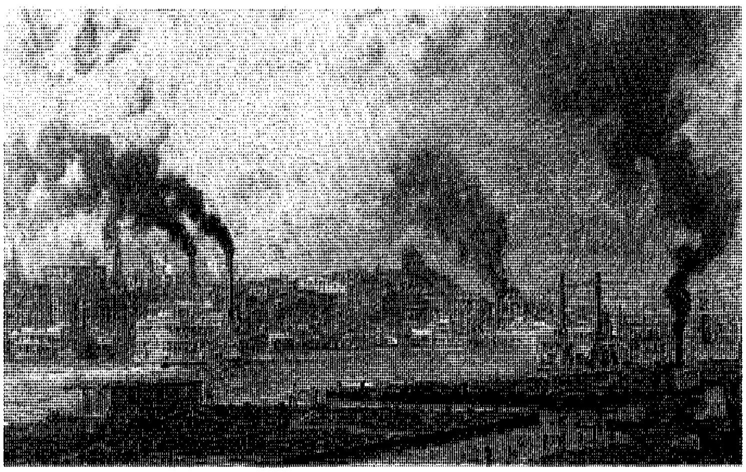


Pittsburgh - the Monongahela Waterfront in 1900
Painting by John Stobart
Courtesy of Bird in Hand Gallery, Swickley

Chapter 11

SLACKWATER TO CAIRO AND OIL CITY?

"Pittsburgh is the seat of inland waterways transportation, more than equalling the present tonnage of the entire Mississippi and its tributaries below the city," wrote Thomas P. Roberts toward the end of his career. "Here were made," he said, "experiments with beartraps, chanoine wickets, rolling lockgates, and other devices leading to further improvements elsewhere on the river. Pittsburgh has been the school of experience."

As a child, Roberts had observed the development of the Monongahela slackwater; as a young man, he had participated in the 1866-67 survey of the Ohio and the 1878 survey of the Allegheny; as an elder expert, he had become chief assistant to the Pittsburgh District Engineer. He had seen the steamboat packet business at its peak and the beginning and flourishing of the barge-towing system during the 19th century, but by 1920 he had become worried that the slackwater projects to Cairo on the Ohio and to Oil City on the Allegheny might never be finished, for the packet trade was languishing and commerce on the Ohio had been halved in 1916 when the Monongahela River Consolidated Coal & Coke Company, the "Combine," suddenly ended long distance coal towing.

Troubled by wrecks and losses on unimproved sections of the Ohio and on the Mississippi, meeting competition in the New Orleans market from Alabama coal and Oklahoma oil, the Monongahela Combine restricted coal shipments after 1916 to plants on the lower Monongahela and upper Ohio rivers. Heavy tonnage still moved on the Monongahela, but traffic on the Ohio hit bottom in 1917 when only 4,598,875 tons moved on the stream. "The Ohio," Thomas Roberts lamented, "has become very largely a playground for the owners of small locally owned boats engaged in short-distance transportation."

"In time, there must come on the Ohio," Roberts predicted, "steel barge lines towed in fleets for long-distance transportation, that is, freight towed in fleets separate from the miscellaneous light traffic possible for fast passenger boats." Frederick B. Duis, principal engineer at the Wheeling District, agreed. Noting that in 1917 continuous slackwater was open only about 200 miles to Dam 20, he predicted that commerce would revive when slackwater reached Cairo. William Hall, who had built the first monolithic concrete locks and fortifications in America and who was construction engineer on 16 locks and dams in the Wheeling District, compared the Ohio slackwater to a railroad between Pittsburgh and Chicago that had been completed only to Fort Wayne: it would not pay until finished.

Critics of waterway projects pointed to the apparent demise of Ohio River commerce in 1917 as an object lesson demonstrating the foolishness of federal waterway investments. Frank H. Alfred, president of the Pere Marquette Railroad, declared:

> *In the light of present experience, one is forced to the conclusion that the construction of these works was an economic waste. The Ohio is the one river in the United States on which there seemed to be a fair prospect of developing a large and important traffic. These great expectations have not been realized, and the writer feels it*

must be admitted that the experiment is a failure.

The Steel Argosy Marine engineers in the headwaters district, from the building of flatboats and keelboats to the fabrication of steamboats, iron-hull vessels, and tank barges, had always been pioneers in design. That tradition continued in September 19, 1892, when W. H. Brown and Sons launched the first steel barge on the inland rivers at Brown's Station on the Monongahela. It was 125 feet long and drew 7.5 feet. John Arras, the Allegheny engineer, told builders of wooden barges not to worry, for the first steel barge had cost fully $3,000 to build, was just as liable to sink after collision as wooden barges, and after sinking would become a dangerous navigation obstruction. "It is highly improbable," Arras predicted, "that they will come into general use."

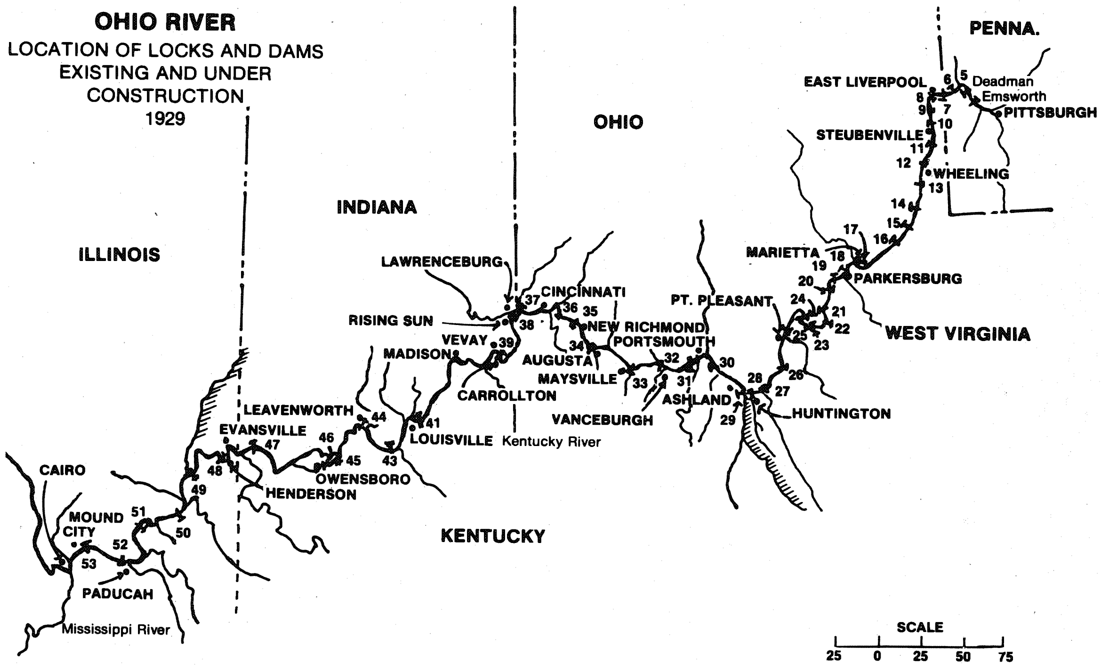
Arras lived to see his prophecy prove false. The first steel barge built lasted 35 years and others were built. By 1910, American Bridge Company was building steel barges for Monongahela coal fleets, for American Steel and Wire, and for United States Steel. When Wheeling Steel built 40 barges in 1920, the age of the standard welded steel barge, that revolutionized inland river commerce, was fully underway.

