

Chapter 4

STEAMBOATS AND THE WESTERN ENGINEERS

"I well remember the alarm created by its sudden appearance," Robert Buchanan of East Liverpool recalled. "Few had heard of the boat and none expected it," he added. "With its lever beam moving up and down, it looked like a floating sawmill, for the cabin was below, and no upper works on the deck. With our townspeople, it was a source of marvelous relation to the surrounding neighbors for years afterward." He had vivid memories of the *New Orleans* and its 1811 voyage because it was the first steamboat successfully operated on the inland rivers. It was not the first steamboat, however, nor was it the first steamboat built on the inland rivers.

Rowing and poling boats against river currents generated both considerable sweat and intense interest in the development of alternate means of propulsion. At Fort Pitt in 1761, William Ramsey hinged two bateaux together and installed paddlewheels on each side, powering them with two pedals bicycle-fashion. He could pedal the boat as fast as two men could row, but his invention never caught on. Ingenious ferrymen devised horse-powered ferryflats: two boats placed parallel, decked over, and powered by horses or oxen on the deck turning a shaft geared to paddlewheels. One inventor patented such a boat in 1795 and took it down the Ohio and Mississippi rivers to New Orleans. Army engineers also experimented with ferryflats, moving supplies up the inland streams, but soon learned that horses and oxen gave out long before soldiers with oars and poles were exhausted.

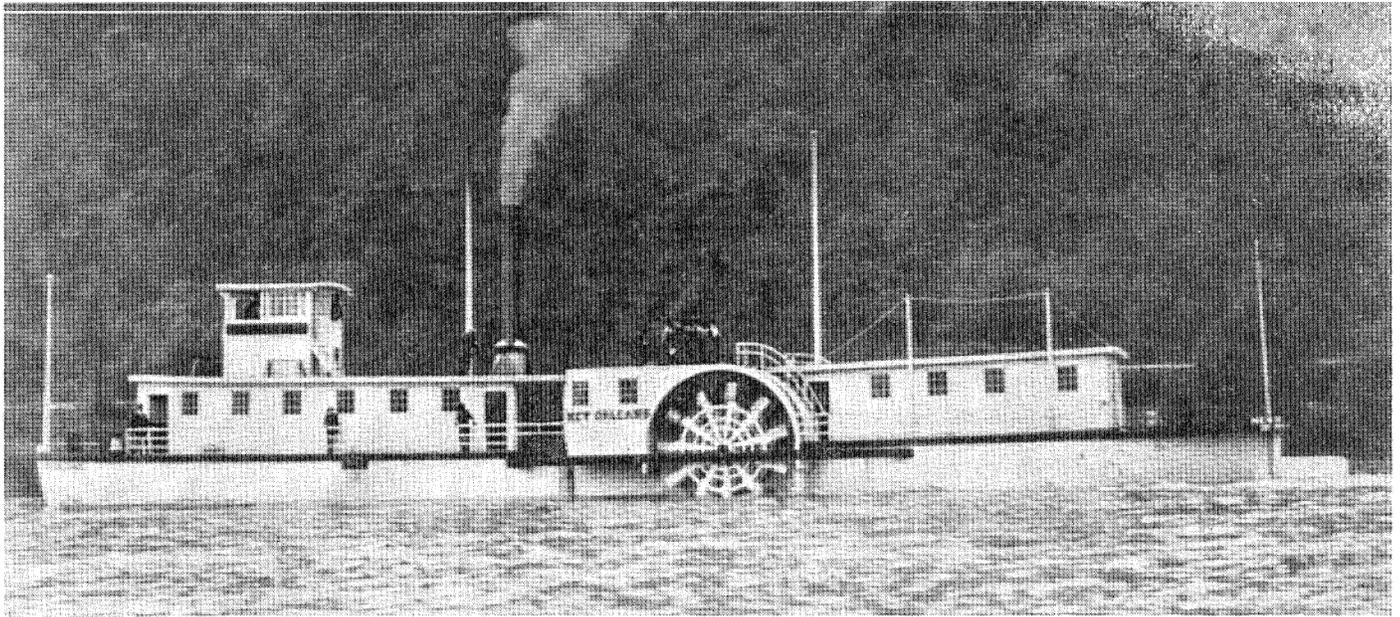
Early Army Engineers who were interested in improved waterway transportation lent their assistance to inventors of steam and mechanical boats. Thomas Hutchins sought federal support for the boat propulsion devices invented by John Fitch, but, though Fitch demonstrated his boat to the Constitutional Convention of 1787, he never acquired government or business backing and eventually

died penniless in Kentucky. George Washington backed inventor James Rumsey, who had assisted George Morgan in the Ohio River trade before the Revolution, and Rumsey won a grant of 30,000 acres of land along the Ohio River from Congress, on condition that he navigate his boat six successive days upstream on the Ohio. Rumsey never made it.

Captain James McKeever, who had sailed several Tarascon ships from Pittsburgh to Philadelphia, purchased a steam engine from inventor Oliver Evans in 1803 and built an 80-foot steamboat hull on the lower Mississippi. When the river fell, however, leaving the hull high and dry with no prospect of a rise for months, McKeever rented his steam engine to a sawmill, where it angered hand sawyers by cutting 3,000 board feet of lumber daily. McKeever lost his \$15,000 investment and eternal fame when the disgruntled sawyers burned the mill containing the engine to the ground.

Instead of Fitch or Rumsey, McKeever or Evans, credit for invention of the steamboat has generally been awarded to Robert Fulton, who first operated a steamboat on the Hudson River in 1807 and who designed the *New Orleans* built at Pittsburgh in 1811. Fulton sent Nicholas Roosevelt, distant ancestor of the Presidents of the same name, to Pittsburgh in 1809 to study the commercial potential of inland river steamboating. Roosevelt flat-boated to New Orleans and made favorable report to Fulton, who secured a grant of monopolistic privileges from Louisiana and dispatched Roosevelt back to Pittsburgh in 1810 to build a steamboat at the Tarascon shipyard on the Monongahela.

A sudden Monongahela flood nearly washed away the Tarascon shipyard in 1811, but Roosevelt saved the *New Orleans* from destruction, and, after a trial run on the Monongahela, sailed it on October 29, 1811, on the way to its namesake city. Curious crowds gathered at communities along the Ohio to see the boat pass, and a few spectators were alarmed by the smoking vessel. One farmer, when he saw the boat approaching, ran for his rifle, shouting: "The British are coming!" General William H. Harrison



The *New Orleans* (replica)

Captain Fred Way

was then engaging the Indians at Tippecanoe on the Wabash, and rumors of war with the British were circulating.

When the *New Orleans* reached the mouth of the Ohio it was shaken by the New Madrid earthquake, so named because it ruined the town founded by Morgan, Hutchins, and Shreve. Pilot Andrew Jack, for whom Jack's Run at Bellevue, Pennsylvania, was named, had serious steering problems; channels had changed and were still changing, banks were caving, islands disintegrating and forming. Captain Jack lashed the *New Orleans* to a tree on an island one night; next morning he found the rope went straight down into the river, for the island had sunk. Captain Jack got The *New Orleans* to the city of its name safely, however, and the Fulton company made \$20,000 profit, 50% of their investment, on the boat during its first year of operation, which was fortunate because it hit a snag in 1814 and sank, a total loss.

Fulton and his associates planned operating steamboats in relays from New Orleans to Natchez, Natchez to Louisville, and Louisville to Pittsburgh, and built four steamboats, the *Vesuvius*, *Aetna*, *Buffalo*, and a second *New Orleans*, for the trade. The company's efforts to monopolize river steamboating were frustrated, however, by independent rivermen who built their own boats and made free navigation an issue in the courts.

