Chapter 5

THE THIRTY INCH PROJECT

Peals of laughter greeted the ungainly vessel as it wallowed down the Ohio like two fat ducks on a pond. Rivermen, after their anger about the Bruce contract debacle had subsided, had been amused by Captain Henry Shreve's efforts to jerk huge trees from the river with the ridiculous machine-boats. Even when a machine-boat managed to pull a snag, the current swept it and the snag away downstream, with Shreve behind in a steamboat in hot pursuit. The weird double-hulled craft that Shreve called a snagboat resembled two roughly built steamers joined like siamese twins. With the ludicrous name *Heliopolis*, it was certainly a laughable sight, doubtless another government boondoggle. Still, Shreve was a man to respect.

After chopping and sawing and pulling his way down the Ohio and Mississippi to the mouth of White River, Shreve had abandoned the machine-boats; they would never work and, besides, it was costing about fourteen dollars for each snag removed. Shreve recalled that steamboats hitting snags at full speed sometimes knocked them over and out of the way, if the boat hull were not punctured; perhaps a steamboat specially built for the purpose could do the job. While his workmen hacked away at snags, he spent time in his boat cabin, drawing up plans, building models, and tinkering until he had what seemed a workable snagging machine.

Captain Henry Shreve and his snagboat

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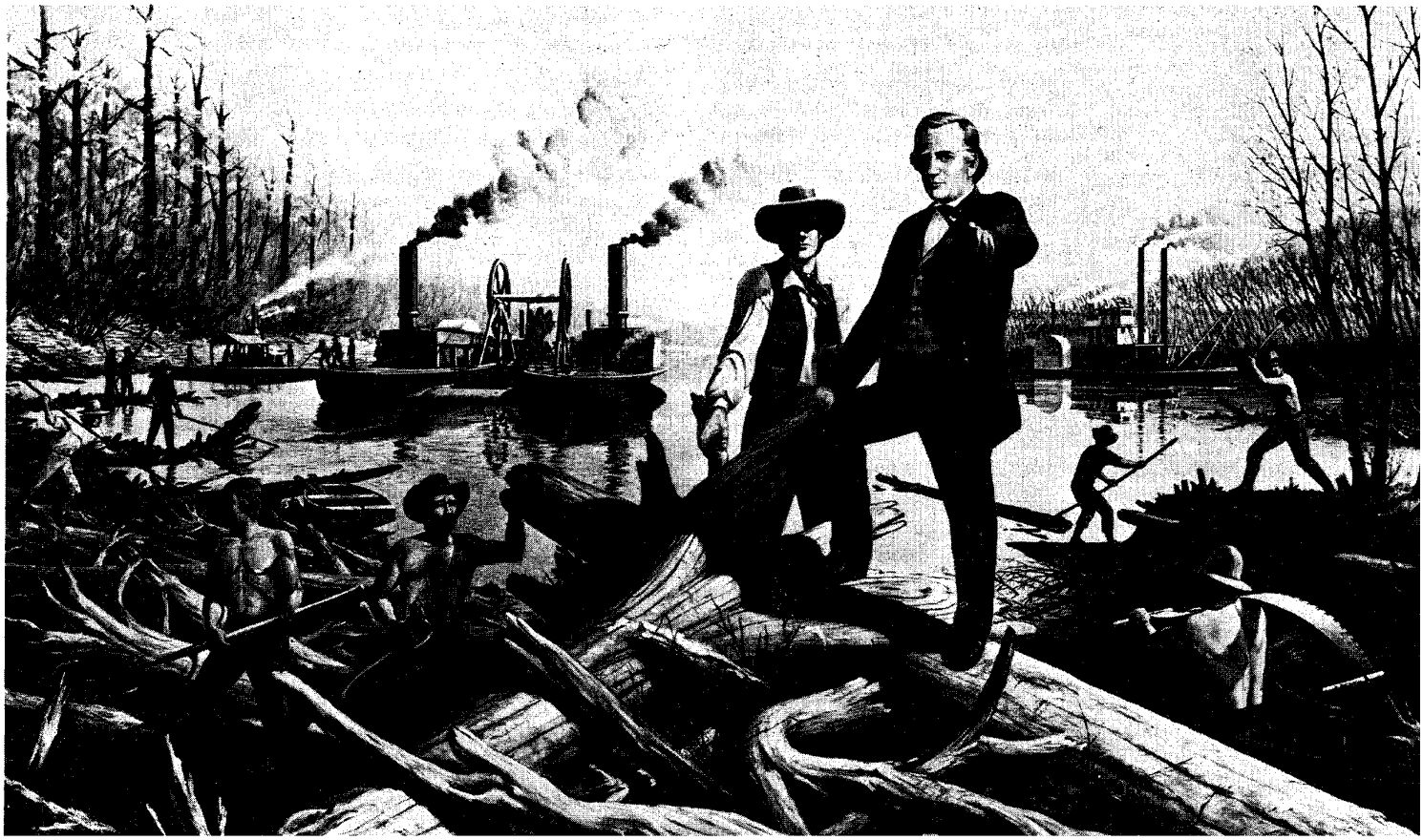
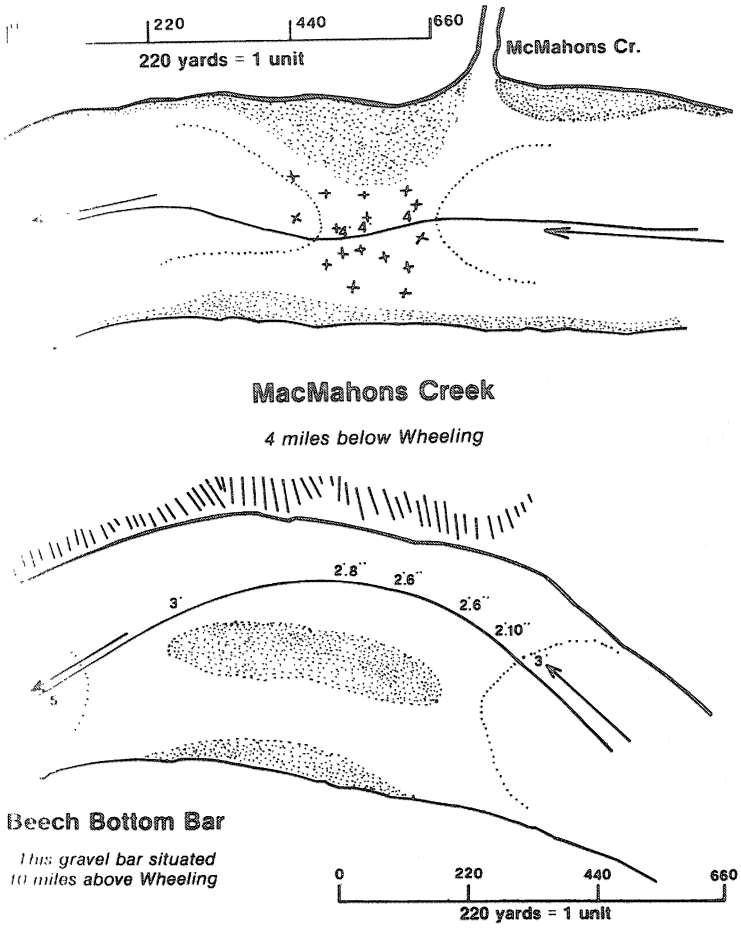