Construction progress on the Ohio Dam 5, September 1905 - river mile 23.9, placed in operation November 1907

Just as Harry Oliver and the Pittsburgh ironmasters had rescued the Davis Island project from political destruction during the 1870's, so Pittsburgh and Wheeling steelmen saved the nine-foot slackwater project on the Ohio during the 1920's. When railroad congestion, railcar shortages, and nationalization of the railways disrupted normal deliveries during the First World War, the steel industry at the headwaters began to look toward the rivers. The interest of big steel in waterways transportation continued in the postwar years when the corporations at the headwaters lost their competitive edge in rail rates known as "Pittsburgh Plus."

The idea of marketing finished steel products by barge has been attributed to B. F. Jones, Jr., of Jones and Laughlin Steel Company. He could see tows of coal and raw materials moving on the Monongahela from his Ross Street office windows. At any rate, Jones and Laughlin Steel in October 1921 loaded barges with finished steel products and hired Charles T. Campbell and his towboat *Transporter* to push them to downriver markets. The first drive-in gasoline station in America had opened at Pittsburgh in 1913, and to serve that new business Campbell had moved the first gasoline tows on the inland rivers, pushing wooden barges containing cylindrical tanks full of gasoline from Sistersville, West Virginia, to the Atlantic Refining Company on the Allegheny at Pittsburgh.

Publicized by Jones and Laughlin as the "Steel Argosy," the voyage of Campbell's *Transporter* with its steel tow down the Ohio in late 1921 was an eye-opener. The steel tow reached St. Louis in fourteen days, as compared with nine days by rail, and the shippers saved about $1500. Campbell's tows, carrying the products of Jones and Laughlin, Aluminum Company of America, American Bridge Company, National Tube Company, and Pittsburgh Steel, known as the "Million Dollar" tows, soon were running regularly to St. Louis and Memphis. Savings of up to $3 a ton was incentive enough; McClintic-Marshall, Crucible, Carnegie, Wheeling, and Inland steel corporations began barging their



products south. They saved altogether about $250,000 through use of the rivers in 1922.

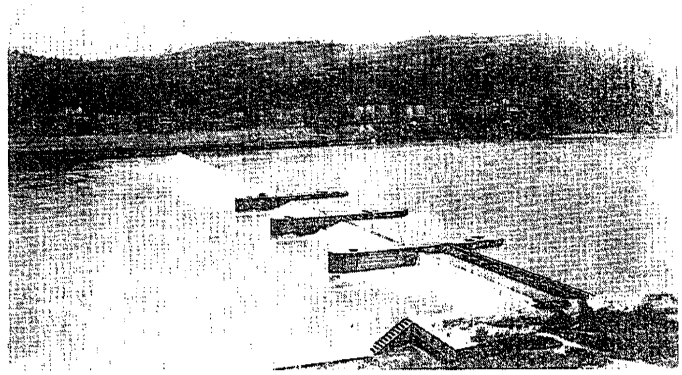
With the end of long distance coal towing from Pittsburgh in 1916, costs of the Ohio River slackwater project, when calculated on the basis of ton-mileage, had jumped dramatically. Congress, which in 1910 promised sufficient funding to open slackwater to Cairo by 1922, had neglected the project, in part because of the World War emergency and in part because of dwindling interest in what seemed a losing proposition. With construction about half finished, the Engineers had been unable to begin work on new locks and dams on the Ohio in 1921 because of funding shortages. At that crisis, steel executives of the headwaters district threw their full support behind the project, cooperating with waterways groups, lobbying with congressmen, and even buying full page ads in newspapers and journals on behalf of slackwater to Cairo. In a speech to industrial leaders in 1922, Arthur E. Crockett of Jones and Laughlin Steel chided Congress for not canalizing the Ohio by 1922 as promised and asserted that the events of the World War had conclusively demonstrated the value of the project. "During this period, as never before, there was emphasis placed on the fact that we could have had better industrial functioning if these rivers had been fully canalized," Crockett commented. "Many a day some of you men here in this room," he continued, "no doubt were obliged to spend weary hours striving to move the products of your mines and mills, but the inadequacy of the railroads at that time was such that the free movement of much-needed materials was blocked, with the result that there were necessary delays that could have been very damaging to our cause."

The headwaters steel industry made completion of Ohio River slackwater an issue in the midterm elections of 1922, and that year a "waterways bloc" in Congress appropriated $42 million for river and harbor projects, sidestepping charges of "pork barrel" by directing the Corps to allot the funds to meritorious projects. With those funds in hand, the Engineers laid plans to open slackwater to Cairo by 1929. Like Jason, the "Steel Argosy" had won the fleece.

Experiments at the Head of the Ohio Engineers are prone to disagree, even to argue, about proper structural design and construction methods. The Engineers on the Ohio River were no exception. As a result, though each lock and movable dam on the Ohio seemed alike to the novice, each differed in some respects from the others. This characteristic was especially typical of the Pittsburgh and Wheeling Districts, where design and construction experiments were first made.

An effort to achieve standardization began in 1907 with formation of the Ohio River Board and the Ohio River Design Force stationed at the Wheeling District. The Ohio River Board, with the Division Engineer as chairman and District Engineers as members, met regularly at Wheeling to seek standardization, but conditions at the site of each lock and dam differed materially. Each District Engineer and his staff also had their own ideas about proper design and construction methods, and the meetings often ended with quarrels. When a District Engineer presented his ideas, he was criticized, even ridiculed, by his colleagues.