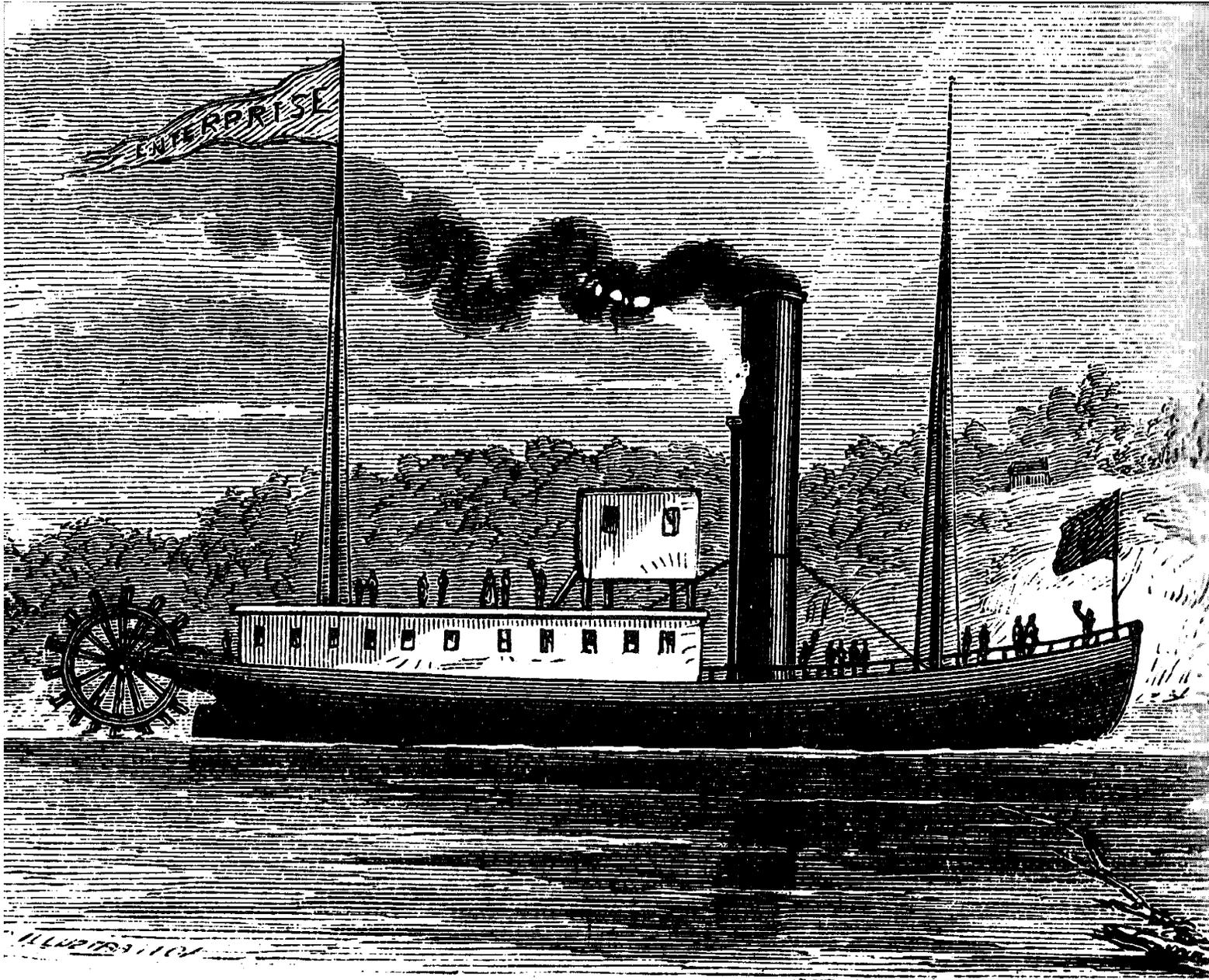
Shreve's *Enterprise* Ice floes bobbing down the Allegheny crashed regularly against the steamboat *Enterprise*, lashed snugly to the bank at Allegheny Arsenal, and ground down the side of the boat, chewing at the wood. Captain Henry Shreve, commanding the *Enterprise*, was eager to get underway before being frozen in for the winter. He leaned against the rail and anxiously watched the soldiers carrying box after heavy box, containing

7,000 stand of rifles and ammunition, from the Arsenal down the bank, up the stageplank aboard the *Enterprise* for stowage, and then rolling cannon up the planks and onto the deck.

When the gunnels of the *Enterprise* were nearly awash, the troops began loading the keelboats moored next to the steamer, and Colonel Abram Woolley, commandant of Allegheny Arsenal, and Major William Foster of the Quartermaster Department boarded to give Captain Shreve the manifest and final orders. Major Foster, better known to posterity as the father of balladeer Stephen Collins Foster, had sold the land at Lawrenceville (now part of Pittsburgh) to the government in 1813 as the site of Allegheny Arsenal, first federal ordnance depot in the Ohio River basin. In 1814, Foster risked his personal credit to purchase arms for General Andrew Jackson, then facing a British invasion at New Orleans.

"We have word," Colonel Woolley told Captain Shreve, "that the British have landed near New Orleans. General Jackson badly needs these arms." Shreve nodded his massive head and replied: "I will get there in time or sink my boat in the attempt." The officers shook hands, wished the river captain good speed, and returned to the Arsenal, while Shreve barked out orders for pulling the gangplanks, casting off lines, and backing into the current. He set off under full steam during that darkening December afternoon, deftly handling the wheel to dodge the running ice, snags, and boulders in the channel. He spent his Christmas in 1814 guiding the sturdy steamer through a snowstorm down intricate river channels.

While it was his first trip to New Orleans at the helm of a steamboat, Shreve knew the river channels as well as the wrinkles of his palm. Son of Colonel Israel Shreve, the partner of Morgan and



The *Enterprise*

Dr. Leland R. Johnson

Hutchins, Henry Shreve had learned river piloting as a youth. He commanded a keelboat at age 22; in 1810 he opened the upper Mississippi lead commerce, shipping lead from Galena, Illinois, to New Orleans; and in 1811 he built a 95-ton keelboat at Brownsville for regular trade to and from New Orleans. He, Israel Gregg, and Daniel French built the little *Enterprise*, known to New Orleans creoles as "le petite Steam Boat," in 1814 at Brownsville, and Captain Gregg tested it that summer on a run to Louisville and back.

Robert Fulton and his partners learned of the fast little *Enterprise* and placed ads in the Pittsburgh papers warning they would use "every legal means to prevent the violation of their patent rights" and stating that Daniel French's steam engine and placement of the paddlewheel at the stern instead of at the sides still infringed their patent. Shreve realized he would meet the Fulton interests at New Orleans, where they had influence with authorities

and a monopoly on steam navigation, but speedy delivery of arms to General Jackson was imperative.

Shreve brought the *Enterprise* to port a few days before the Battle of New Orleans and was welcomed by General Jackson, who sent him back upstream to tow down the ammunition-laden keelboats that followed. When Shreve returned with the keelboats, Jackson challenged him: "Captain Shreve, I understand you are a man who will always do what you undertake. Can you pass the British batteries on the bank of the river nine miles below, and with your steamer bear supplies to Fort St. Philip?" Shreve accepted the challenge, covered the exposed side of the *Enterprise* with cotton bales, and passed the British cannon under cover of fog and darkness to resupply the fort. On January 8, 1815, Shreve joined the hunters of Kentucky and Lafitte's pirates in the American line outside New Orleans, serving one of the cannon that broke the British assault.



Henry Shreve
Up the Heights of Fame and
Fortune, by Frederick B. Read, 1873

After defeat of the British, a new battle began: Shreve was arrested and the *Enterprise* impounded for violating the legal prerogatives of the Fulton company. Shreve made the necessary bond and turned his steamer toward home, arriving at Brownsville 51 days later. "Le petite Steam Boat" was first to ascend the Mississippi, Ohio, and Monongahela from New Orleans, first to tow other boats, first to go to the mouth of the Mississippi, first to navigate Red River, first to be used in combat, and first to challenge the Fulton steam navigation monopoly.

Shreve meant always to be first and had an uncanny knack for finding the action. He, Gregg, and French built a second steamer, the *Dispatch*, at Brownsville in 1815, and Captain Gregg took it to New Orleans, where the Fulton company prevented it from taking on a cargo. Shreve, meanwhile, built the *Washington* on Wheeling Creek, using seasoned timbers from old Fort Henry for the hull. It was the first double-decked steamer, first to have its cylinders connected by pitman to the paddlewheels, and first to have its boilers on the deck, arrangements that became standard for inland river steamboats.

Flying a flag embroidered by ladies of Wheeling with the legend OUR FRIENDS SHALL NOT TAKE FROM US WHAT WE HAVE WRESTED FROM OUR ENEMIES and on the reverse with DON'T GIVE UP THE SHIP, Shreve sailed the *Washington* from Wheeling in June 1816 to again challenge the Fulton monopoly. At Marietta, a cylinder head on the *Washington* exploded, blowing Captain Shreve overboard and mercifully scalding fortunate passengers to death. The unfortunate were skinned alive by the steam and died slowly in agony or were maimed for life. Shreve swam to the bank and escaped the first steamboat explosion on the inland rivers without serious injury.

Shreve continued his voyage after repairs, but had lost high water and stranded the *Washington* near Maysville, Kentucky, where it lay the entire summer before a rise freed it. At New Orleans, he

again met legal action by the Fulton interests, who offered him a substantial share in their company if he would deliberately lose his case; Shreve peremptorily refused the offer. During his return trip, he raced the *Washington* against the *Constitution* on the lower Mississippi and won the race because the *Constitution* exploded, killing eleven passengers and a gambler who was buried separately. On the Ohio, he was challenged to a race by the captain of the *General Pike*; the *Pike* also exploded with loss of life. Shreve had nearly lost his life in the first steamboat explosion on the inland rivers and had won the first two steamboat races at a terrible price. He became leader of a campaign for steamboat safety legislation and improved river navigation, and was selected in 1826 to direct river projects for the Corps of Engineers.