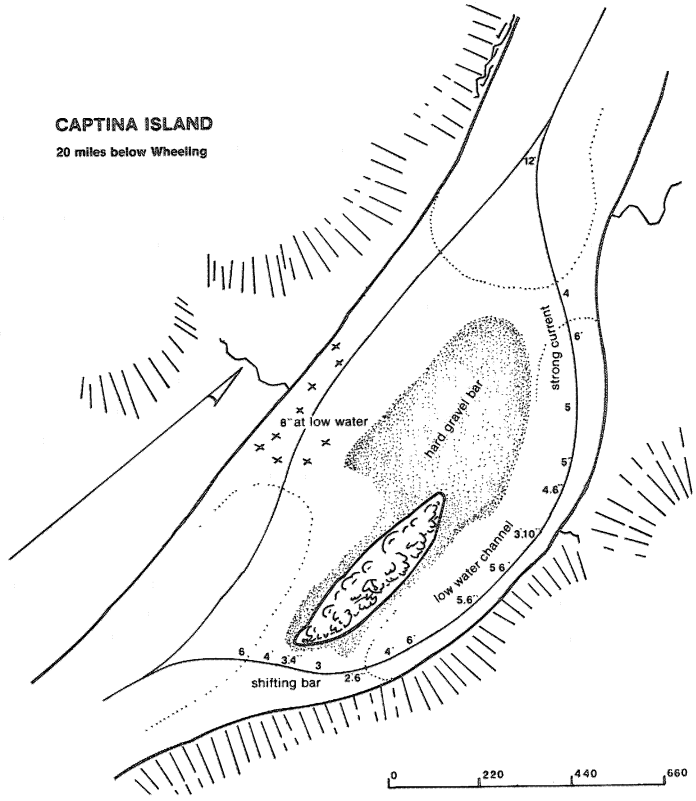
Sections of Lt. George Dutton's 1835 map of the Ohio
(Prepared from material furnished by National Archives)

Shreve sent his plans to the Office of the Chief Engineer (OCE) in 1828 and requested funds to build an experimental prototype. With memories of the Bruce disaster fresh in mind, the Chief Engineer was reluctant to invest money in another untried experiment that might heap more coals on the Corps; yet, the clamor for action in Washington was terrific. He gave Shreve approval for building the prototype, but warned that both Congress and the people of the Ohio and Mississippi valleys demanded quick results.

Shreve's snagboat was actually two steamboats with hulls 100 feet long and 12 feet wide, spaced 10 feet apart and joined by heavy timbers. Between the two hulls at the waterline near the bow was a timber bulkhead covered with sheet iron that Shreve called the "snag-beam." The prototype *Heliopolis*, named after the home of ancient Greek engineers, cost $26,424.71 and was launched at the Falls of the Ohio on April 28, 1829. Shreve planned to run it at full steam with the current and smash head on into snags. Either it worked, or the government lost $26,000 and he lost his job.

Rivermen anchored their boats near the test site to watch the fun; most expected failure. They saw clouds of smoke fogging from the chimneys of the twinboat, as Shreve, a notorious man to swear, gave the men stoking the furnaces vigorous verbal encouragement, and saw the weird vessel gain speed and bear down on a monster snag. Shreve deftly aimed his boat to strike the snag with the beam between the two hulls, then rammed at top speed. The crash of impact boomed across the river, the *Heliopolis* shuddered perceptibly, the snag waved for a second and toppled with splintering crunch into the water. Kibitzers on nearby boats and the crew of the *Heliopolis* cheered, while Shreve backed off and men on the bows put down chains from the windlass to catch the snag and raise it for sawing into harmless chunks.

After eleven hours work, the *Heliopolis* had cleared several miles of river and Shreve dispatched the triumphant message to the Chief Engineer that his snagboat had exceeded the "most sanguine expectations." An inspecting Engineer officer confirmed the report, commenting that "no machine can surpass it in its adaptation to the work in the execution of which it is now engaged." One riverman declared the boat extracted snags as fast as a debt-



Opposite page: Sketch of dams at Brown's Island - river mile 61

ridden dentist pulled teeth, and so it and its successors became "Uncle Sam's Toothpullers" to rivermen.

The *Heliopolis* so impressed rivermen and engineers that the Chief Engineer approved construction of a second "toothpuller," the *Archimedes* completed in 1830. With these, Shreve roamed the inland rivers knocking snags from channels. Because the snagboats had too much draft for convenient operation on the upper Ohio, Shreve employed William Courtney, one of the Pennsylvania commissioners who had cleared the Ohio to Wheeling in 1824, to recruit workers at Pittsburgh and remove snags from the Ohio missed by John Bruce or newly deposited. By 1832 Shreve had the Ohio and Mississippi fairly clear of snags, and in that year he heard of no boats of any kind that sank as a result of hitting these obstacles. Snags had caused about three-fifths of all sinkings before 1824, and perhaps the best index to the value of Shreve's work was that marine insurance rates for vessels plying the inland rivers dropped as much as 75% between 1827 and 1834.

Shreve had indomitable energy, but his experience as river captain had ill-prepared him for the paper work and strict accounting required at Corps of Engineers projects. He was, in addition, constantly traveling between work parties and snagboats scattered from Pittsburgh to New Orleans. "If I was so situated as to be at one point with all my work under my eye & all my papers in an office, I could than comply with all the rules and regulations of the Engineer Department," Shreve complained, "but the work under my charge, is of an entirely different character, attended with more casualties and more complicated in its operations than perhaps any other work under the direction of the Department. I cannot carry on works on the Mississippi, Red, Arkansas, and the Ohio and do justice to all," he said, "and I therefore ask to be relieved from the Ohio, which differs so materially from that of the other rivers that it requires much more of my time than can be spared from the other rivers."

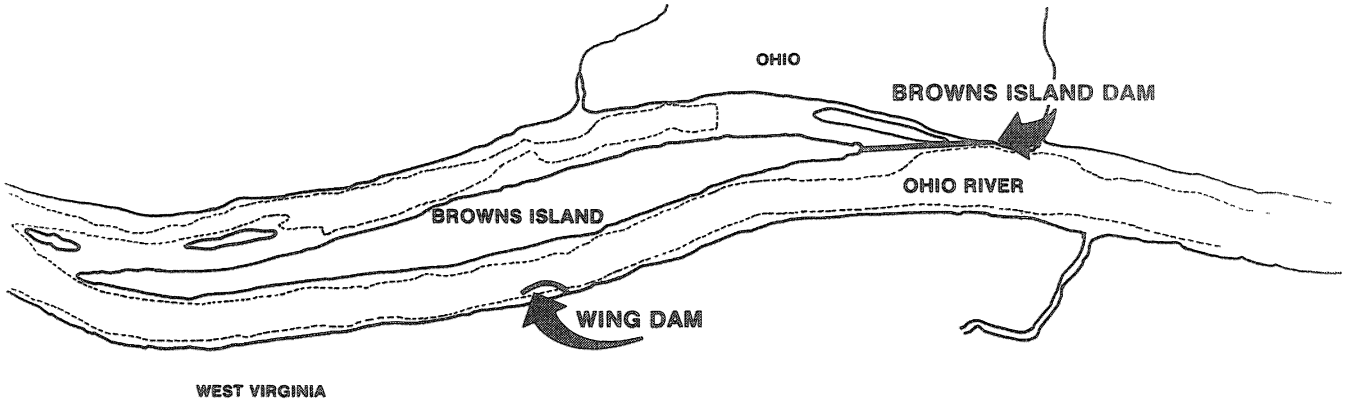
The Thirty Inch Project Lieutenant George Dutton of the Corps, with copies of the 1819 Ohio River survey supplied by Pennsylvania engineers, boarded a skiff at Pittsburgh in September 1835 and embarked down the Ohio to update the maps and plan a separate project for the Ohio from Pittsburgh to Louisville. He found the channel again littered with snags and rocks washed in by each flood, gravel bars with barely fifteen inches of water over them, and the condition of the upper Ohio not much different from what it had been in 1819.

On March 3, 1835, Congress appropriated $50,000 for work on the upper Ohio River and separated its improvement from the remainder of the inland rivers. At the request of Captain Shreve, the Chief Engineer placed Lieutenant Dutton in charge of the upper Ohio.