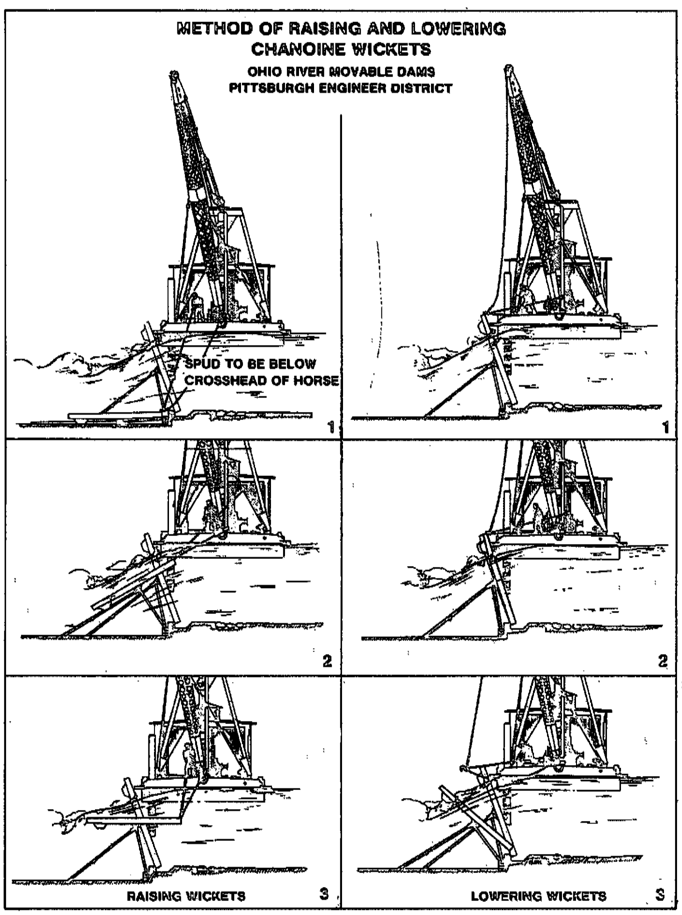
The Ohio River Design Force, headed by J. A. McDonough, C. I. "Pete" Grimm, C. A. Peterson, and C.



Lock and Dam 5, Ohio River - completed structure

N. Connor, was transferred from Wheeling to Division headquarters at Cincinnati in 1915 and became part of the Division staff. During the First World War, while Engineer officers were in France and the Ohio River districts were commanded by civilians (John Arras at Pittsburgh, Robert R. Jones at First Cincinnati, Benjamin Thomas at Second Cincinnati, and William McAlpine at Louisville), the Division Engineer ended the troublesome meetings of the Ohio River Board. Thereafter, each District prepared its own plans for submission directly to the Division office, which undertook whatever coordination that was necessary.

When the nine-foot slackwater project got underway in 1910, work was divided among four Engineer Districts: Pittsburgh had the upper section to Steubenville, Dams 1-10; Wheeling had the section from Steubenville to Huntington, Dams 11-28; Cincinnati had the section from Huntington to Madison, Dams 29-40; and Louisville had the lower section, Dams 41 to 54 (Dams 40, 42, and 54 were eliminated through higher dams and location changes). When the District office at Wheeling was moved to Huntington in 1922, the Pittsburgh District boundary was moved downriver to include Lock and Dam 11.

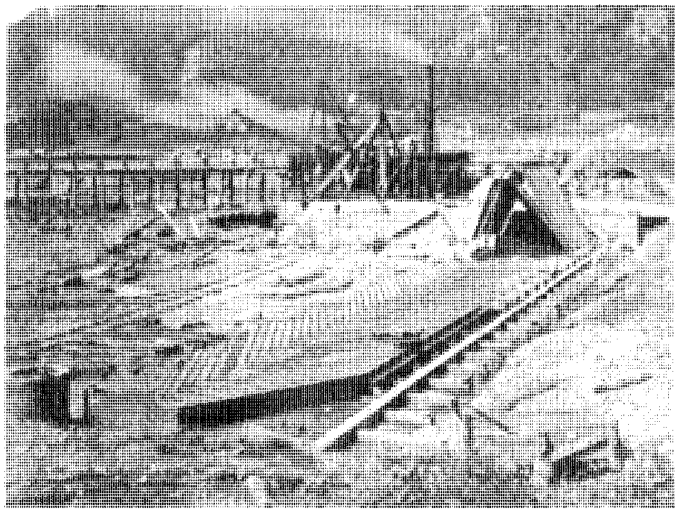


Construction methods differed at each lock and dam, but perhaps those used at Lock and Dam 9 were typical. National Contract Company began work in 1910, first building 135-foot wooden towers on each bank to support cables used to deliver timber, stone, cement, and other materials from rail sidings and barges to different parts of the work. Under supervision of Karl H. Shriver and other Corps inspectors, the contractors built the lock, navigable pass, weirs, abutment, and guidewalls inside six cofferdams, beginning with the lock, in three working seasons.

The "Ohio River box-type" cofferdams used at No. 9 differed little from cofferdams used by Roman engineers twenty centuries earlier. Timber framing, held together with iron rods and wooden spacers, about 20 feet wide and 16 feet high, was built and sheathed on the sides with planks aboard barges and allowed to settle to the river bottom as the barges moved forward. After dredges filled the boxes with material from the riverbed, the boxes were decked over and banked on both sides with dredged fill.

The interior of the cofferdams was "unwatered" by pumps mounted on boats; excavation inside the coffer was finished; and rows of round wooden bearing piles were driven to bedrock by a derrickboat with swinging leads. Cement and aggregate moved to concrete mixers placed on the cofferdams in small carts pulled by men and mules along a railtrack laid atop the cofferdam; derricks swung the buckets of concrete to the wooden forms spiked to the top of the piles for the lock foundation; concrete for the dam foundation was moved by the highlines from the towers.

A-Frame construction - Dam 6, Ohio River



The lockwalls at Davis Island and Merrill Dam, Nos. 1 and 6, first two completed, were cutstone masonry, and lockwalls at the next four, Nos. 2-5, were natural cement faced with timbers. Lockwalls below No. 6 were of Portland cement, generally 5 feet wide at the top, 15 feet wide at the bottom, and with two recesses for lockgates in the landwalls.