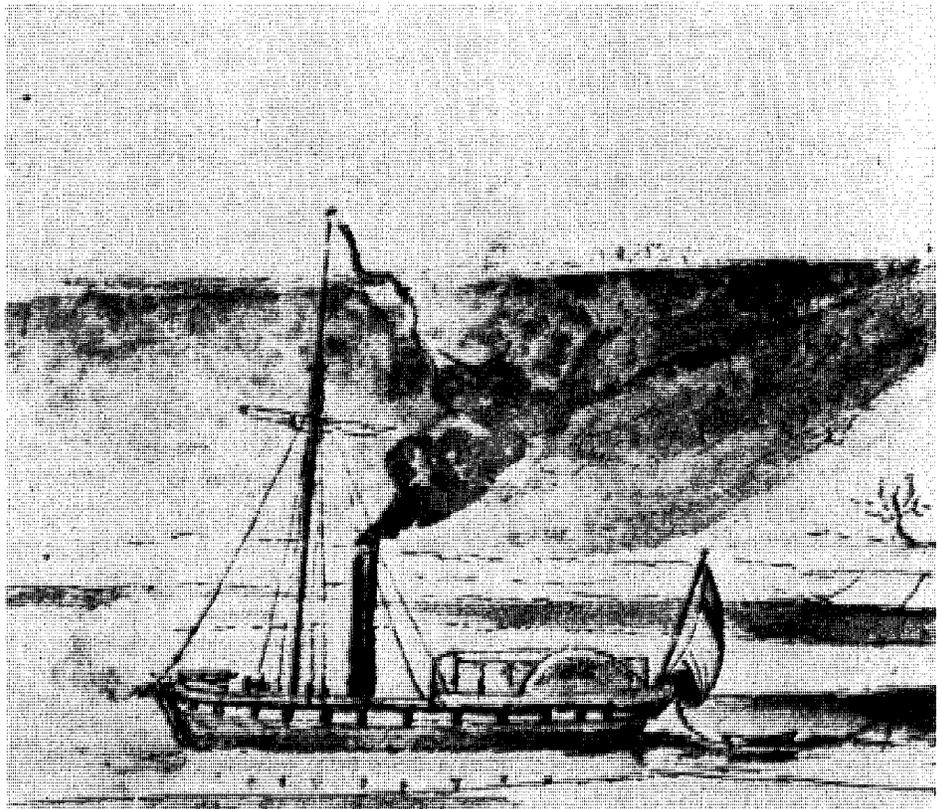
For his feats and especially for his scornful opposition to the Fulton monopoly, Captain Shreve became quite a hero to the people of the Ohio River basin, who vehemently resented restrictions on free navigation and steamboat development. Legislatures of states bordering the rivers asked their congressmen to seek federal investigation of the Fulton monopoly, and Ohio enacted a retaliatory law forbidding Fulton boats from landing in the state. By 1819 the Fulton company had ended its efforts to maintain its monopoly on inland river steam navigation, and in 1824 the Supreme Court ruled that such monopolies could not be granted because interstate commerce was under federal rather than state jurisdiction.

The *Western Engineer* As the boom echoing from the Allegheny hills subsided, artillerymen at the Arsenal scurried about the fieldpiece, wheeling it back into position, swabbing out the bore, and ramming home another powder bag to fire the second of twenty-two salutes, one for each state in the Union. Major Stephen H. Long touched the match to the cannon on the forecastle of the *Western Engineer* and stood away from the recoil of the salute in answer to those from the Arsenal. Crowds along the banks cheered wildly as the weird *Western Engineer* got under way, water dashing from under its hidden

sternwheel, a serpent at its bow belching steam from its mouth, flags snapping in the breeze, and cannon on its decks blasting salutes as it steamed the two miles from the Arsenal to the Pittsburgh Point.

Major Long anchored his steamboat away from the bank at the Point to prevent boarding by enthusiastic spectators, but ordered rockets launched to arch gracefully into the sky above the Monongahela bluffs for entertainment of the crowd and to announce to all Pittsburgh that the Engineers had arrived. A newspaper reporter, much impressed by the unusual craft, wrote a vivid description:

The bow of this vessel exhibits the form of a huge serpent, black and scaly, rising out of the water from under the boat, his head as high as the deck, darting forward, his mouth open, vomiting smoke, and apparently carrying the boat on his back. From under the boat at its stern issues a stream of foaming water, dashing violently along. All the machinery is hid. Three small brass field-pieces mounted on wheel carriages stand on the deck.....Neither wind nor human hands are seen to help her and to the eye of ignorance the illusion is complete, that a monster of the deep carries her on his back smoking with fatigue, and lashing the waves with violent exertion. Her equipment is at once calculated to awe and to attract the savage. Objects pleasing and terrifying are at once before him--white men and an Indian shaking hands, the calumet of peace, the sword through the apparent monster with a painted vessel on his back, the sides gaping with port-holes and bristling with guns--taken altogether and without intelligence of her composition or design, it would require a daring savage to approach and accost her.



U.S. Western Engineer

Titian R. Peale: American Philosophical Society, Philadelphia

Major Long of the Corps of Engineers built the *Western Engineer* at Allegheny Arsenal and took it on its maiden voyage down the Allegheny to the Point on the evening of May 3, 1819. He had orders to spearhead an Army expedition up the Missouri River, explore the rivers and the West to the Rockies, and collect all information of value to the Army and to westward bound pioneers.

Major Long had explored the upper Mississippi River basin in 1816 and in 1818 had won approval for scientific exploration in advance of the Army moving up the Missouri and for construction of an experimental steamboat designed for shallow snag-strewn inland rivers to transport his scientific task group. He built his steamboat in the autumn of 1818, in the process inventing the cam-cutoff for more economical use of steam, placing the paddlewheel in housing at the stern to prevent damage by snags, and engineering a craft, 75 feet long and 13 feet wide, that drew merely 19 inches of water. Its shallow draft and cam-cutoff were significant marine engineering innovations, but its serpentine disguise and heavy armament engrossed public attention.

With the foremost scientists of the day, a small crew, and soldiers to serve the cannon, Major Long



Stephen H. Long, Colonel, Corps of Engineers

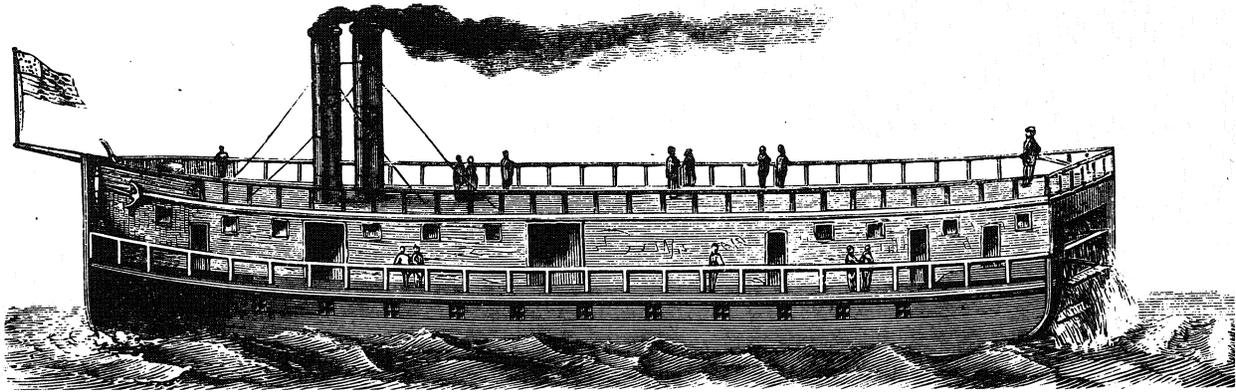
left Pittsburgh on May 5 in company with keelboats bearing the Sixth U.S. Infantry, stopping at Steubenville the first night out and saluting the ports of Wellsburg and Wheeling with cannon as he passed. As had Meriwether Lewis in 1803, Major Long used the trip down the Ohio to train members of his expedition, drilling his boatcrew and artillerymen, tinkering with the engine to obtain maximum power, and pausing along the river to investigate area geology, botany, zoology, and archaeology. He also prepared a report on the navigation and obstructions of the Ohio River, a report that was to bring him back to the river in 1824.

The *Western Engineer* missed being the first steamboat to navigate the Missouri by a few days, but, because of its shallow draft, ascended that muddy stream much farther than the first steamer, reaching the site of Council Bluffs, Iowa, from whence Major Long marched his exploration party across the Great Plains to the Rockies. On his return trip, he hoped to ascend the Ohio to Pittsburgh aboard the *Western Engineer* but found that even with a 19-inch draft it could get no farther upstream than the mouth of the Cumberland River because a depth of merely 15 inches was available over some bars.

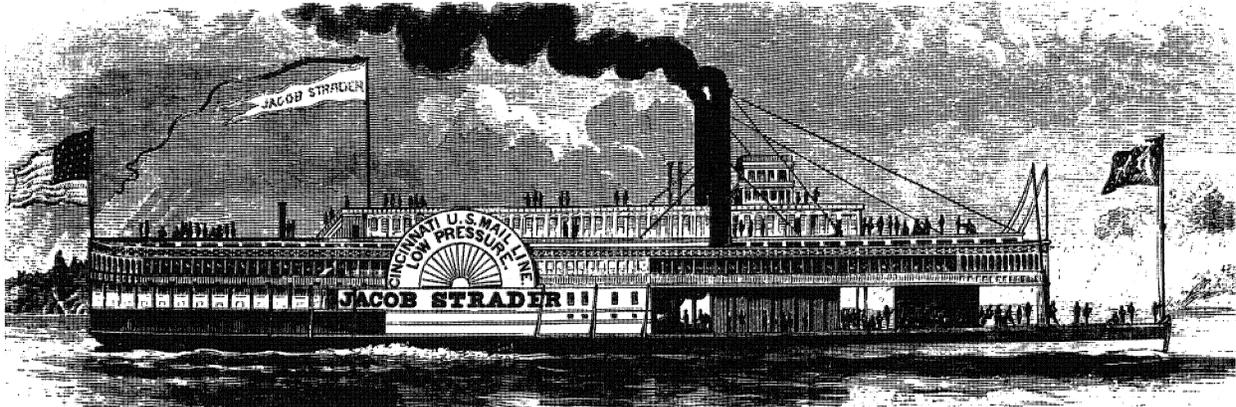
The Steamboat Boom "The improvement of our barges and steamboats insure within two years the total supply by the Mississippi and Ohio Rivers of many articles which are now wagoned from Baltimore and Philadelphia and our exports will be then commensurate with our imports," announced the editors of the *Brownsville Telegraph* in 1815. "Our flour, pork, tobacco, and whiskey will return in calicoes, hardware, coffee, cotton, sugar, bartered for at New Orleans. There was never such a prospect for improvement and trade at one time on any portion of the globe as that which is now exhibited to western America."