After his return to Pittsburgh, Dutton informed the Chief that only a slackwater lock and dam system would provide satisfactory depths on the Ohio, because its low-water flow was inadequate, but rivermen opposed locks and dams because they might delay traffic at high water stages. Since funds for the project were insufficient to complete a single lock and dam, much less canalize the stream from Pittsburgh to Louisville, Dutton proposed to clear the channel of rocks and snags, build wing dams to create scouring currents at bars, and build dams to close channels back of islands.

The Chief approved Dutton's plans and by the summer of 1836 Dutton had four machine-boats and crews at work on the river. The project had just gotten underway when Dutton was reassigned to construction of the National Road (now Highway 40) across Ohio from Wheeling through Zanesville, Columbus, and Springfield into Indiana; direction of the Ohio River project was assigned to Lieutenant John Sanders.

John Sanders, graduate of West Point in 1834, was short, stout, gregarious, and good humored despite the intense pain he suffered as victim of a disease later recognized as diabetes. His contem-



poraries thought him a mathematical genius, and he was indeed a remarkably original engineer: he invented a steam-powered piledriver and developed formulas for calculating bearings and resistance of piles; he invented a mechanical cement mixer and conducted some of the earliest studies of the strengths and properties of cements.

Sanders opened the Office of Ohio River Improvements in Pittsburgh in 1836, and he personally enjoyed life in the bustling little city to its fullest. He spent his leisure hours at the magnificent Homewood estate, then the city's social center, and demonstrated his intelligence by marrying the beautiful daughter of its owner, Congressman William Wilkins, the man who had supervised the first improvement of Ohio River navigation in 1819.

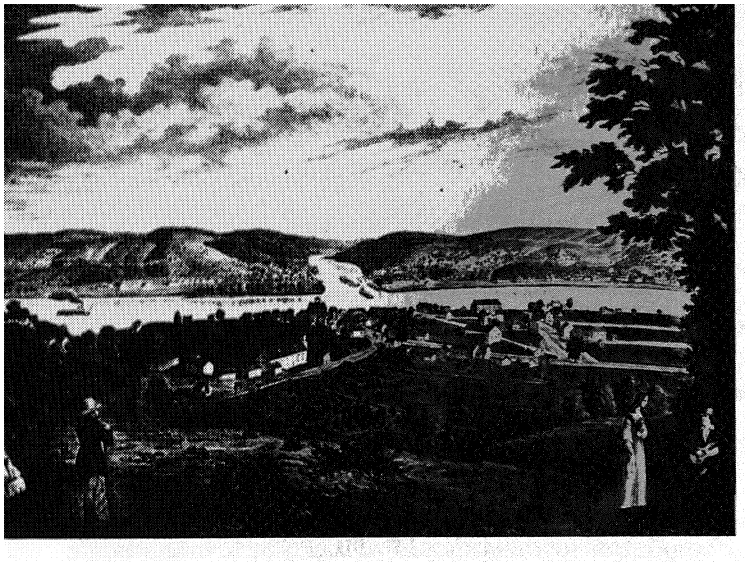
Charles A. Fuller and Allan Campbell headed the engineering and surveying section of the new Pittsburgh office. Campbell had learned his trade on the Erie Canal; he later built the first railroad in South America and served as chief of construction on the Union Pacific Railroad and as director of public works for New York City. Fuller, a classmate of Sanders at West Point, had resigned from the Army to become a civil engineer. He worked for the Corps on inland river projects until his death, except for four years as an Engineer officer in the Confederate Army. Sanders hired steamboat captains James McKinney and Benjamin Crooks to direct snagging operations and Henry McCarty, a Pittsburgh mechanic and inventor, to supervise dam construction.

Sanders contracted with Samuel Walker and C. & I. Boyle of Elizabeth, Pennsylvania, for the floating plant needed by the Pittsburgh office. The twin-hull machine-boats, built for $650 each, were two flatboats, each 70 feet long and 10 feet wide with 40-inch gunnels, spaced 9 feet apart and joined by 12-inch timbers on which the machinery, wheels with 16-foot diameters and cast iron axles, was mounted. Workers were quartered in keelboats, 80 feet long and 15 feet wide, with blacksmith shops in their sterns. Sanders placed the fleet under command of James McKinney, chartered the steamboat *Ploughman* (sometimes *Plowman*) to tow the boats up and down the Ohio, and made Steubenville the headquarters for the fleet.

Working up and down river from Steubenville, the machine-boats and their crews removed rocks and wrecks from the channel, pulled snags and sawed them up, and blasted stumps and roots to bits. At high water, the workers cleared trees from banks and islands with hand tools.

Lieutenant Sanders realized the machine-boats could not handle the largest boulders and snags, so in 1836 he built a steam snagboat for the job, naming it the *Henry M. Shreve* after its inventor. The *Shreve* was smaller than the first toothpullers and, instead of twin hulls, had a single hull with a double bow. Sanders appointed John K. Dillingham, former captain of the *Archimedes*, to command of the *Shreve*, which began operation on August 1, 1837. During its first month, the *Shreve* cleared the upper Ohio of 2 wrecked boats, 4 driftpiles, 7 treetops, and 415 snags, many a hundred feet long with six-foot butt diameters, at a cost of $9.44 per obstruction.

"The articles of traffic and commerce transported on the Ohio river." Lieutenant Sanders reported in 1836, "consist of produce, lumber and coal, merchandise and manufactures. The three first articles, which are undoubtedly the greatest in tonnage, if not also in value, are wafted to market by the current in flatboats and rafts, and, therefore, are seldom shipped at low water when the current is too sluggish to carry them down. The merchandise and manufactures are generally freighted in steamboats, unless the water is too low; then in keel-boats. The steamboat is the only vessel which plies backwards and forwards between the several ports and carries passengers." Sanders recommended the Corps attempt to establish a channel 200 feet wide with minimum depth of thirty inches, to permit low-water navigation by 100-ton steamboats. A reliable thirty-inch channel, he thought, would result in reduction of river freight rates to 2/3 cent per ton mile and passenger fares to 1/6 cent per mile.



Ohio River at the mouth of Beaver River about 1840
Carnegie Library of Pittsburgh

Sanders planned to increase the low-water depth of the Ohio to thirty inches by building low stone riprap dams closing secondary channels behind islands and wing dams narrowing the channel to constrict flow and erode obstructive bars. He selected Brown's Island, seven miles upstream from Steubenville and the shoalest point on the upper Ohio, as the site of the first Engineer dam built above Louisville. He designed a dam to close the chute on the Ohio side of the island and divert flow to the Virginia side, which was the chute used by steamboats at low water. He also planned a wing dam on the Virginia side to narrow the chute to a width of 385 feet and to increase flow across the gravel bar.

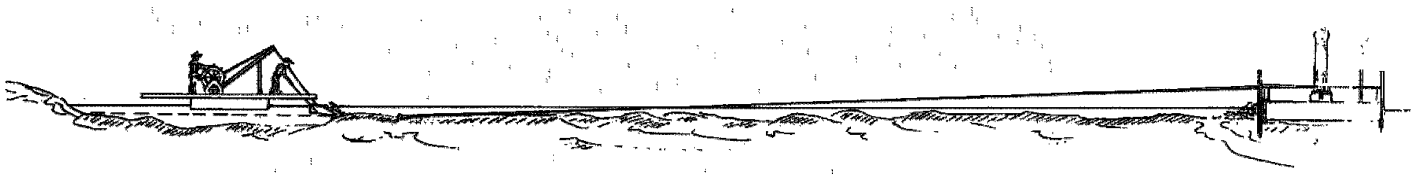
Henry McCarty opened a stone quarry near Brown's Island in 1836 and soon learned that people in the vicinity opposed the project. They did not want the Ohio chute dammed because they loaded flatboats with flour at mills on Island Creek and floated them out of the creek and down the Ohio side of Brown's Island. They shipped 24,000 barrels of flour by that route in 1835 and they complained that damming the Ohio chute would ruin their business. They asked that the dam be relocated to the Virginia side of the island and they offered to supply labor, horses, plows, and scrapers to dredge the Ohio chute without charge to the government. Sanders explained to the flatboatmen that the dam would divert only low-water flow and would not interfere with high-water flatboat traffic, and he continued the project as first planned.