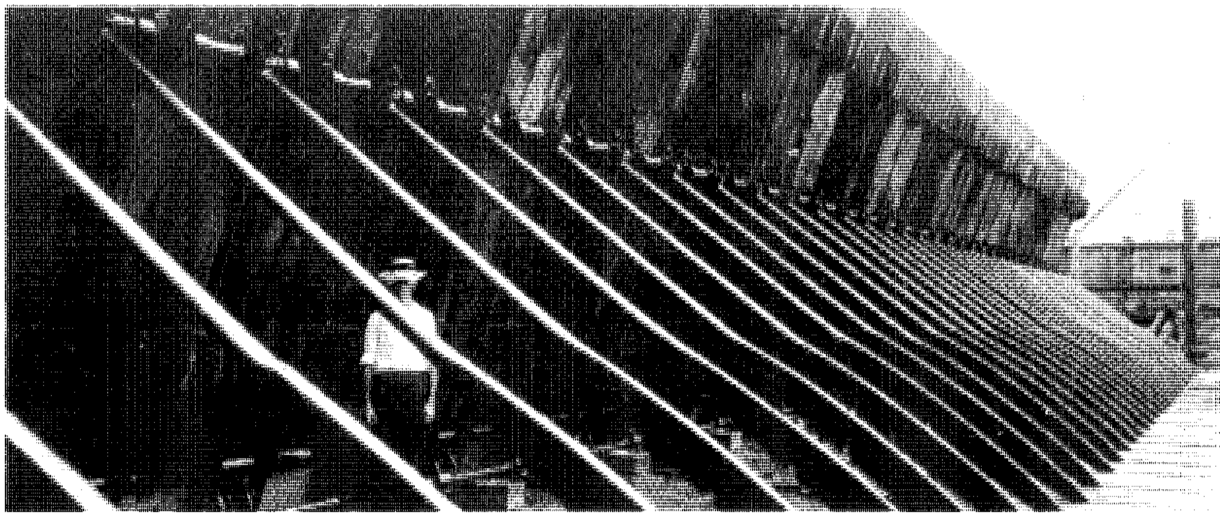
Dams generally extended from the middle of the lockwall across the river, allowing space above and below the dam for valves to empty and fill the locks, but dams 8, 11, and 13 were located near the lower end of the lockwall in the hope of reducing scour. The experiment failed. Scour was not much lessened and the arrangement caused turbulence in the lower lock approach because emptying valves were located in the lower lockgates.

The Pittsburgh and Wheeling Districts also experimented with various movable dam weirs as substitutes for chanoine and beartrap weirs, which were used to pass rises and maintain pool levels. A-frame trestle wickets, invented by Benjamin Thomas of the Cincinnati District, were installed in a weir section next the bank at Dam 6. Located below a gravel bar, the A-frames were covered with gravel while collapsed against the foundation and it was necessary to build a cofferdam and clear away the gravel with picks and shovels before the trestles could be raised. They were never again lowered. Thinking the experiment had been a failure, John Arras replaced the A-frame trestles with a fixed concrete weir in 1923. A-frames were never again tried on the Ohio, but the Nashville District installed them in 1933 on the crests of Cumberland River dams and made them work.

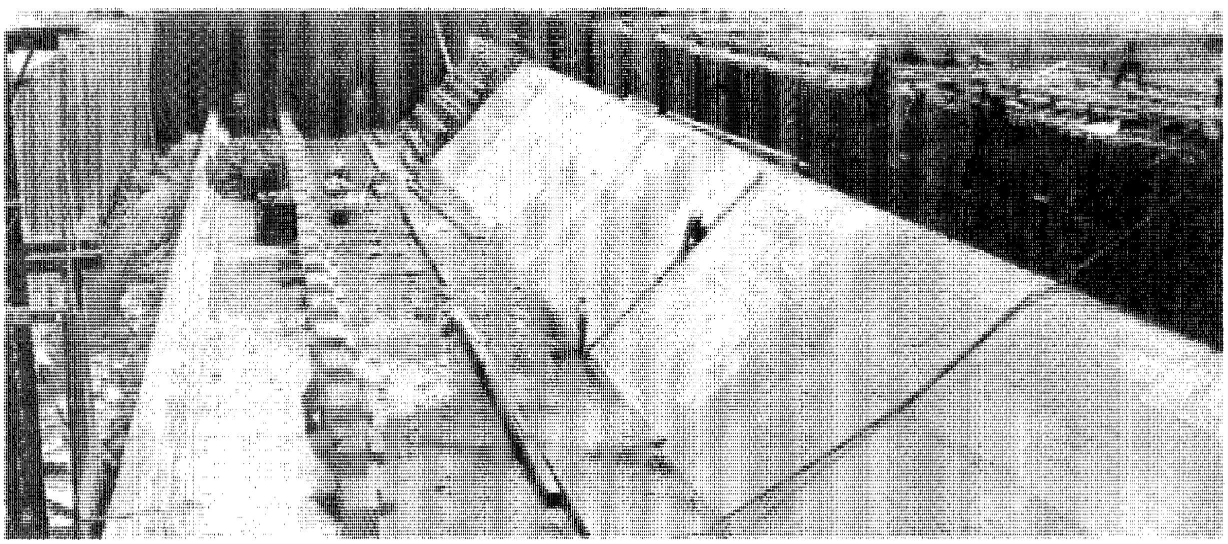
Automatic wickets, invented in 1908 by Guy B. Bebout of the Wheeling District, were placed in the navigable passes of Dams 13 and 18 in 1914-15. Bebout wickets resembled chanoine wickets but with support and hinge assembly designed for automatic collapse when water of upper pools reached a certain stage. Boat waves and drift sometimes tripped them, always it seemed on Sundays or holidays, and a maneuverboat and crew had to go out to raise them. That disadvantage resulted in sparing use of bebout wickets.

A reverse Parker beartrap with three leaves, invented by a Wisconsin lumberman, was installed at Dam 13 in 1909. The seventh time the beartrap was raised, its third, or middle "idler" leaf failed, and repairs were expensive. It was replaced in 1923 with a two-leaf beartrap and thenceforward only the old two-leaf beartrap, based on a rational design formula devised by General Hiram M. Chittenden, was used on the Ohio. The beartraps at Dam 13 never did work properly, however, and it took special air compressors to force them upright.