With the defeat of the Fulton monopoly, steamboat construction became the major industry in the headwaters district, and by the end of 1819 seventy-five steamboats employing 2,500 hands were plying the inland rivers. Nearly six thousand steamers, aggregating more than a million tons, were built on the inland rivers between 1820 and 1880, an average of a hundred boats measuring 18,000 tons annually, and the headwaters district produced at least 32% of all steamboats ever built. And the business of building the floating gingerbread palaces stimulated secondary industries: machine shops, boiler works, foundries, and sawmills worked to capacity to supply materials to the boatyards. By 1850, steamboat tonnage on inland rivers surpassed the steamboat and steamship tonnage, foreign and domestic, of the rest of the world.

Timothy Flint descended the inland rivers in a flatboat in 1816 and ascended ten years later in a steamboat. "I found the Ohio, ten years before, with log-houses, and wooden benches," he said. "There were now brick houses, ornamented court-yards, trellis-wrought summer-houses, fruit-gardens, and within, carpets, side-boards, and sofas." By cutting travel time 50% or more and reducing transportation costs by as much as 80%, steamboats had a major role in the transformation of the Ohio River basin in a decade from a frontier dependent upon subsistence farming and flatboat marketing to a mature agricultural-commercial-industrial region bound to the national economic structure by a

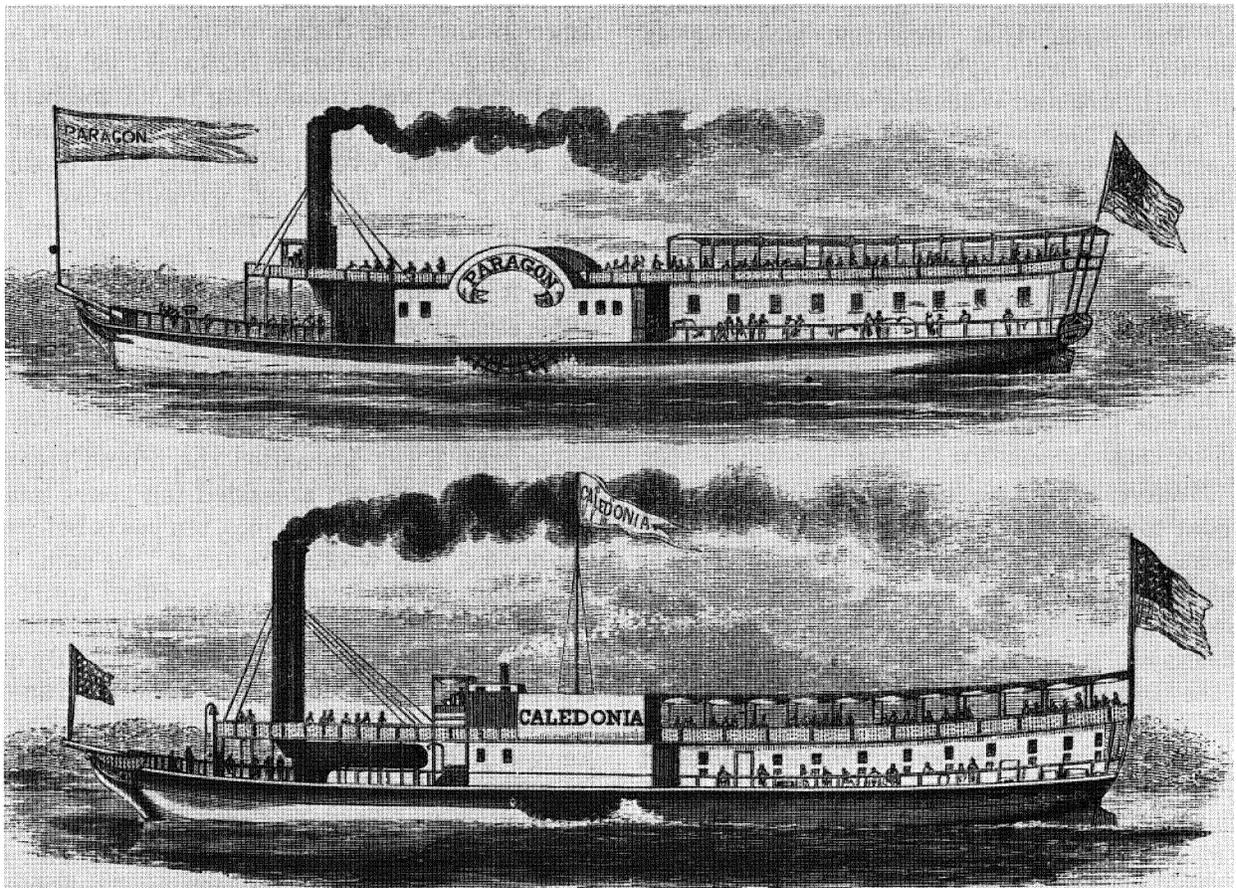


The General Pike



Early Steamers on the Ohio
1818, 1819, 1823

Up the Heights of Fame and
Fortune, by Frederick B. Read, 1873



steamboat chain. Surely the steamboat was the chief technological development of the early 19th century.

Origins of Inland River Projects "Nothing exhibits in so significant a manner the extent to which steam navigation is identified with the active genius of the people of the West, as the daily motion of the floating ark, known as the *steamboat of the West*," said Captain William Tell Poussin of the Corps of Engineers. Poussin was aide to Colonel Joseph Totten, Chief Engineer of the Army, and General Simon Bernard, former chief engineer to Napoleon, who in 1821 resumed the survey of the Ohio begun in 1819 by Magnus Murray and the joint state commission. Bernard and Poussin were French engineers who fled France at the recommendation of Lafayette after Waterloo to join the American Corps of Engineers. Poussin thought river steamboats somehow embodied the aggressive American spirit. "This is especially the case," he said, "when two steamboats coming in opposite directions are seen to pass each other. A stranger cannot witness this scene without a feeling of apprehension. But the cool and tranquil American, confiding in the skill of the helmsman, contemplates with interest and a species of vanity these two smoking points, which are scarcely in sight before they are far away in contrary directions. They indicate his genius and his power!"

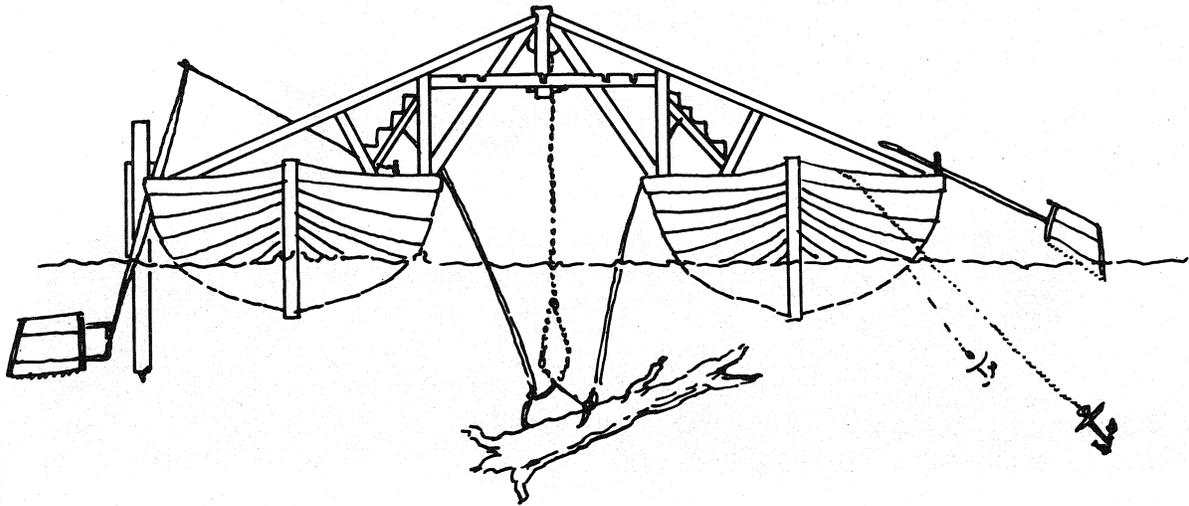
The Bernard-Totten survey of the Ohio and Mississippi in 1821 culminated several decades of increasing support for federal waterway projects. "No country is more capable of improvements in this way than our own," President Washington commented, and "none which will be more benefited by them." But the constitutionality of federal civil works was questioned, and the only navigation improvements made during the Washington and Adams administrations were minor harbor works and the installation of seacoast beacons and buoys. In 1806, President Jefferson approved federal construction of the National Road to the Ohio, and in 1807 Senator Thomas Worthington of Ohio introduced a resolution calling on the Secretary of

Treasury to plan nationwide transportation projects.