McCarty and forty laborers quarried stone, loaded it in scows, floated it to the site where Sanders had staked out the outlines of the dams, and pushed the stone into the river. When completed on September 24, 1838, the dam across the Ohio chute was 2,178 feet long, 11 feet high, with a base seven times its height. The wing dam running out from the Virginia bank and downstream in an arc was 2,246 feet long, 4 feet high on a 20-foot base, and contained 78,111 cubic feet of stone.

The dams increased low-water depths in the Virginia chute about twelve inches and were appreciated by steamboat captains who had often stranded in the chute before its improvement. Island Creek flatboatmen did not approve, however, and Sanders had to bring suit to prevent their breaching the dam across the Ohio chute. The dam across the Ohio chute was repaired in 1884 and a timbercrib superstructure was added. In 1907 it was again rebuilt with more stone, piling, and a concrete crown. The Brown's Island dam on the back channel is still in place.

Through construction of the Brown's Island dams, Sanders gained sufficient cost data and construction experience to permit preparation of firm contract specifications, and he arranged the building of more dams under contract. He asked in 1838 for funds to build dams at the head of Brunot Island, Neville Island, White's Ripple, Woolery's Trap, Deadman's Island, Raccoon Bar, Black's Island, Captina Island, Horsetail Ripple, and Beaver Shoals. Funds supplied were insufficient to begin all the projects, but were enough for a small start; in 1838 he began construction of dams at Woolery's Trap, 10 miles below Pittsburgh near Coraopolis, and at Captina Island, 108 miles below Pittsburgh near Powhatan Point.

Construction of riprap dams was supplemented by limited channel excavation, usually by blasting rocks and rock ledges out of the channel. The biggest job of this variety was at Beaver Shoals, just below the mouth of Beaver River, where Sanders blasted a 150-foot wide channel to a three-foot depth through a solid rock ledge. Workmen waded into the stream at low-water stages to drill holes in the rock. To drill the holes, some men held metal star drills upright and turned them between each blow from the power tools--sledgehammers. After holes were at the proper depth, the men inserted tin tubes containing powder charges and fuse, tamped clay around the charge, lit the fuse, and ran for cover from the shower of rock fragments. After the blast, they wad-



Sketch of McCarty dredge - across the channel

ed back into the river and shoveled the broken rock into small scows for removal. Sanders reported he excavated 250 cubic yards of rock at Beaver Shoals with 666 blasts, consuming 17 kegs of powder and 1600 feet of fuse.

The Survey of 1838 Lieutenant Sanders learned the survey of the Ohio made in 1819 by Magnus Murray was not sufficiently detailed for rational selection of damsites and channel excavation and that he needed high-detail maps showing channel depths, foundation conditions, stream gradient, and other data. He began his survey in 1838, a year of record low water in the headwaters district, when every tributary of the Monongahela except the Youghiogheny below Brownsville went dry at its mouth. Sanders descended the Ohio in a rowboat to Cincinnati in September and found no more than twelve-inches of water over many bars, and he reported to the Chief Engineer.

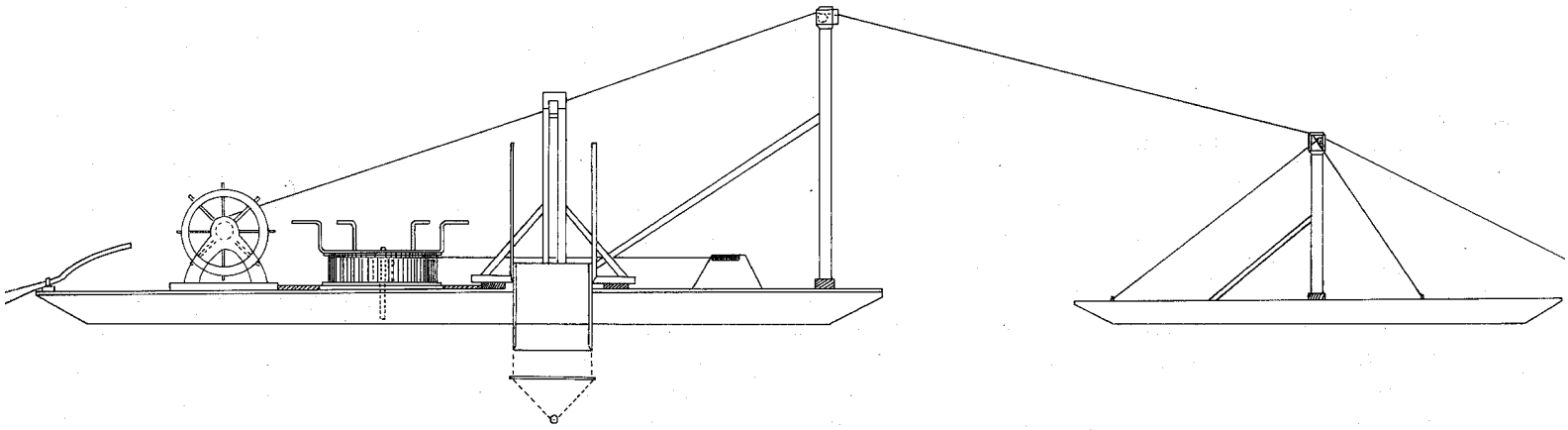
> *The inconvenience and loss arising from an interrupted navigation of the river has been felt throughout the Union. Large quantities of merchandise destined west, were detained for want of river transportation at Pittsburgh, Wheeling, and Portsmouth, and the produce of the country at the points where grown. Travellers had to resort to an expensive land transportation, or await the rising of the river. To give an idea of the length of the suspension of navigation, I will mention that steamboats stopped taking freight about the 20th of July, and the lightest draught stopped running on the 26th of August. On the 22d of October a few light-draught boats commenced running; on the 8th November steamboats recommenced freighting; so that steamboat navigation from this port was entirely suspended for fifty-seven days, and for three and a half months steamboats carried little or no freight.*

Sanders and Charles A. Fuller began at Pittsburgh and waded downstream, measuring depths and channel dimensions and noting foundation conditions, while survey parties ran levels along the banks to determine elevations and amount of stream slope. They mapped the upper 234 miles of the Ohio on a scale of 1000 feet to 1 inch, from Pittsburgh to Letart Falls, and their maps were so accurate that the Corps did not find resurvey necessary until 1895.

Sanders asked for an appropriation in 1839 of $312,000 to place all structures needed to secure a thirty-inch channel from Pittsburgh to Louisville under contract at once. "The magnitude and importance of the Ohio, as a national and commercial thoroughfare," said Sanders, "seems to justify the hope that adequate means will be furnished to perfect its navigation." But his request was fruitless, for in 1839 Congress and the Van Buren administration suspended funding for the thirty-inch project and all other waterway improvements.

Projects Suspended in 1839 "We are not aware of the causes which have induced the discontinuance of this valuable service," rivermen complained, "but we know that the consequences have been disastrous." Between 1836 and 1840, 41 steamers were built at Wheeling and 170, aggregating 24,016 tons, at Pittsburgh. From the first of 1838 to mid-1840, 3,650 steamboats and 62 keelboats landed at Pittsburgh; in the same period, 4,175 steamers and 11 keelboats landed at Wheeling. River traffic was burgeoning. But from 1839 to 1842, 136 steamers went to the bottom of the rivers, causing losses estimated at a million dollars a year.