By October 31, 1915, the Pittsburgh District had finished construction of the ten Ohio River locks and dams on its river section. The Wheeling District had nearly completed the work on its section of the Ohio when that office was moved to Huntington in 1922. Cost estimates made in 1910 assumed the cost of an Ohio River lock and dam to be $1.2 million where the river was 1200 feet wide, adding $400 for each additional foot of width. Actual costs on the upper Ohio averaged close to that estimate, but dams built on the lower river after 1920 cost more. The Pittsburgh and the Wheeling Districts had done their jobs well, but before the downstream districts opened slackwater on to Cairo the locks and dams built on the upper river for a six-foot project before 1908 had reached the end of their usefulness.



Movable dam



Fixed dam

First Fixed Dam on the Ohio "How do you explain your high operations costs?" asked General Beach. Lansing Beach, Central Division Engineer, like his mentor William Merrill, was a blunt, sometimes caustic fellow. When he visited Colonel Francis Shunk at Pittsburgh in 1915, he was upset because operation-maintenance costs at Ohio River dams in the Pittsburgh District averaged $15,000 annually, while the Wheeling District held those costs down to $12,000.

"This is a headwaters district, with steeper slope and swifter runoff than in downstream districts," Colonel Shunk replied. "You know the river falls nearly 35 feet in its first 19 miles. It rises so fast we must begin lowering wickets at an eight-foot stage, or we can't get them down; and often we can't raise them before the river falls to seven feet. And because ice gorges come from either the Allegheny or Monongahela, we must maneuver the dams more frequently in winter than downstream districts. All these increase operation costs. Repair costs are rising because we have the oldest dams on the Ohio and have six dams built for six-foot slackwater that are holding nine feet."

General Beach was unimpressed; he had heard it all before. "How do you propose to bring your costs in line with those in other districts?" he asked.

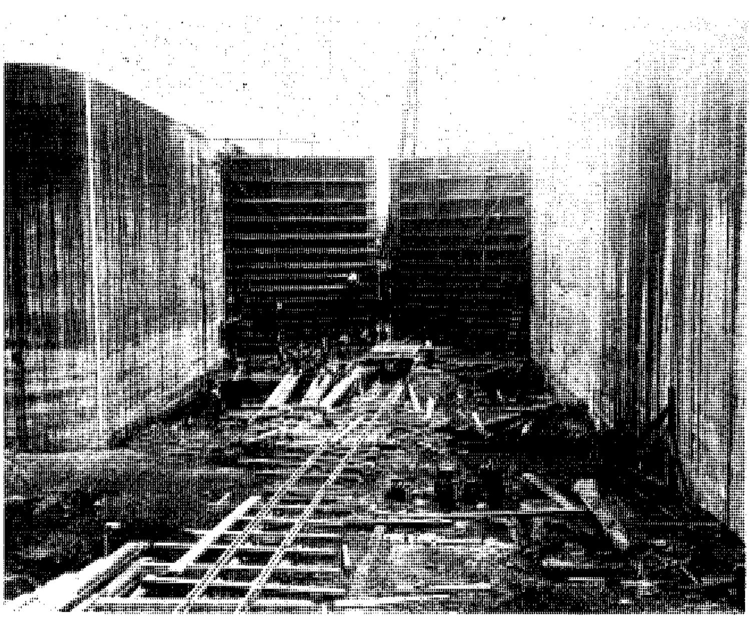
"A fixed dam to replace Nos. 1 and 2 would reduce our operations costs at least $5,000 a year. Our repair costs at 1 and 2 are steadily climbing. Davis Island is thirty years old. We have repaired it 123 times; the sandstone walls are gouged and worn; its design is obsolete."

General Beach smiled, for he had had a hand in designing Davis Island, and asked, "What about No. 2?"

"The natural cement in the lockwalls is crumbling and the sill of the navigable pass is 1.5 feet above the low-water plane. The dam is at the head of Merriman's Run, where the fall is nine feet in two miles. The river bottom has changed since we built the dam, and when tows go through the pass the turbulence raises wickets, which punch holes in the barges and ruin the wickets."

Colonel Shunk called John Arras to the office, and the two spread maps and blueprints along the conference table. After they had explained their plans for a fixed concrete dam with double locks at Emsworth, 1.5 miles below Davis Island, General Beach commented, "You know the pilots' association and coal shippers will oppose it, don't you?"

"Don't they always," the Colonel replied with a grin creasing his face. "Conditions have changed here, General. Coal tows now go down to Dam 6 at the mouth of the Beaver, sometimes all the way to the end of slackwater, to wait for a rise, and they no longer need movable dams above the mouth of the Beaver. We will have the support of industry located along the river; they want fixed dams like on the Monongahela for constant water supply and regular coal delivery. The Jones and Laughlin plant at Aliquippa has to stock 160,000 tons of coal reserve each winter because they can't get coal at times when the dams are down."



Below: Emsworth Dam, Ohio River - installing lower lock gates, outer lock

"The people of Pittsburgh," Beach interjected, "oppose a fixed dam that would increase their flooding problems."

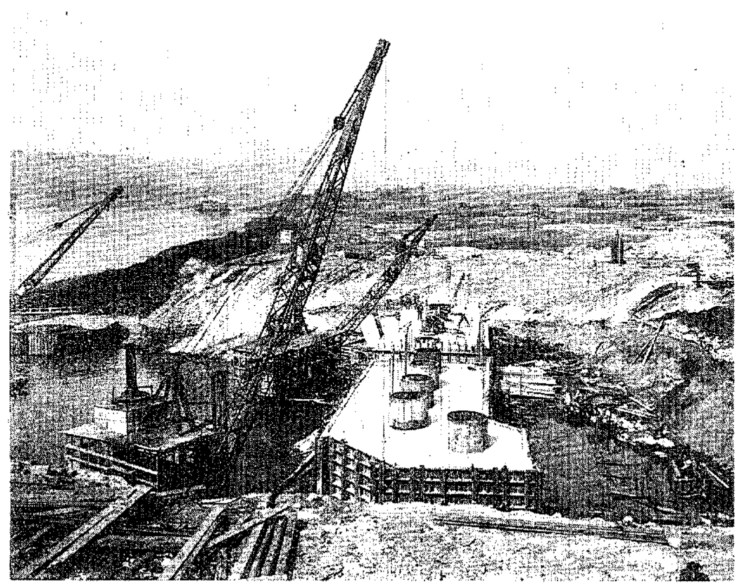
"General, if that were so I would not recommend a fixed dam, but it is not. My deputy, Captain Harold Fiske, and Thomas Roberts calculated the effect of a 21-foot high dam at Emsworth and found it would have negligible influence on flood stages at Pittsburgh. Our only problem will be proving it to the public."