Secretary Albert Gallatin, of New Geneva on the Monongahela, in 1808 recommended a \$20 million federal investment in a canal and road system from Maine to Georgia and across the Appalachians to the Ohio River basin. He thought canals and roads should be built to link the Potomac with the Cheat River, the Juniata with the Allegheny, the James with the Kanawha, and the Savannah with the Tennessee. Gallatin was a financial wizard who not only balanced the federal budget, but also paid the national debt, leaving a surplus that he proposed to invest in civil works. Foreign conflict, the Embargo Act of 1808, and the War of 1812 intervened, however, eroding the budget surplus and distracting public attention from domestic needs.

The high cost of supplying armies on the frontiers and the difficulty of concentrating troops to meet British attacks on Washington, New Orleans, and other points during the War of 1812 focused public attention during postwar years on the defense values of improved transportation. General Simon Bernard, Colonel Joseph Totten, and Captain Jesse D. Elliott, a Navy engineer, assisted by Captain Poussin, began national defense planning in 1816 and reported it should rest on four pillars: a strong navy, a standing army and organized militia, a strategic chain of coastal and frontier forts, and improved transportation. Poussin commented: "While every improvement in the channels of communication has, as we have just shown, a direct relation to the national defense, it especially tends to develop the agricultural industry of the country...and to consolidate the internal peace of the citizens. Moreover, such improvements are fruitful sources of revenue."

After review of the Gallatin plan of 1808 and the report of the engineer board, Secretary of War John C. Calhoun in 1819 proposed extensive federal aid to transportation, recommending, among other projects, construction of canals linking the Potomac with the Monongahela River and the Ohio with Lake Erie and of waterway improvements on the Ohio



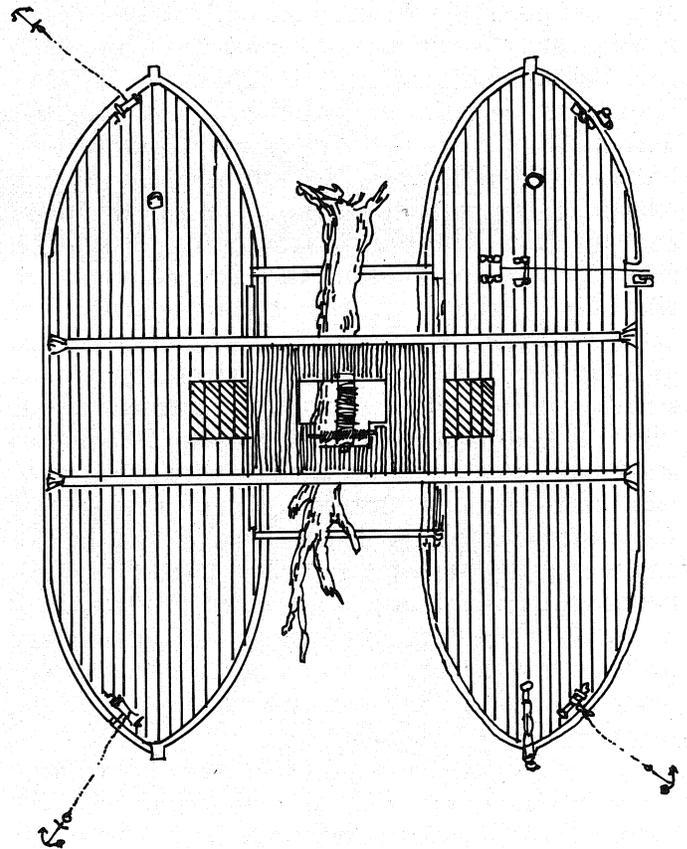
Experiments in snag removal

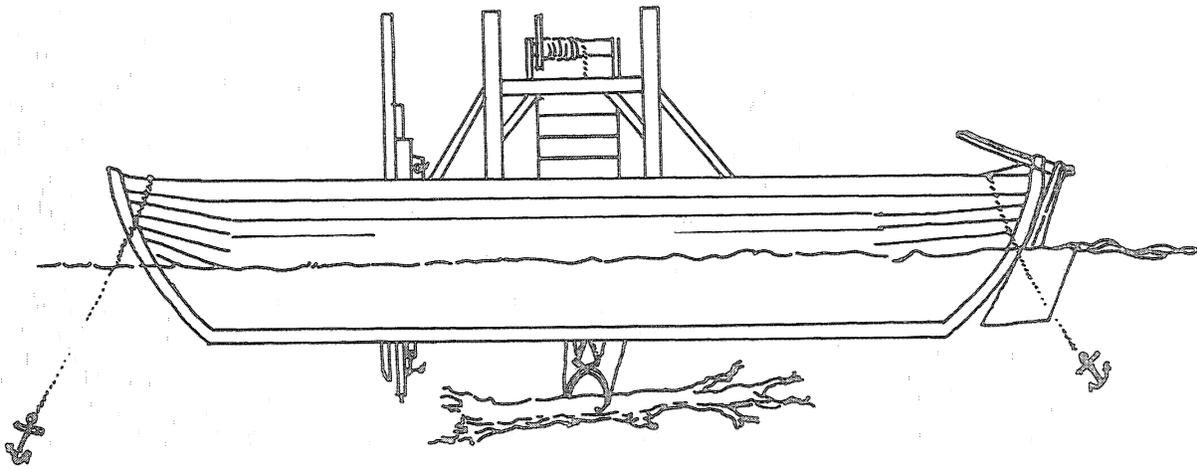
and Mississippi rivers. "It is in a state of war," Calhoun declared, "when a nation is compelled to put all of its resources in men, money, skill, and devotion to country into requisition, that its Government realizes in its security the beneficial effects from a people made prosperous and happy by a wise direction of its resources in peace."

Members of Congress from states bordering inland streams supported the Calhoun plan for internal improvements or civil works and won a preliminary victory on April 14, 1820, through enactment of an appropriation for continuing the survey of the Ohio begun in 1819 by the states. Bernard, Totten, and Poussin completed the survey in 1821 and 1822. They found river channels so obstructed that steamboats dared not run at night and shippers suffered heavy losses, and to reduce navigation risks they recommended development of machines to remove snags and hydraulic experiments with wing dams as a means of deepening channels.

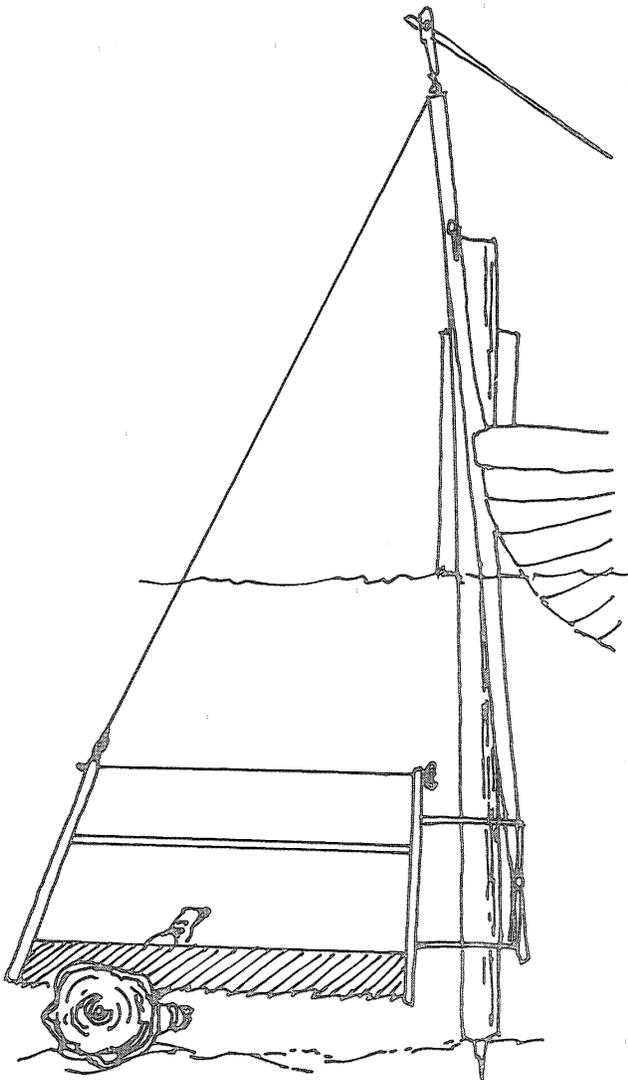
Proponents of federal civil works pushed the General Surveys Act through Congress on April 30, 1824. It assigned the Army Engineers to surveys and planning studies for transportation projects that might benefit national defense and commerce. General Bernard and Colonel Totten, assisted by Engineer officers and outstanding civil engineers such as John Sullivan, Dr. William Howard, and James Shriver, began the national survey program in 1824 by dispatching survey crews to Uniontown and Meadville, Pennsylvania, to locate the routes of the most important canal projects in the nation: canals between the Potomac and the Youghioghney and between the Ohio River and Lake Erie.

After enacting the General Surveys Act, Congress turned its attention to improvement of the trunkline of inland river commerce from Brownsville to New Orleans. Debates centered around three issues: whether the government had constitutional authori-





ty to improve waterways, what rivers should be improved, and how should the work be done. Congressman Alexander Smyth of Virginia suggested the issue of constitutionality be avoided by ordering the Navy to again build gunboats in the headwaters district and directing the gunboat crews to clear the rivers while on the way to New Orleans. Henry Clay contended clearance of inland streams bordering several states and the "common commercial highway of all," was clearly within federal powers; the issue, he argued, was not constitutionality but expediency, and his view prevailed. Clay and his friends reminded Congress that people of the Ohio River basin had on several occasions prior to 1803 considered separation from the Union to secure free navigation, that in 1794 western Pennsylvania had actually revolted against the central government, and warned that river projects would be undertaken by a regional compact of the states, if not by Congress, and such a confederacy, devoted to its special interest, might threaten national unity.