General Andrew Jackson, President from 1829 to 1837, had marketed the produce of his Tennessee plantation by river since 1795, and he approved waterway projects. As an Army officer, he also understood the work of the Corps of Engineers. "In improving the navigation of our rivers, bays, and harbors, constructing roads, and, above all, erecting those important fortifications which are to constitute the frontier defence of this country, this corps forms an essential reliance," said Jackson. "Intelligent and skillful," he continued, "these branches of service have been confided to them, and



Sketch of McCarty dredge - side view

the fidelity of execution everywhere displayed is a manifestation of their worth and value to the country."

President Martin Van Buren, however, thought waterway projects unconstitutional and improvident. When a national economic depression began in 1837, Van Buren curtailed federal expenditures and stopped waterway projects. Captain Shreve "mothballed" his snagboat fleet at St. Louis, and Lieutenant Sanders moored the *Henry M. Shreve* and other floating plant at the warehouse of Captain James McKinney at Steubenville, where it was sold at great loss in 1840. Sanders had finished only the dams at Brown's Island, the Trap, and Captina Island when he was reassigned to New York harbor defenses in 1839; the other half-finished dams were abandoned and left to destruction.

Though rivermen complained loudly, no improvement of inland river navigation was approved from 1839 to 1842. Van Buren paid the price for national depression in 1849, and President John Tyler, who became President at the death of William H. Harrison in 1842, favored improvement of the Ohio and Mississippi. "The great importance of these subjects to the prosperity of the extensive region referred to, and the security of the whole country in time of war." Tyler said, "cannot escape observation." Congress enacted and Tyler signed a River and Harbor bill in 1842, and, after a three year hiatus, the Army Engineers resumed their work.

The Second Beginning, 1842 "This is embarrassing," wrote snagboat superintendent John W. Russell. "Captain Shreve, the former superintendent, has secured a court injunction against me." Captain Russell, known to rivermen as "Roaring Jack," was not easily embarrassed. A physical giant hardened by years of keelboating, he had once whipped pirate Jean Lafitte in a New Orleans brawl and had won a reputation as the bravest steamboat captain on the rivers. When one of his passengers was relieved of his wallet at Natchez, Russell ran a cable from his boat around a notorious pleasure house and towed the rickety frame building into the Mississippi, threatening to tow in the entire town. His passenger's wallet was promptly returned.

"Roaring Jack" was also an ardent Whig, and when the Whig administration of Harrison and Tyler fired Henry Shreve, a Democrat, in 1841, it chose Russell for the job. Russell was the perfect man, one newspaper editor said, to supervise the snagboats because he could "knock down six of the best men in his employment at any time."

"Roaring Jack" Russell
Sketch from portrait - Kentucky Historical Society

Shreve was disgruntled by his dismissal, and he embarrassed Russell in 1842 by securing an injunction against use of the "toothpullers," which he had patented in 1838. Shreve dropped court action, however, when Congress agreed to study his claim, and Captain Russell put the *Heliopolis* and *Archimedes* back on patrol in 1843; he also began building more snagboats, the *Hercules*, *Samson*, *Sevier*, *Gopher*, and *Dragon*. Shreve refused $40,000 compensation for use of his snagboat design, contending his invention had saved waterborne commerce millions. In 1881, thirty years after Shreve died, Congress awarded his estate $50,000.

To improve administration of river projects and perhaps also to reduce some of the political controversy in connection with the work, the Chief Engineer sent Colonel Stephen H. Long to Cincinnati in 1842 to open the Office of Western River Improvements in charge of all inland river projects. Colonel Long was to serve in a capacity similar to that of the modern 'Division Engineer," supervising and coordinating the work of subordinate, or "District Engineers." He also sent Captain George W. Hughes to Pittsburgh to examine the upper Ohio and ascertain the condition of the thirty-inch project after three years of neglect.

With a copy of the Sanders-Fuller survey in hand, Captain Hughes, steamboat pilot Nelson Crooks, and two oarsmen left Pittsburgh in a skiff on October 12, 1842. They found the channel again filled with snags and drift, the unfinished dams washed out, and the completed dams breached by vandals.

In his report, Captain Hughes commented that river navigation improvement was considered "the most difficult problem of solution in the whole science of civil engineering," and that the complexities of the problem in England had resulted in the construction of canals instead of river improvements, with rivers used merely as feeders for canals. French engineers, however, had devised methods of building locks and dams in rapid streams to form "une rivière canalizé."

Hughes thought canalization would best serve the needs of Ohio River navigation, but agreed with John Sanders that the costs of canalization would exceed available resources. He thought a minimum thirty-inch depth could be secured through an open-channel project at a cost of about $2 million, but warned that the job would require "*intimate* knowledge of the *habitudes* of the river." Colonel Long at Cincinnati concurred. Long said that open-channel work was the "only feasible and economical means of improvement that can be applied in this river with a fair prospect of beneficial results."

At the request of rivermen, and perhaps also because he was married to a Pittsburgh belle, the daughter of the Secretary of War, Captain John Sanders was sent to reopen the Pittsburgh office in April 1843. He reemployed Charles A. Fuller, recovered the tools and machinery stored at Steubenville, and built five crane boats, so called because instead of the wheel and axle used on the Bruce machine boats they had stiff-leg timber derricks on their bows to raise snags and rocks. He assigned each of the five boats and their crews to a specific hundred-mile section of river and made it their responsibility to keep that section clear of snags, wrecks, and boulders.

Sanders entered into 27 contracts for completion of old dams and construction of new. The contracts simply called for quarrying of stone and delivery in scows to damsites for placement as directed by an inspector appointed by Sanders. He estimated the costs of placing stone in the dams at 50¢ a ton, but bidding was highly competitive and he let the contracts at an average of 36¢ a ton. The contractors, however, later took legal action to recoup some of their losses; some took their complaints to Congress and occasionally won additional compensation through act of Congress.

Dredging channels through compacted sand and gravel bars was a major engineering problem. Horse and oxen teams pulling plows and scrapers could do the job, but only at lowest water stages. The Engineers had ladder dredges of the endless bucket-

chain type in use in 1843 at coastal harbors, but those had too great a draft for use on the upper Ohio except at flood time. Henry McCarty invented a dredge for the Ohio by mounting a steam engine on a boat anchored upstream of the bar to be channeled; the steam engine turned a drum winding a cable attached to a small boat holding a scraper, and pulled the scraper over the bar. At a cost of $1,500, Sanders built a McCarty scraper, the first crude dredge used by the Engineers on inland rivers, and put it to work at Brunot's Island on August 1, 1843. He reported it produced "most beneficial results," excavating in a single day fifty cubic yards of compacted gravel at a cost of 25¢ per cubic yard! And it even transported the spoil a hundred feet. The McCarty scraper worked so well that Sanders built four more for the upper Ohio project.

The Hazards of Snagging "This is the most eccentric and obnoxious branch of the public service," Colonel Long complained to the Chief Engineer, "and more resembles a military campaign than work. My men are dying from disease and are being killed and maimed for life as if they were engaging an enemy." He explained that in 1844 alone he lost Isaac Graham who lost his footing, fell overboard, and drowned; Nathan Griswold, dragged off a snagboat by a chain; Michael Fry, nearly beheaded by a rope from a capstan; George Crawford, crushed by a falling snag; and Jack, a black man, who fell out of a yawl while running rapids. They were the dead. Those who lost eyes, legs, and hands continued on the job as watchmen. Engineer employees had no pensions nor disability retirement in 1844.