"All right," Beach said, "if our choices are either rebuilding dams 1 and 2 or building the fixed dam, let's get our ducks in a row. Send your recommendation to me and I'll forward it to the Chief with approval."

Colonel Shunk set up a public hearing on the Emsworth project at Pittsburgh on January 29, 1915, and arranged the return of Colonel William Sibert from Panama to testify at the hearing on behalf of the fixed dam. Sibert had proposed fixed dams for the upper Ohio in 1902, but opposition had been violent at the time. Shunk also asked the City of Pittsburgh and consulting engineer organizations for independent studies of the effect of a fixed dam at Emsworth on flood crests. The city, through its flood commission, had distinguished civil engineer Morris Knowles undertake the study, and he concurred with Roberts and Fiske: the effect of Emsworth Dam on extreme floods would be minor.

Shunk's advance work and the Knowles report allayed but did not stamp out opposition. As Shunk had predicted, the river pilots association vehemently opposed: it was happy with the old movable dams and it warned that fixed dams would

Dashields Dam, Ohio River - right bank abutment construction



block river navigation and increase flood damages at Pittsburgh.

While the Chief of Engineers was considering the objections from rivermen, the reason for their opposition ended in 1916 when the Monongahela Combine stopped long distance coal shipments. When Congress approved Emsworth Locks and Dam on August 8, 1917, the immense coal tows that had run from Pittsburgh to New Orleans since 1854 no longer wended their way between bridge piers and through the passes of the movable dams. Ohio River commerce had reached its nadir, and need for movable dams on the upper river no longer existed.

Because a fixed dam at Emsworth, unlike movable wicket dams, could not pass traffic through a navigable pass when the lock was closed, the District planned two locks, one with standard 110 by 600 feet Ohio River dimensions and the other with standard 56 by 360 feet Monongahela dimensions, each with a 13-foot lift. Double locks allowed lock repair without closing navigation, permitted lockage of two tows simultaneously, and could conserve water during droughts through use of the smaller lock. Lockgates were the swinging mitering type, all steel. The novel feature of the 21-foot high concrete dam was the long downstream slope and apron designed to shoot water downriver away from the dam to prevent scour; that feature was not very successful.

Under supervision of John Arras and William Fairchild, Dravo Contracting Company began construction of the Emsworth project in 1919, using Ohio River box-type cofferdams, whirler cranes for excavation and materials handling, and the first floating concrete mixing plant on the inland rivers.

Completed at a cost of nearly $3 million, Emsworth Locks opened to navigation on September 1, 1921, before Dams 1 and 2 were removed. Davis Island Lock ceased operations on August 3, 1922, Lock 2 closed later that month, and the stone from the two structures was removed to serve as riprap on the downstream side of Emsworth Dam. The pioneer Davis Island Lock and Dam, after 37 years of operation, thus became part of the experimental Emsworth project, the first fixed dam and first double locks on the Ohio. General Beach directed that plans for additional fixed dams be held up until rivermen and Pittsburghers became convinced that the fixed dam at Emsworth was no threat to their business or property.

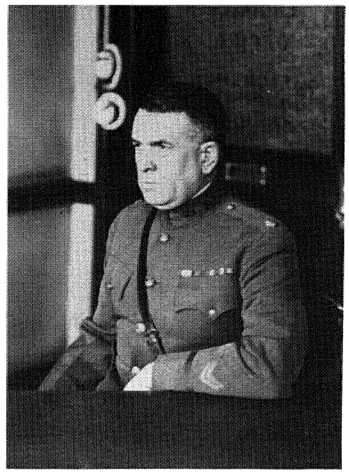
The Story at Deadman's Island A salesman strode into Thomas Roberts' office at Pittsburgh in 1905, dropped his case on the floor, plopped into a chair next to Roberts' desk, and delivered a high-pressure spiel about the interlocking steel sheetpiles for cofferdams he was selling. He propped books in the middle of the desk to serve as make-believe bridge piers and rapidly surrounded them with models of the interlocking piles.

Roberts interrupted the sales pitch with a question, "What happens if a pile strikes a tree trunk 20 feet down in the gravel?"

The unabashed salesman chuckled and replied, "Why, you pound away until you cut right through it!"

"What if you hit a boulder?"

"That's easy. Now here's your ink stand; it's the boulder. When I come to it I start a curve and go



Major Edmund L. Daley

right around it and get on the line on the other side, see, just as slick as a wink."

"But suppose," Roberts countered, "it's a nest of big boulders."

"Well," the salesman drawled, scratching his head, "you keep on curving around and you'll get through all right."

Roberts glared at the huckster. "That's just it," he said. "You salesmen and all the books and the so-called authorities know all about cofferdams, except the trifling point of getting them securely in place at the desired depth so we can pump them out and get on with our work. We can get more advice that we can use up to the time we begin work, but when boulders, tree trunks and quicksands are encountered and big springs come boiling through fissures in the rock into the cofferdams, where are you salesmen? *You* are hundreds of miles away, setting up your models on someone's office table."

Taken aback by the tirade, the salesman glanced furtively at the door, but Roberts had not finished.

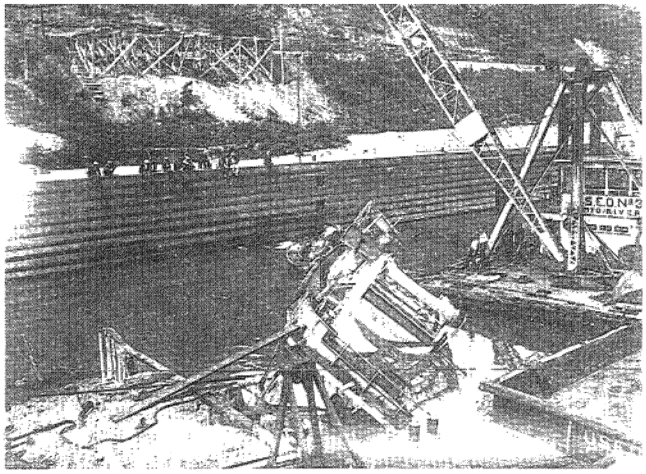
"No two jobs are alike on these three rivers," Roberts continued, "and each job seems meaner than the last. When we get a leaky cofferdam, we get help from men on the job. A dredge runner once found a leak for me by dropping a weighted gumball on a cord outside the dam and feeling nibbles on his line like a fisherman; one of my blacksmiths once stopped a leak by dumping ashes around the coffer to plug it; and my pumpmen have stopped leaks by inserting pipes into crevices and running grout mixed with chopped rope down the pipes. But I never got help from you experts. We will use wooden box cofferdams, we have used them a hundred years, and we will not use your expensive gadgets!"