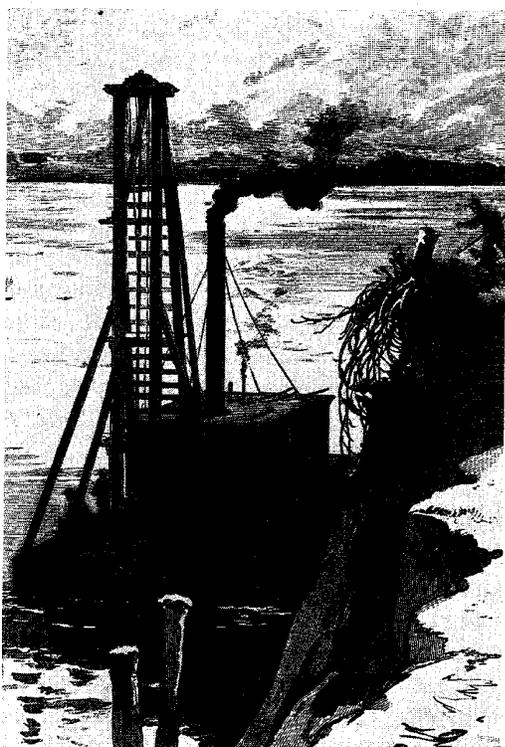


The original waterway bill called for removal of snags and construction of dams at bars to provide a minimum three-foot navigation depth from Brownsville to New Orleans. Henry Clay amended the bill to assign the project to the Army Engineers and leave specific engineering details to them. Andrew Stewart of Uniontown fought hard for work on the Monongahela below Brownsville, but lost, apparently because the river flowed within a single state below Brownsville and because he had opposition from within his delegation, notably from James Buchanan (U.S. President, 1857-61).

As enacted on May 24, 1824, the bill deleted improvement of the Monongahela and added work on the Mississippi from the mouth of the Ohio to St. Louis as part of the approved project. Henry Clay commented the \$75,000 appropriation would be inadequate, but he felt sure more appropriations would be made. The bill, he said, set the precedent for treatment of the inland rivers "as our SEAS--as

our Atlantic ocean and Mexican gulf, and as such are considered as entitled to special care and attention.”

The Wing Dam Experiment Major Long stood at the stern watching his men turn the windlass to pull the 500-pound ram to the top of the tower, then release it to plummet guillotine-fashion to the top of the pile, impacting with the sound of cannonshot. The Major had several piledrivers mounted on flatboats at work on the dam, and the constant concussion of the falling weights driving the piles ever deeper into the riverbed resembled a barrage from an artillery battery. The men turning the windlasses perspired freely in the summerheat and had stripped to their waists. Carpenters wading in the river to spike crossttimbers between the double row of piling were cooler, but had trouble keeping on their feet in the swift current rushing over the bar. The Ohio had been inching upwards for several days, and Major Long was rushing the end of the



Early pile driver

Carnegie Library of Pittsburgh

dam to a point where it might withstand winter floods and ice; tomorrow they would stop work and return upstream to harbor at Steubenville.

Stephen Long had arrived at Pittsburgh in the summer of 1824 with orders to build the first federal dam on the Ohio and perform the Corps' first experiments with fluvial hydraulics. He built flatboats, 37 feet long and 14 feet wide, to quarter his workmen and serve as platforms for piledrivers, and he employed Asa B. Shepherd, who had worked for the Pennsylvania commission that cleared the Ohio to Wheeling, as foreman; Shepherd thus became the first civilian employee of the Corps of Engineers on an inland river project. After the Major finished his preparations at Pittsburgh, he floated down the Ohio and put the piledrivers into operation, forming a wing dam at a compacted sand and gravel bar that had only fifteen inches of water over it during dry spells. His workmen cut trees to serve as piles, placed them at points indicated by the Major, and drove them into the riverbed in a row. Carpenters followed the piledrivers, spiking timber stringers between the piles to form a box-like framework that was filled with brush and stone. When high water interrupted work, Long harbored the first Engineer fleet on the inland rivers at Steubenville, then returned to the damsite in the summer of 1825 to finish the job.

The Major tried dams of differing lengths, widths, and heights until he had a 402-yard long structure that seemed to answer the purpose. The wing dam, unlike slackwater dams, did not close the channel. It extended from one bank toward the channel at about a 45° angle downstream with the purpose of concentrating river flow to erode the obstructive bar. (Wing dams were later renamed spur dikes to prevent confusion with slackwater dams.)

Long left Asa Shepherd to observe the effects of the first dam on the Ohio, and in 1826 Shepherd reported it had eroded the bar, establishing a four-foot channel without creating current velocities that

might hamper upstream navigation. Sand and gravel accumulated around the Long wing dam, making it nearly impervious, and it served navigation until 1872 when it was repaired and extended. Modified versions of the wing dam type structure devised by Major Long were still built by Army Engineers on a few inland rivers a century and a half later.

The Contest of 1824 "The Amazing Quantity of Goods, of all Descriptions, and Lives lost on these Rivers, is Frightful in the Extreme to the Human Heart," declared one inventor who entered the contest of 1824. "Could I cast in a Mite," he continued, "to Prevent this Wonderful Devastation, it would be a lasting Source of Consolation, and to the People of the United States an Unknown Saving." He had entered a contest begun in 1824 by General Alexander Macomb, Chief Engineer of the Army, who had orders to "promptly" remove all snags from the Ohio and Mississippi rivers. General Macomb offered a \$1,000 prize for the best snagging device.

"Snag," in the parlance of rivermen, was a timber obstruction to navigation. Snags were commonly classed as planters or sawyers. A riverman explained: "A *Planter* is a tree rooted fast to the bottom of the river, & rotted off level with the water; a heavy boat striking one of them may be staved and sunk. *Sawyers* are trees less firmly rooted; they rise and fall with the water; if they point up the stream, they are dangerous, but not so much when they point down." An estimated 50,000 water-soaked snags, some more than a hundred feet long and weighing many tons, were deeply embedded in the Ohio and Mississippi, indeed in nearly all inland rivers. They could be sawed or chopped off at low water, but stumps were more dangerous than the original snags because pilots could not see them. General Macomb wanted a powerful mechanism to extract snags entire.

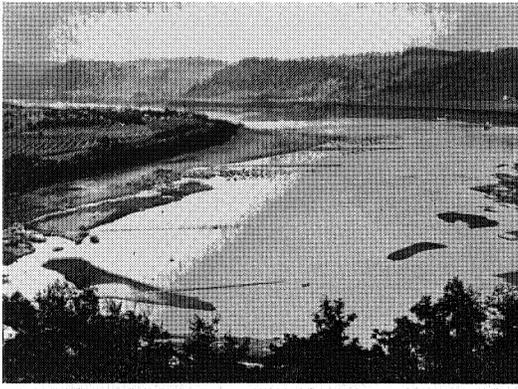
An avalanche of contest entries fell on General Macomb during the summer of 1824, coming from engineers, rivermen, mechanics, and well-meaning



General Alexander Macomb

crackpots. Scores of ingenious, promising, worthless, and weird snagging devices were submitted. One contestant proposed an "Impulse Boat," a flatboat loaded with stone and attached by long chain to a snag, which, when running with the current, would jerk snags from the bottom when it reached the end of the chain. Another suggested floating wooden dams propelled by the current with enough force to pull plows down the riverbed, excavating channels and cutting snags; such devices, the inventor suggested, could be regularly released at Pittsburgh and collected when they arrived at New Orleans. Devices for boring holes in snags, inserting gunpowder canisters, and blasting snags to splinters were common, as were subaqueous sawing machines. One unusual entry recommended that men in diving suits patrol the riverbottom from Pittsburgh to the Gulf and sever snags free with crosscut saws.

Most entries were inspired by twin-hull ferryflats propelled by horses walking in circles on deck and turning a capstan geared to paddlewheels. These entries proposed anchoring a ferryflat below a snag, attaching a chain from the capstan to the snag, then whipping the horses. Charles DeHass, engineer of Washington, Pennsylvania, asserted that horses would be "preferable to steam for they may be instantly checked if necessary."



Wing dams

General Macomb awarded the prize in early 1825 to John W. Bruce, flatboat and steamboat captain from Kentucky, for a twin-hull ferryflat with windlass and lever mounted on timbers between the hulls that Bruce called a "machine-boat." The machine-boat was positioned above a snag, and an iron claw, hanging from the short end of a lever, was hooked to the snag. Four stout men turned a windlass attached by rope to the long end of the lever, pulling it down and obtaining sufficient leverage to break snags from their mooring and raise them for sawing into disposable chunks. The machine-boat may not have been the most effective snagging device submitted, but Bruce had been awarded a contract for clearing the Ohio and Mississippi rivers of snags and had made his bid contingent on use of his own equipment.

