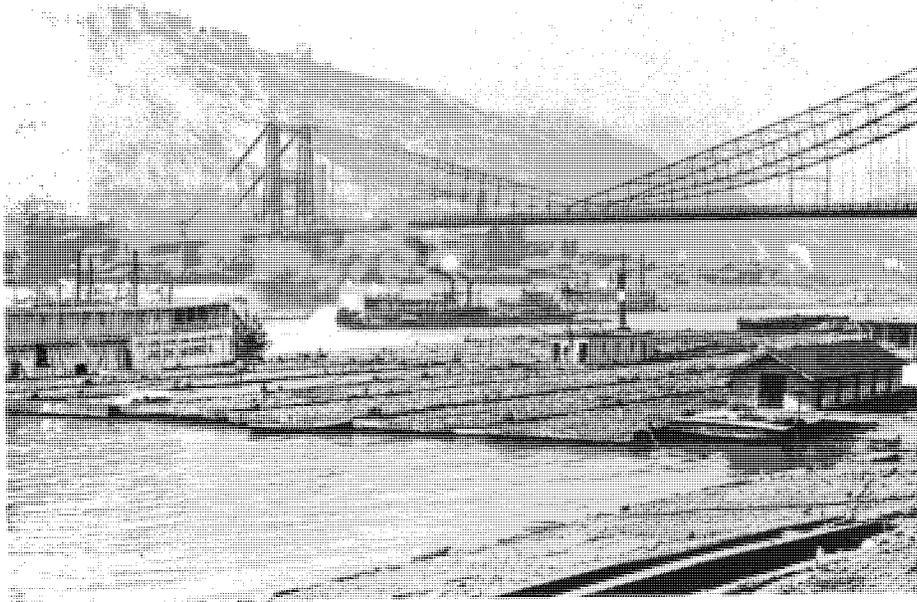
People along the Upper Monongahela, realizing that slackwater navigation could result in the opening of new coal mines and in greater real estate values, clamored for extension of the project upstream. In 1854, the Pennsylvania legislature required the company to begin construction of Locks and Dams 5 and 6, extending slackwater 28 miles above Brownsville to Geneva. Lothrop and his assistant Charles Stewart designed Nos. 5 and 6, let contracts in 1854, and opened the two new locks to navigation in November 1856.

Citizens of Monongalia, Marion, and Harrison counties, Virginia, were as eager as Pennsylvanians for slackwater navigation, but General Moorhead's

company held no charter from Virginia and did not have the capital needed to finish the project to the state line, and certainly not into Virginia. Virginians, largely from Morgantown and Fairmont, secured a charter on March 10, 1847, for a Monongahela Navigation Company with power to build locks and dams to extend slackwater up the Monongahela and even to Clarksburg on West Fork, where the ruins of General John G. Jackson's slackwater project could still be seen. The Virginia legislature offered to subscribe more than half the funds needed for construction, if individuals would subscribe the remainder, and therein lay the catch: the funds could not be raised.

By offering a prize of \$1,000, the people of Fairmont got the steamboat *Globe* up to their town at high water in February 1850, proving the upper river was navigable for steamers, even in an unimproved condition. Delegations from Morgantown and Fairmont met with General Moorhead and the Pennsylvania directors in 1853, and arranged for the Pennsylvania company to open books for stock subscription at ports on the upper river, but there simply was no money for investment there. On March 8, 1860, Virginia appropriated \$48,000, its share of the \$80,000 needed to begin construction, and books were opened at Morgantown and Fairmont in 1861 to collect private subscriptions, but this business was obliterated by marching armies that ended the authority of the Virginia government in the upper Monongahela valley and temporarily interrupted public interest in river improvement projects.

**Capital Investment and Project Success** Why did some 19th century waterway projects succeed while others failed, miserably? Chiefly because waterway projects required immense capital investments for construction and sufficient traffic afterwards to justify maintenance and operations costs. The necessary capital could come from three sources: federal government, state government, and private corporations. Sufficient traffic could come from transport of large volumes of bulky commodities.



Coal fleets at Pittsburgh

The Federal Government invested funds intermittently in the improvement of Ohio River navigation between 1824 and 1852, but politics prevented regular funding needed for proper project maintenance and benefits of the work were largely lost. The same politics prevented federal investment in improvement of Ohio River tributaries. Only the Cumberland and Tennessee rivers were improved with federal funds before 1861 and those were minor channel clearance projects whose benefits also were lost when funds for maintenance were not provided.

When people of the Allegheny and Monongahela basins failed in efforts to obtain federal capital for waterway improvements, they turned to state governments. State governments in the headwaters district, however, had invested most of their available capital in elaborate canal projects that brought them to the verge of fiscal disaster, projects that were wiped out by railroad competition.

Private capital resources were sufficient only for three waterway projects, on the Monongahela, its West Fork, and the Youghiogeny, in the headwaters district. And of the three, only the Monongahela project was successful, thanks to General James Moorhead who invested his money in construction of the locks and dams when the navigation company was near bankruptcy and to swelling coal commerce with resulting toll revenues that made the project profitable for investors and permitted proper maintenance and some expansion of the system. Without similar heavy traffic and toll revenues, maintenance costs of the West Fork and

Youghiogeny slackwater projects overwhelmed the resources of private capital and destroyed the projects.

A similar comparison might be made between the Monongahela project and slackwater projects built by the states of Ohio and Kentucky on the Muskingum, Kentucky, and Green rivers during the same era. The states underwrote construction costs, but without a heavy traffic in bulky commodities, like the Monongahela coal commerce, toll revenues were insufficient, maintenance was neglected, and when the locks and dams were completely worn out the states abandoned the projects.

Coal saved the Monongahela Navigation Company and made it the most successful slackwater project built in the 19th century; indeed, for years in the 20th century tonnage on the Monongahela exceeded that on the Ohio and Mississippi rivers and was even greater than that passing through the Panama Canal. Thomas P. Roberts, son of the engineer who designed the Monongahela slackwater and himself chief engineer for the project, declared with great pride:

*Perhaps not in the history of the country has so small an investment of capital brought about, directly and indirectly, such a growth of population and wealth as resulted from the capital expended in the construction of the locks and dams on the Monongahela, and which has made Pittsburgh a household word, from the Allegheny mountains to the Gulf of Mexico.*