Realizing the interview had ended, the salesman swept his models from the desk into his case and stalked out of the office. Thomas Roberts leaned back in his swivelchair until the door slammed, then returned to his work.

Until Thomas Roberts retired in 1923, interlocking steel sheetpiles were not used in cofferdams built by the Pittsburgh District, but in 1911 the Corps first used such coffers to raise the battleship *Maine* from the floor of Havana harbor. About 1919, Districts downstream from Pittsburgh used steel sheetpile cofferdams at Ohio River dams 23, 25, and 34 because they could be built to greater height and with less banking than wooden box coffers. But higher costs of the steel coffers and the difficulty of pulling the steel piles after the job was finished seemed to outweigh their advantages. The Contracting Division of Dravo Corporation, however, insisted in 1926 on use of steel sheetpile cofferdams in construction of Dashields Locks and Dam, planned by the Pittsburgh District to submerge one of the three major falls on the Ohio.

"This continual menace to navigation must be obliterated," Major Edmund L. Daley wrote in 1925 when he recommended construction of the Dashields project. Below Emsworth Dam, in the pool of movable dam No. 3, were Merriman's Ripple, White's Ripple, and the Trap, a near continuous rapids ending at Deadman's Island that had been ranked with Letart Falls and Louisville Falls as the most dangerous obstructions on the river. When the wickets of Dam 3 were up, the falls were submerged, but when down a high velocity current made navigation difficult. In 1926, the Chief of Engineers approved Dashields Locks and Dam, named after pioneer David A. Shields of Shields Station near the project site, at Deadman's Island, 13.3 miles below Pittsburgh, to replace Dam 3 and permanently submerge the ripples above.

The Pittsburgh District permitted Dravo Contracting to use cellular steel cofferdams while building the 1585-foot long concrete dam. The cellular cofferdams consisted of 40-foot diameter cells, made of a hundred steel sheetpiles driven to rock with the interior filled and capped. The Dashields experiment worked: cellular coffers proved exceptionally watertight, extended the number of working days, and allowed easy access to



Failure of cofferdam at Dashields Island Dam, June 1929 (See page 173)

the work through use of whirler cranes mounted on the cells.

More evidence of the value of cellular steel coffers was furnished on June 5, 1929, when an Ohio River wooden box cofferdam at the lower end of the 110-foot Dashields lock chamber failed. A man at work on the pumps on the lock floor heard a crashing noise, looked up to see water breaking through the cofferdam, and "instantly" scaled a ladder out of the hole to rouse men on the boats tied next to the dam. Captain Silas Sayre and his crew barely escaped when the pumpboat, derrickboat, coalflat, and survey steamer *Kittanning* were drawn into the breached cofferdam and sunk. John Arras, E. H. Beechley, Charles Wellons, R. C. McCullough, and Jack H. Dodds investigated the failure and found the rupture of the dam had been instantaneous, probably due to a defective rod or oak stringer inside the box coffer. It was an expensive lesson that in combination with the success of the steel sheetpile cells at Dashields resulted in increased use of cellular cofferdams at other projects.

Another innovation at Dashields was placement of steel armoring on the lockwalls. Steel barges, used extensively after 1920, gouged furrows and broke the vertical corners of lockwalls, requiring lock closure for expensive repairs. Charles Wellons and the District engineering staff conducted experiments with lockwall armoring. Some steel plate types were crushed by barges and railroad rails embedded in the concrete walls were soon broken loose, so those systems of protection were rejected in favor of cast steel armor, which was first installed at Allegheny Lock 6 and at Dashields Locks. Armoring lockwalls became standard practice on all inland waterways.

When the Ohio River dedication pageant, celebrating completion of nine-foot slackwater from Pittsburgh to Cairo, passed down the Ohio in October 1929, Dashields Locks were not completed, but District Engineer Jarvis J. Bain arranged installation of improvised machinery to operate the lockgates and valves and locked the pageant through without difficulty. The second fixed dam with double locks was thus in operation in Pittsburgh District by the time the last movable dam was completed near Cairo.

Cairo at Last The media called it "Pittsburgh's Greatest Celebration." Perhaps it was. It began the rainy evening of October 17, 1929, when 1400 people packed into the grand ballroom of the William Penn Hotel for a dinner and orations honoring completion of the Engineer nine-foot slackwater project, Pittsburgh to Cairo. At the speakers' table were Mayor Charles Kline, Governor John Fisher, five members of the President's cabinet, six railroad presidents, one riverman, and one engineer. Most politicians and railroad men had an opportunity to express their quasi-approval of the nine-foot project at length. The riverman, Alexander Dann of the Coal Exchange, introduced the toastmaster; but the crowd had no opportunity to hear the engineer. That was regrettable. General Lytle Brown, Chief of Engineers, might have described his nasty encounter with Ohio River mosquitoes and shoal waters during his 1909 survey to locate lock and dam sites for the nine-foot project, or perhaps regaled the crowd with an account of his experiences in Cuba in 1898, when he built roads and river crossings under Spanish fire and joined the Rough Riders in the charge up San Juan hills.

Toastmaster James Francis Burke, the golden-tongued orator who had spoken at the "Free Monongahela" jubilee in 1897, broke the ice in the ballroom by proposing that those present form an "American Council of Transportation" to coordinate railway, waterway, highway, and airway systems. Every subsequent speaker seconded the proposal, but it came to naught. Doubtless the highlight of the evening was the address by Secretary of Treasury Andrew W. Mellon, who pointed out that the early development of Pittsburgh came because of its strategic location at the headwaters of the Ohio, the logical shipping port for east-west traffic. "We shall be among the first to feel the effects of the revival in water transportation that is bound to come," he said. "It will open a new chapter in the history of this city whose development, since the very beginning, has been intimately connected with water transportation."