The Contract of 1824 John Bruce had served in the Kentucky legislature and was an ardent campaigner for presidential candidate Henry Clay, author of the 1824 waterway act; Clay told the Secretary of War he was confident Bruce could successfully clear the rivers of snags. General Macomb received about a dozen bids for the snag-removal project, and most resembled the \$175 per river mile bid of C. S. Reno of Pittsburgh; Bruce, however, made a lump sum bid about \$140,000 less than the bid of his nearest competitor, Samuel McKee. The Secretary of War was astonished by the low bid, but since Bruce was highly recommended by many congressmen for his integrity and appeared to have a workable snagging machine, he instructed General Macomb to award the contract to Bruce. The contract provided that for \$60,000 Bruce would remove all snags impeding navigation on the Ohio-Mississippi waterway in accordance with the 1824 act, would complete the job by January 1, 1827, and submit to inspection by an Engineer officer.

As project inspector, General Macomb selected Major Samuel Babcock, a distinguished veteran of the War of 1812. Babcock arrived in Pittsburgh in November 1824 and found Bruce building machine-boats and collecting workmen. Since Bruce would

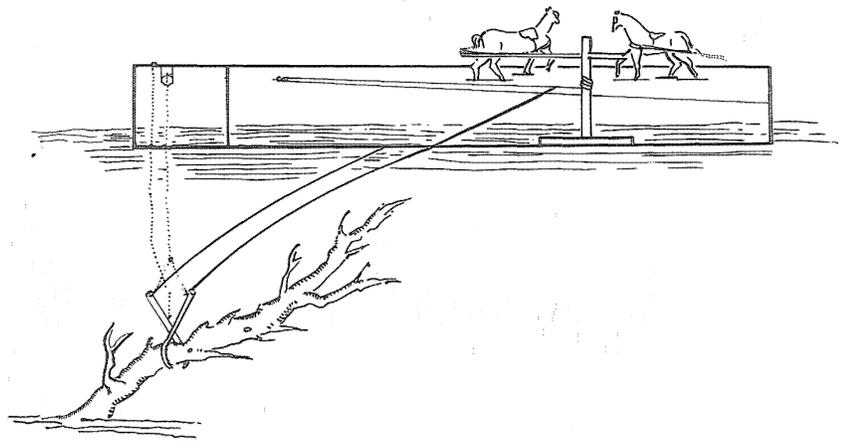
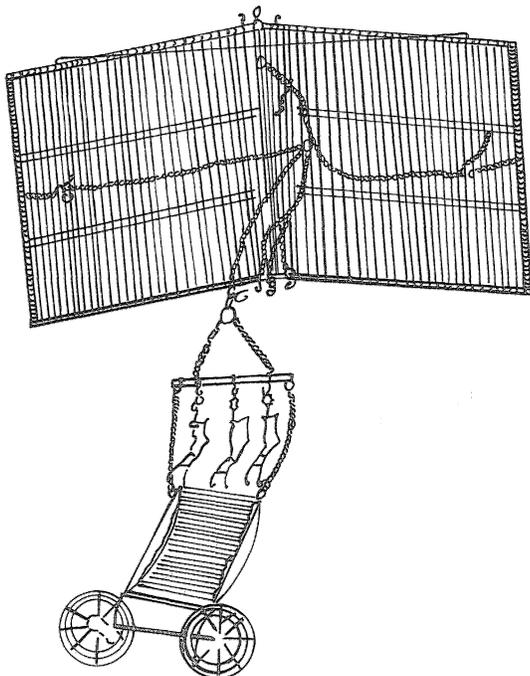
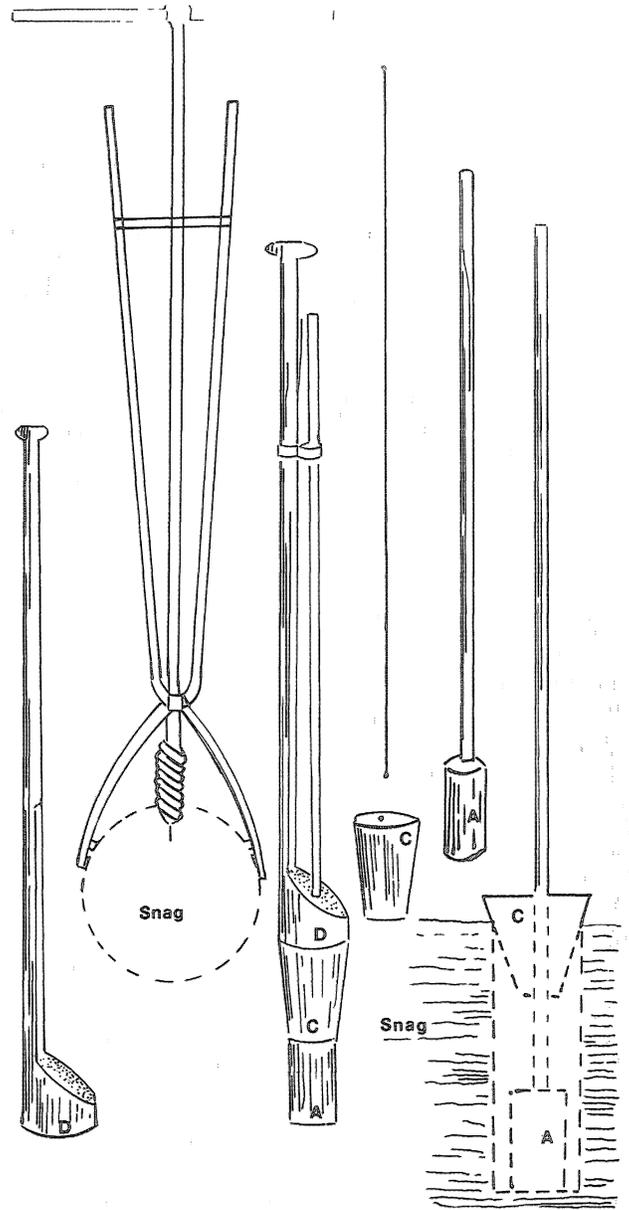
not begin work until low water in June 1825, Babcock requested leave until that date, but General Macomb ordered him to stay on the job, explaining: "Western people look with great anxiety towards the accomplishment of the contract, and the Department feels great solicitude that nothing shall be wanted on its part towards carrying into effect the magnificent designs of Congress in this instance."

Bruce assembled a floating plant of eight skiffs and four machine-boats, employed thirty-two men to operate the machine-boats and others to use hand tools, and left the Pittsburgh Point on June 30, 1825, with eighteen months contract time remaining. Major Babcock drifted along behind the workboats in a bateau to inspect the snagging as it progressed downstream. Because Pennsylvania had cleared the upper river section in 1824, Bruce reached Wheeling in eleven days and was paid \$1,000 for the work, which he used to begin construction of machine-boats at St. Louis. Work temporarily stopped at Maysville, Kentucky, in September, when Bruce's workmen celebrated, overindulged, and were arrested, but amicable settlement was arranged and work resumed.

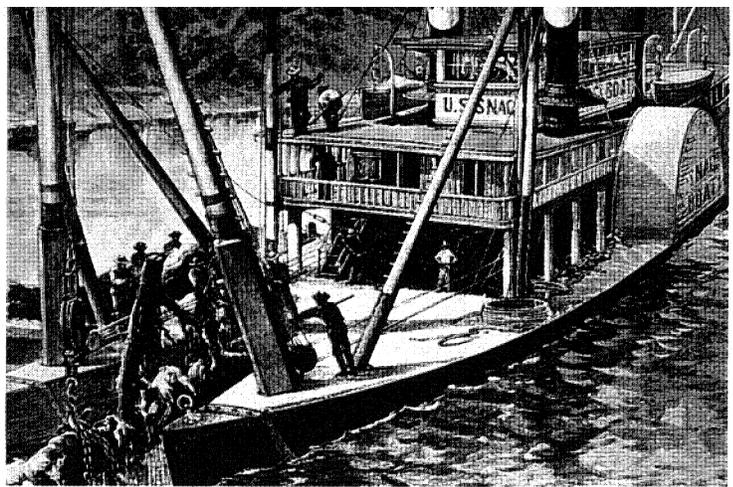
Major Babcock became concerned because Bruce was clearing only the low-water channel and requested instructions from the Chief Engineer. General Macomb replied: "It appears to me impossible to make the 1st Article of that contract, which embraces the points in question, more clear by any attempt at explanation which would be merely a repetition of the language in which that article is couched. I must again refer you to the contract which admits of but one interpretation." The contract, nevertheless, was subject to two interpretations: the government's and the contractor's. One phrase required removal of all snags that impeded navigation; another required the work be done in accordance with provisions of the Act of 1824. Bruce doubtless presented Babcock with copies of the Act of 1824 and the advertisement for contract bids, both of which called for snag removal from the channel at the lowest stage of water, for Babcock accepted the contractor's interpretation.

By November 1825, rivermen were describing the work of Bruce and Babcock with their most pungent adjectives. In letters to Congress and the Chief Engineer, they asserted only the low-water channel was being cleared and that not very well, and they urged removal of Babcock, "one who knows nothing of the rivers Ohio and Mississippi, who has never navigated them, who knows not on which side the channel is." They pointed out that more snags impeded navigation at high water than at low, that they commonly used different channels at high water, and that they opposed the Bruce contract because contractors "consult their own interest, rather than the public good, which, in the present instance, they do not hesitate to say has been the case."