At the request of Colonel Long, the Chief Engineer asked that any captain or crewman of the Engineer Fleet, "employed on duties as exposed, as hazardous, and often as fatal, as the vicissitudes of a campaign, should like the wounded and disabled soldiers, receive a pension proportioned to the injury he has received." Forty years passed, however, before Congress acted on that and similar requests.

Congressional neglect accentuated the headaches Colonel Long suffered as chief of the Office of Western River Improvements. "The service in which I am engaged," he once wrote in a moment of despair, "is the most irksome and disagreeable I have had to perform. Were it extended, its loathsomeness would be increased in due proportion."

First of all, Colonel Long was badly overworked. He was responsible for projects on 1,600 miles of the Mississippi, 600 miles of the Arkansas, 600 miles of the Missouri, the Red River to the head of the Great Raft, and all 981 miles of the Ohio, plus minor projects. Nor were relations between the quick-tempered Colonel and his subordinates, especially the gregarious Captain Sanders at Pittsburgh and the rambunctious "Roaring Jack" Russell at Louisville, always harmonious. He quarrelled with Sanders and Russell, about whether supervision meant joint planning and accounting, or merely inspection, an issue that the Chief Engineer merely confused by ruling that supervision entailed both inspection and joint planning.

His principal headache was the snagging project. During each winter, Long recruited new crews, repaired and supplied the snagboats, and planned the next season's campaign, usually sending the light-draft single hull snagboats *Gopher* and *Dragon* to the upper Ohio, Missouri, and Mississippi and the heavy twin-hull boats to the lower river sections. All had to be ready for action when spring floods ended, for the Colonel was not likely to see the boats again until late autumn, when they limped into port looking as if they had been shelled by an enemy, with many of their crewmen missing, sick, maimed, or dead.

At first, crewmen often deserted the dangerous and lonely work. Long put a stop to that by withholding pay until the boats returned to port. He hired the bravest, soberest, and most experienced rivermen he could find as snagboat officers, but still found it necessary to issue strict regulations for shipboard conduct. After a drunken captain sank a snagboat, the Colonel absolutely forbade ardent spirits aboard ship, and frequent accidents forced him to issue orders that hanging wrenches on safety

valves would cease. To promote shipboard discipline, the Colonel instituted severe penalties for infractions of snagboat rules, revealing his ascerbic view of human nature in his orders:

> *The propriety of substituting rewards instead of penalties, for the purpose of promoting correct discipline...is questionable & would probably tend to the subversion of order and good fellowship on board; for however worthless and inefficient any individual may prove to be, he is generally unwilling to admit, that his services are not equally as valuable & praiseworthy as those of the most industrious...; which the awarding of a compensation to one, greater than that allowed to another, would be likely to engender dissatisfaction, animosities & strife on board.*

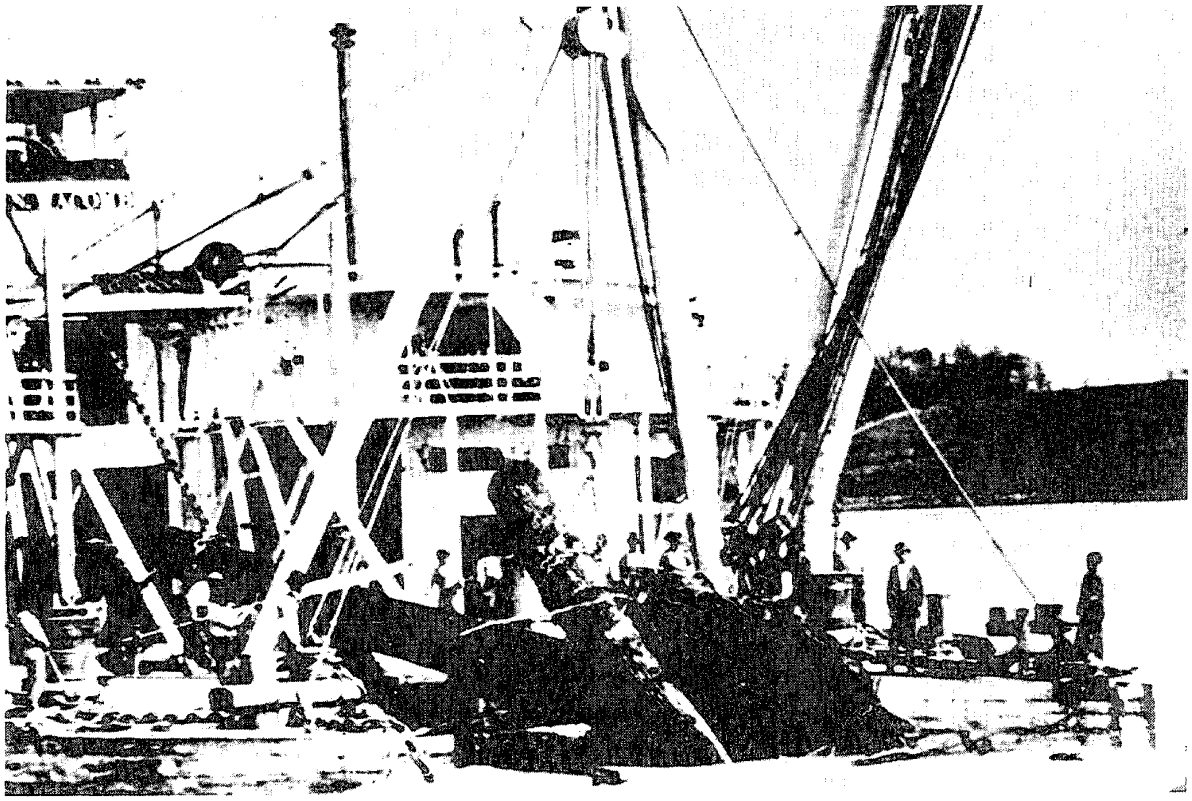
Mexican War and the Waterways Colonel Long's problems were abruptly resolved in 1845, when the Democratic administration of James K. Polk terminated the river work. On the issue of federal waterway projects, the presidential candidates in 1844 had been clear: Henry Clay favored; Polk opposed. Clay carried Pittsburgh in that election, but Polk's campaign managers complained it was because the rivermen supporting Clay had hired all the Democrats they could find as boat crews and sent them downriver before election day.

Chief Engineer John J. Abert made himself very unpopular with the Polk administration by continually calling attention to the connection between waterway projects and national defense. Abert declared:

> *It is a country that is to be benefited, not a county--a nation that has to be aided, not a town. And all these [projects], by increased facilities of intercourse, by concentrating population, by encouraging agriculture and manufactures, add to national*

Snagboat *John N. Macomb* (Post Civil War)

Carnegie Library of Pittsburgh

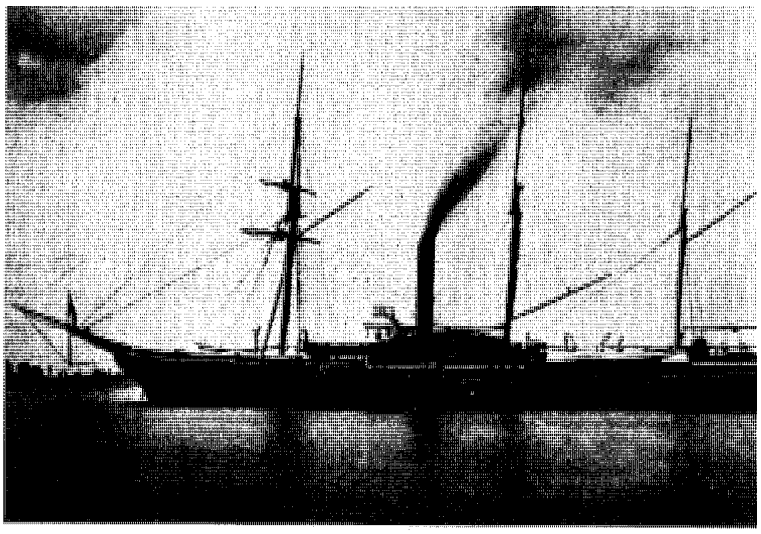


resources, civil and military; give wealth, give arms and implements of war, and means of making them; increase national unity, national strength, and add to all elements of national defence.