Senator William H. Harrison and the Ohio congressional delegation formally protested to the Chief Engineer, and General Macomb launched an investigation, ordering Captain William H. Chase to catch the express stage to Pittsburgh and proceed down the Ohio. The contract called for clearing the entire river and made no allusion to the channel of the river, General Macomb told Captain Chase, and



Contest of 1824
Some of the losing entries



Twin-hulled snagboat
The winning entry
looked like this

The Military Engineer, July-August 1973

he added: "I can hardly believe Major Babcock or Mr. Bruce could have construed the contract in the manner imputed to them; and particularly the latter, who was present when it was formed, and who, in the course of frequent discussions respecting it, became thoroughly informed of the intention of the Government." Chase arrived at Pittsburgh on November 26, 1825, purchased a skiff and hastily embarked, examining the Ohio as far as Louisville. He reported the river "exhibited the greatest neglect on the part of the contractor, Mr. Bruce, in the execution of his contract." General Macomb immediately suspended the Bruce contract, issued orders for the arrest of Major Babcock, and directed Stephen Long, then at Steubenville, to take over as project inspector.

A general court-martial at Cincinnati in June 1826 tried Major Babcock for disobedience of orders, neglect of duty, and falsifying official reports. Rivermen testified for the prosecution, as did Captain Chase and the pilot of Babcock's bateau. Notable witnesses for the defense were John Bruce and Samuel McKee. The court found Major Babcock guilty on all charges and sentenced him to dismissal from the service, but recommended clemency because of the project's novel character and the Major's distinguished service record. President John Quincy Adams, after review of the evidence, concluded that Babcock had not been qualified for the project, had performed his duties to the best of his abilities, and had erred chiefly in accepting Bruce's interpretation of the contract. He therefore remitted the sentence and ordered the Major retained in the service.

Because Major Long was needed for important canal and road surveys, General Macomb appointed Samuel McKee as snagging project inspector. McKee was a former Warhawk congressman from Kentucky and had been Bruce's chief competitor for the contract. Bruce resumed work in the summer of 1826, but progress slowed because McKee required clearance of the Ohio from bank to bank before approving payments. Bruce was again delayed in October by the death of McKee and during General

Macomb's search for a replacement whose appointment would satisfy rivermen. At the recommendation of Stephen Long and others, on December 10, 1826, General Macomb appointed Henry M. Shreve, the famed steamboat captain, as Superintendent of Western River Improvements.

The Chief Engineer told Captain Shreve the Bruce contract could be terminated and the penalty for nonfulfillment exacted on January 1, 1827, but he would not do it until Shreve completed an inspection. At the time, Bruce with eight machine-boats had reached the mouth of Green River on the Ohio, had five machine-boats under construction at St. Louis, and had 129 employees who were paid \$12.50 a month plus board. Shreve reported in early 1827 that Bruce had neither the means nor the ability to complete the job satisfactorily, and the Chief Engineer forfeited the contract on April 9, 1827, directing Captain Shreve to employ workers and personally supervise continued snag removal.

John Bruce had been paid \$18,563.93 for work completed and had received the \$1,000 prize of the contest of 1824. He hired attorneys and asked Congress to reimburse his losses, basing his case not on the wording of the contract but on the failure of the Corps to furnish adequate supervision. Congress awarded Bruce \$6,240.63 in 1834, but rejected claims for additional compensation. The Bruce case continued in the courts for forty years, until the United States Court of Claims in 1865 decided: "There is not, apart from the contract and the act of Congress upon which it is founded, one scintilla of legal evidence in this record that can in any way support this claim."

A House committee that investigated the contract of 1824 debacle concluded:

The undertaking was new. Persons possessing the requisite practical knowledge of the navigation and the obstructions to the same, of those rivers, could not be, or were not employed at the commencement of the work. The difficulty of removing obstructions which were

THE CONTRACT OF 1824

[Doc. No. 14.] [Doc. No. 14.]

Articles of Agreement between Major General Alexander Macomb and John Bruce, October 12, 1824.

Articles of Agreement, made and concluded the 12th day of October, in the year of our Lord one thousand eight hundred and twenty-four, by and between Alexander Macomb, Major General and Chief Engineer in the Army of the United States, on behalf of the Department of War, of the first part, and John Bruce, of Vanceburg, Lewis County, Kentucky, of the second part, to wit:

Article the first. It is hereby agreed, by and between the parties aforesaid, that the said party of the second part for, and in consideration of the sum of sixty thousand dollars, to be paid him by the said party of the first part, in the manner hereinafter stated, hath covenanted and agreed, and by these presents doth covenant and agree, to improve the navigation of that portion of the River Mississippi, extending from the mouth of the River Missouri to New Orleans; and of the whole extent of the River Ohio, from Pittsburg to its junction with the Mississippi river; according to the provisions of the act of Congress of the twenty-fourth of May, one thousand eight hundred and twenty-four, by removing all trees, limbs, and roots of trees, and logs, commonly called planters, sawyers, and snags, that may be found in those rivers, respectively, which impede the navigation of the same, by extracting them from their positions, or cutting them off at the bottom of the river, or at least ten feet below extreme low water mark; and disposing of them in such manner upon the shore, or otherwise, as will effectually prevent their becoming afterwards injurious to their navigation.

Article the second. It is further agreed, by and between the parties aforesaid, that the said party of the second part, shall complete the abovementioned improvement of the navigation of the Rivers Mississippi and Ohio, on or before the first day of January, in the year of our Lord one thousand eight hundred and twenty-seven. The whole to be done under the inspection, and to the satisfaction of an officer of the Corps of Engineers, or some other person, to be appointed by the Department of War to inspect the same.

Article the third. It is further agreed, by and between the parties aforesaid, that no advance of money shall be made by the party of the first part, on account of work to be performed under this agreement; but, that the sum stipulated to be paid, shall be paid, in proportion as the work advances; and, on the inspection and certificate of the officer of the Corps of Engineers, or person designated for that purpose, setting forth the extent of work done, and that it is completed in conformity to the stipulations of the first article of this Agreement, and, also, certifying the value of the same, in his opinion, compared with the entire amount which the party of the second part is to receive on the completion of the work: Provided always, that the said party of the second part, shall have no right to claim the inspection and certificate, aforesaid, to entitle him to receive payment for a less value than one thousand dollars, to be estimated, as above, by the officer or person designated to inspect the work in its progress.

fastened in the bed of the river, 20, 30, and 40 feet below the surface of the water, was not easily to be overcome. The agency of some machinery, not before in use, for the improvement of our water courses, was deemed indispensable. Much of the time, and a great portion of the money was expended in the necessary experiments and preparation to commence the work.

The Lessons of 1824 While the contest and contract of 1824 were unproductive of the goals set by the first appropriation for inland rivers, Congress and the Corps of Engineers learned lessons that had nationwide application. The tools and machinery necessary to improve waterways could only be developed by men with intimate knowledge of the special problems of river navigation and extensive on-the-job experience. There were no "prompt"

Article the fourth. It is lastly agreed, by and between the parties aforesaid, that the said party of the second part shall furnish, as security for his faithful performance of this Agreement, a penal bond for the sum of sixty thousand dollars, to be approved by the Secretary of War.

In testimony whereof, we have hereunto, interchangeably, set our hands and seals, at the dates hereinafter specified by the witnesses thereto.

ALEXANDER MACOMB, Maj. Gen. [Seal.]
JOHN BRUCE, [Seal.]

Copy of bond given by John Bruce and others to the United States.

Know all men by these presents, that we, John Bruce, of Lewis County, in the state of Kentucky, Henry Halbert, William Jameson, Burton Palmer, James Palmer, John Boyle, Robert Boyle, Henry Terrell, are held and firmly bound unto the United States of America, in the just and lawful sum of sixty thousand dollars, for the payment whereof, well and truly to be made, we bind ourselves and each...of our heirs, administrators, executors, and assigns, jointly and severally, firmly, by these presents: Sealed with our seals, and dated this 12th day of October, in the year of our Lord one thousand eight hundred and twenty-four.

Whereas, on the 12th day of October, 1824, an agreement was made and concluded, by Major General Alexander Macomb, on the part of the War Department of the United States, and John Bruce aforesaid, for the improvement of the navigation of the Mississippi and Ohio Rivers, as by reference to said agreement will more fully and at large appear: now the condition of this obligation is such, that, if the said John Bruce shall well and faithfully execute his part of the said contract, or cause the same thus to be executed, then this obligation to be void; otherwise, to remain in full force and virtue in law.

John W. Dyal, witness to the signature of John Bruce & Henry Halbert.	JOHN BRUCE, HENRY HALBERT, WM. JAMESON, BURTON PALMER,
James Morris, witness to the signature of Burton Palmer.	JAMES PALMER, JOHN BOYLE, ROBERT BAYLE,
Laura Boyle, witness to the signature of James Palmer & John Boyle. Alexander Boyle, Jun. witness to the signature of Henry Terrell.	HENRY TERRELL.

methods to establish safe and reliable channels; new snags and bars were formed by every flood and river projects would perforce be continuing efforts. Work on rivers was so variable that the Engineers would have to develop firm contract specifications and standard evaluation procedures before performing such work by contract could be successful.

These lessons were reflected in the "Rivers and Harbors" Act of March 3, 1827, first of a series of annual appropriations, that directed removal of obstructions of every description that endangered navigation at any river stage and that required a "practical agent" with long experience on inland rivers be placed in charge of the project. Under the capable direction of that "practical agent," Captain Henry M. Shreve, the snagging project on the Ohio and Mississippi rivers resumed in 1827 and was expanded to include several tributary streams.