While at Pittsburgh, Captain John Sanders had developed concepts similar to those of the Chief Engineer; and in 1840 he published his *Memoir upon the Military Resources of the Valley of the Ohio* in which he proposed formation of military and naval depots in the valley and construction of ironclad steamboats and steamships as a freshwater flotilla capable of descending the inland rivers to defend the Gulf frontier and operate on the high seas. Monongahela coal, he said, could be bunkered at New Orleans and other Gulf ports; foundries of Pittsburgh, Wheeling, and Cincinnati could supply armament, ordnance, and munitions; and inland river shipyards could produce upwards of a hundred steam vessels a year.

Captain Sanders closed his Pittsburgh office in 1845 and transferred the Pittsburgh floating plant and Engineer property to Colonel Long who warehoused machinery that might be used if work resumed in a few years and sold the residue along with most of the snagboats at public auction. Sanders left for Texas and was with General Zachary Taylor at the outbreak of war with Mexico. Under orders from Taylor, Sanders implemented part of his plan for use of Ohio valley resources, returning to Pittsburgh to purchase fourteen steamboats and rushing them to the Rio Grande, where they supplied General Taylor's army and initiated steam navigation on that stream. Sanders commanded the combat engineers at the Battle of Monterey, where he cut a path, literally through adobe walls and roofs, for Taylor's army into the city. Sanders was breveted Major for his gallantry in the action at Monterey.

Congressman William W. Irwin of Pittsburgh, inspired by Sanders' mobilization plans for the Ohio valley, had, before the Mexican War, pushed a bill through Congress establishing a navy yard at



U.S.S. Michigan Western Pennsylvania Historical Society

Memphis and funding construction of ironclad steamships at Pittsburgh for service on the Great Lakes and the Gulf. The first iron vessel of the American navy, the *Michigan*, was built at Pittsburgh in 1841 and transported to Erie, where it was reassembled and launched for revenue service; it served the Navy on the Great Lakes until 1927. Other iron warships were built at Pittsburgh and launched during the Mexican War. The *George M. Bibb*, for example, went to New Orleans in 1845 and saw action on the coast of Mexico in 1847.

Colonel Long contributed to the war effort through loan of Engineer snagboats to the Quartermaster Department to clear snags from Texas rivers and by construction of a steam ladder dredge and six huge steamships, carrying both steam power and full sail, for service in the Gulf of Mexico.

Captain Sanders' prewar mobilization plans for the mustering of Ohio valley military resources were almost completely effected during the Mexican War. Troops and immense arms shipments departed Fort Pitt Foundry, Allegheny Arsenal, and other mills and towns along the Ohio regularly by river. The Ohio-Mississippi waterway became a major logistic line to the armies in Mexico.

The Third Try, 1852 "I entertain no doubt of the authority of Congress to make appropriations for leading objects in that class of public works comprising what are usually called works of internal improvement," declared President Millard Fillmore. He and his predecessor Zachary Taylor, the Whig administration elected in 1848, plainly approved river projects. They could not obtain the cooperation of Congress, however, and by 1850 rivermen had become upset by that lack of cooperation.

Navigation obstructions, the rivermen lamented, caused annual losses greater than all money spent for national defense. The inland rivers, they argued, carried more passengers and freight than did the American merchant marine. Yet, as a result of congressional neglect, navigation on the inland streams was little better in 1850 than "when the first 'broadhorn' floated down the Ohio and Mississippi and deposited her cargo of flour and whiskey, after a two months' voyage, in the *Spanish port* of New Orleans."

In 1852, Congress debated at length the merits of river improvements. One congressman pointed out that 951 river steamers had been lost since 1811: 166 by fire, 209 by explosion, and 576 by snagging. Another declared: "Whatever diminishes the risks and the cost of navigation and the cost of insurance goes to benefit the producer was well as the consumer; and just as we open safe channels to navigation from the interior of the country, we, to a certain extent, benefit every agriculturalist in the country." Proponents of river projects won their fight on the floor of Congress in 1852 and enacted the first major river and harbor bill since 1844.

The old team of Colonel Long, Charles A. Fuller, and "Roaring Jack" Russell resumed work in 1852, building a steam ladder dredge, the *Gopher*, and five new snagboats for the inland rivers. The dredge *Gopher* and the snagboat *Terror*, commanded by Captain John K. Dillingham, former captain of the *Henry M. Shreve*, were assigned to the Ohio River and began clearing the stream in 1853. Major John Sanders was performing engineering experiments at Fort Delaware in 1853 and was not returned to the Ohio; diabetes claimed his life in 1858.

Charles A. Fuller went to Pittsburgh in 1853, recovered the Engineer equipment left there in 1845 by Major Sanders, and reconnoitered the river, inspecting the dams and channel excavation work. He reported the dams had benefited low-water navigation but had been breached by vandals. "A remarkable resemblance was observed," he commented, "in several instances between the rocks at certain landings, in saw-mill ways, &c., to those remaining in the neighboring dams." Fuller contracted with local quarrymen to place new stone in the breached dams to restore their effectiveness.

Fuller asked for $90,000 to continue work on the thirty-inch open-channel project by building thirty-two new dams. His proposal was not well received, however, by the Board of Western Rivers and Lake Harbors, a distant predecessor of the Board of Engineers for Rivers and Harbors (BERH). In its review of the thirty-inch project, the Board commented:

> *The method of improving these localities by the erection of jettys, wing dams, &c., of stone or other materials, is very questionable.....The Board is therefore of the opinion, that in almost every case where channels are to be found across shifting sand bars, the surest and most economical method of improvement consists in the use of properly constructed steam dredges, to be employed on the subsidence of every considerable freshet, and prior to the occurrence of ordinary low water.*

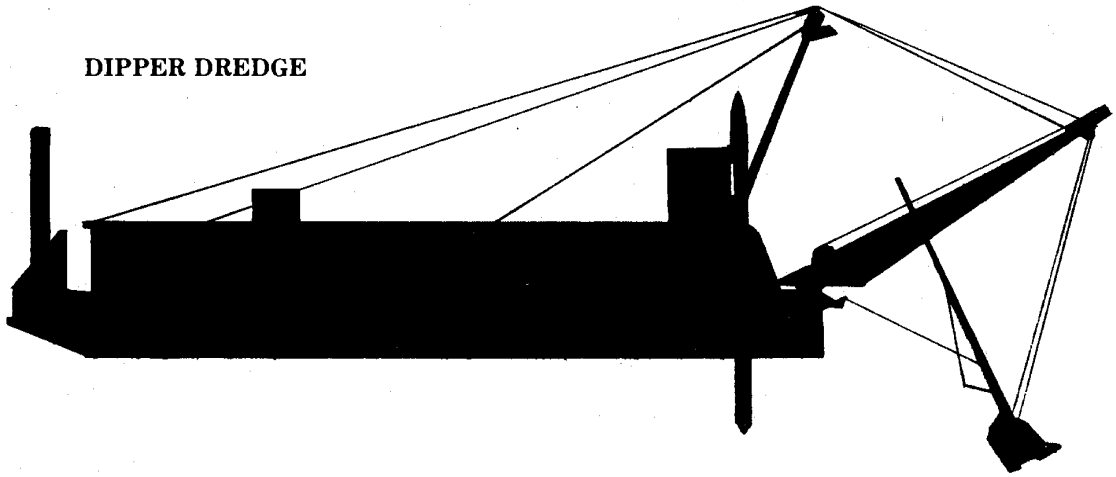
Not a bad idea, thought Fuller, but he had a single dredge for the entire Ohio River and it had such deep draft that it could not ascend the stream above Louisville. The question of the merits of wing dams versus those of dredging was never settled, for in 1853 Democrat Franklin Pierce, who thought waterway projects unconstitutional, became President.

President Pierce selected Jefferson Davis, later President of the Confederacy, as Secretary of War and axed every waterway appropriation bill that crossed his desk. Congress enacted a few bills over his vetoes, but those provided mere pittances for minor projects and none at all for general improvement of the inland rivers.

At the first opportunity, President Pierce fired "Roaring Jack" Russell, a Whig appointee. Colonel Long kept Russell on the payroll for a time to settle accounts, but when Secretary Davis learned of it he

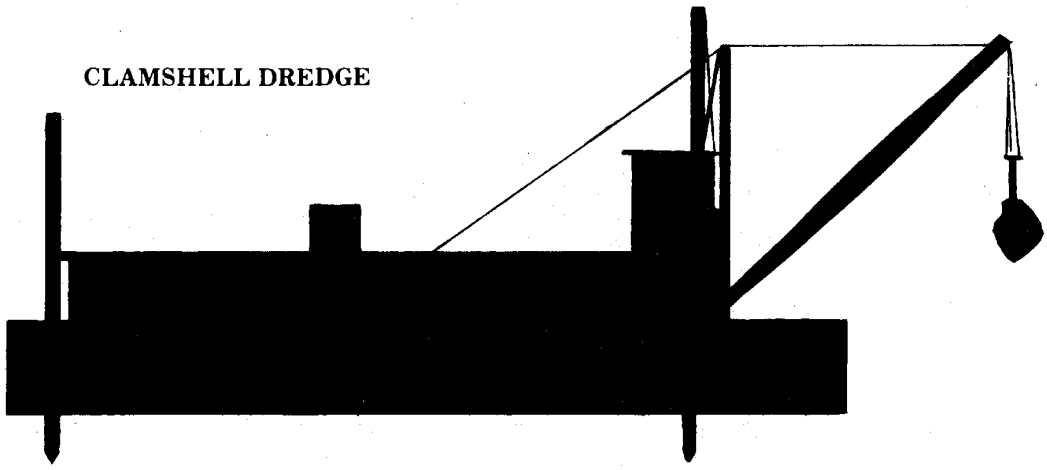
DIPPER DREDGE

A dipper dredge uses a power shovel to rip hard material such as rock and highly compacted soil. It has proven extremely successful in excavating glacial till formations consisting essentially of boulders and clay.



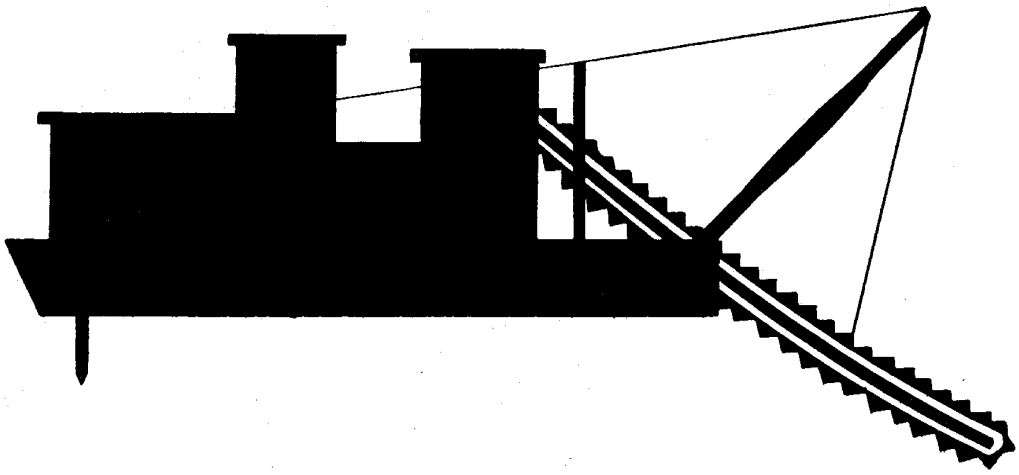
CLAMSHELL DREDGE

A clamshell dredge uses a bucket suspended from a boom by cables and is primarily for excavating loose alluvial soil. Its method of operation lends itself to working in confined areas.



LADDER BUCKET DREDGE

A ladder bucket dredge uses a series of buckets on a continuous chain and has general application in mining sand and gravel. In modern times this type of dredge is seldom used on waterway projects.



accused the Colonel of trying to protect Russell and summarily relieved Long as chief of inland river projects, replacing him with Colonel Joseph E. Johnston (who became a Confederate General in 1861).

After two years, the quarrel over Russell was forgotten and Davis reassigned Colonel Long to the Office of Western River Improvements. Long reported that 124 people had lost their lives in 85 steamboat accidents in 1854 and urged appropriation of $621,000 to resume river projects. Funds were not furnished, however, and Colonel Long was forced to sell the snagboat fleet at a huge loss for the third time. Most of the boats were purchased by James B. Eads for conversion into "submarine boats" used to salvage boats wrecked on the rivers.

When he closed the Office of Western River Improvements in 1856, Colonel Long was age 72. Officers in those days were retired only by severe physical disabilities or death. The Colonel had never enjoyed river work, but he had invested half his life in it and had the audacity to publicly lecture Congress on the shortcomings of its waterway policies. Three times, he said, we have built a fleet and placed work under contract; three times we have sold the fleet at great loss and annulled the contracts, thereby wasting nearly half of all funds provided. Only regular and continuous funding, he argued, will make and keep the inland waterways safe for navigation.

For the benefit of his successors, if any, Colonel Long published some advice gleaned from hard experience:

> *The selection and appointment of local agents, snag-boat captains, &c., demand the utmost circumspection and caution on the part of the appointing power. None but men of experience, ability and integrity, recommended by disinterested, competent and impartial judges, should be deemed worthy of such appointments. The agent in charge of surveys, delineations, constructions, &c., should be well versed in engineering. Every agent charged with the disbursement of funds should be a practical accountant. Every captain of a snagboat should be well-versed in the management of watercraft.....*
>
> *The laborers employed should be in all cases robust, healthy, strong, active, and industrious, and in addition to these qualifications should possess quiet and peaceable tempers, kind dispositions, and be temperate and orderly in all respects.*
>
> *A careful observance of the rules and regulations prescribed for the government of the western river service should be exacted from all concerned.*

The End of an Era The Pennsylvania railroad built into Pittsburgh on November 29, 1852, the Baltimore and Ohio line reached Wheeling by way of Fairmont and Grafton on January 1, 1853, and railroad mania began in earnest in the Ohio River basin. Increasing interest in railroads, declining interest in waterways, low-water interruptions to navigation for months each year in the late 1850s, and a national business depression beginning in 1857, combined to depress river business and rivermen during the years just before the Civil War. Though waterborne tonnage was increasing, passenger traffic and high value freight moved to railroads as quickly as they were built and marine engineers built larger steamers to replace several smaller vessels. It appeared that traffic on inland rivers was dwindling. Because the new and larger boats stranded more often on bars, it seemed the navigability of inland streams was deteriorating.

Both Army Engineers and rivermen were discouraged by the wreck of the waterways improvement program on the rocks of political factionalism and party principles and especially by irregular and inadequate federal funding. Congress had appropriated more money prior to 1861 for construction of seacoast lighthouses to warn ships of dangers than for removal of obstructions from inland streams. During the late 1850s, James B. Eads and his salvage company, using the Engineer snagboat fleet to retrieve wrecked boats from inland river channels, made a fortune.