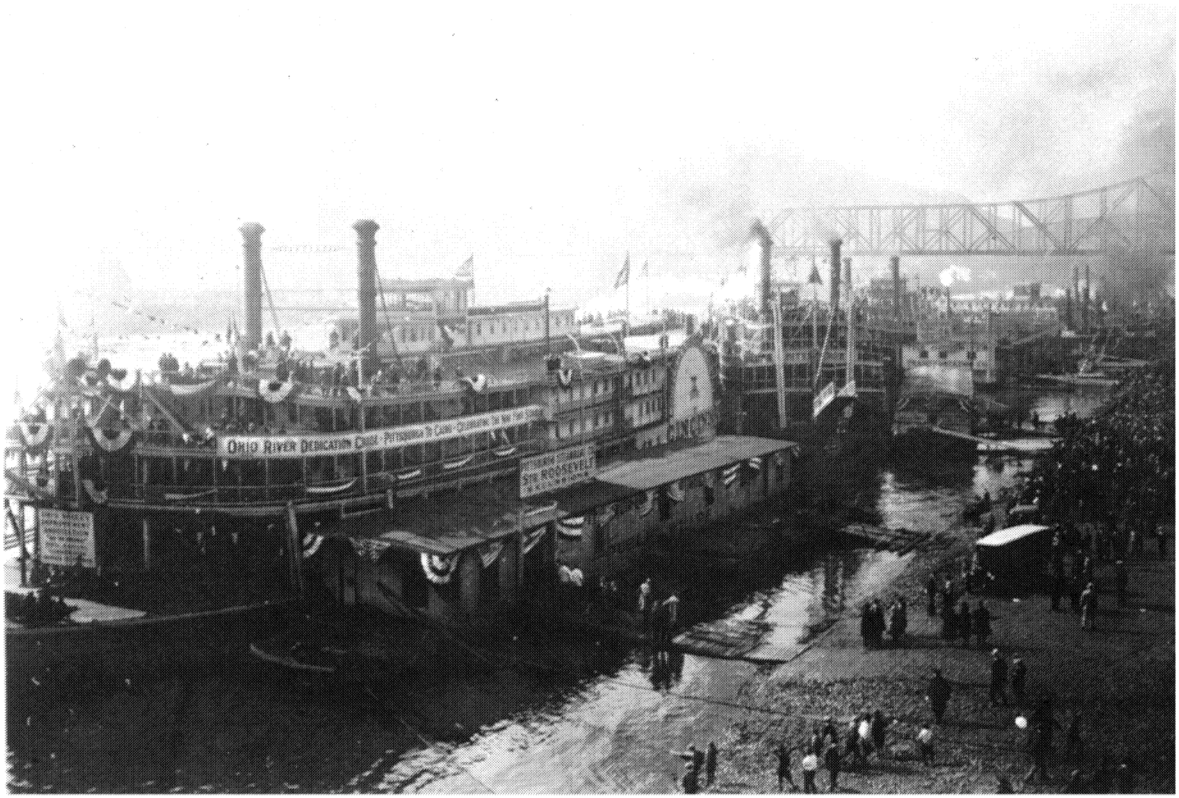
Next morning, survivors of the festivities boarded bunting-draped packets and towboats at the Monongahela wharf, while spectators by the thousands gathered on the river bluffs and bridges to watch the beginning of the dedication parade. The Engineer launches *Monongahela* and *Youghiogheny* and steamer *Swan* checked the river ahead of the dedication fleet. The stately packets *Cincinnati, Greater Pittsburgh,* and *Queen City* left the wharf first, followed by a line of towboats and the little *Betsy Ann,* towing a bargeload of spectators, at the rear of what was to be the last of Pittsburgh's historic steamboat pageants. Pilots of the flagship *Cincinnati* were Captains James Rowley and Jesse P. Hughes. Hughes had piloted the *Greenwood,* first boat through Merrill Dam (Lock 6) in 1904. Rowley had piloted a boat to Davis Island Lock in the 1885 pageant and was a nephew of Captain George W. Rowley.

The Pittsburgh pageant ended at Emsworth Locks, but the packets continued toward Cairo, passing Dashields Locks thanks to the improvised lock operation system. Circulating among the political and civic dignitaries aboard the packets were James Milnor Roberts, son and grandson of Thomas and William Milnor Roberts, the engineers who had renewed the Ohio River project in 1866; John W. Arras, principal engineer at Pittsburgh District since 1887, whose design innovations had had major impact on the nine-foot project; and General William "Goliath" Sibert, who had launched the nine-foot project while Pittsburgh District Engineer.

Welcomed by music, whistles, crowds, and cannon salutes at each port city, the packets proceeded at a leisurely pace to Cincinnati, where President Herbert Hoover, an engineer with a real understanding of the significance of the occasion, dedicated a monument to the men who had built the nine-foot project. President Hoover expressed his regret that Colonel William Merrill and Captain William B. Rodgers had not survived to see their work completed. "In some generations to come," he said, "they will perhaps look back at our triumph in building a channel nine feet in depth in the same way that we look at the triumph of our forefathers when, having cleared snags and bars, they announced that a boat drawing two feet of water could pass safely from Pittsburgh to New Orleans. Yet for their times and means they, too, accomplished a great task. It is the river that is permanent; it is one of God's gifts to man, and with each succeeding generation we will advance in our appreciation and our use of it."

Except for a grim reminder of the Davis Island pageant, when a soldier firing a salute to the President was killed by a cannon that fired prematurely, the parade continued without incident and with royal welcomes at each port to Lock 53, last on the river nearest Cairo. During the trip, General Sibert renewed his acquaintance with Colonel George R. Spalding, the officer he had once ordered not to finish a dam until a nine-foot depth was approved. In the quarter century that had elapsed, "Goliath" Sibert had helped Goethals build the Panama Canal and had become first chief of Army Chemical Warfare Service; Spalding had served with the A. E. F. in France and had become the Louisville District Engineer, charged with rushing the nine-foot slackwater to completion by 1929.

At Lock 53, on October 29, 1929, General Sibert, the man who had initiated the nine-foot project, finished it by cutting a satin ribbon across the lock to open it to navigation, and the packets locked through, steaming the last few miles to Cairo by golden sunset. At ten that night, while a band played "Til We Meet Again," the packets *Cincinnati* and *Greater Pittsburgh* rang their bells, backed away from Cairo wharf, and began their return toward Pittsburgh. A more appropriate selection for the band would have been "Taps," for October 25 was Black Tuesday, day of the stockmarket crash that sounded the death knell for the historic steamboat packet business.



Marine celebration, Pittsburgh to Cairo
at Monongahela Wharf, October 18, 1929

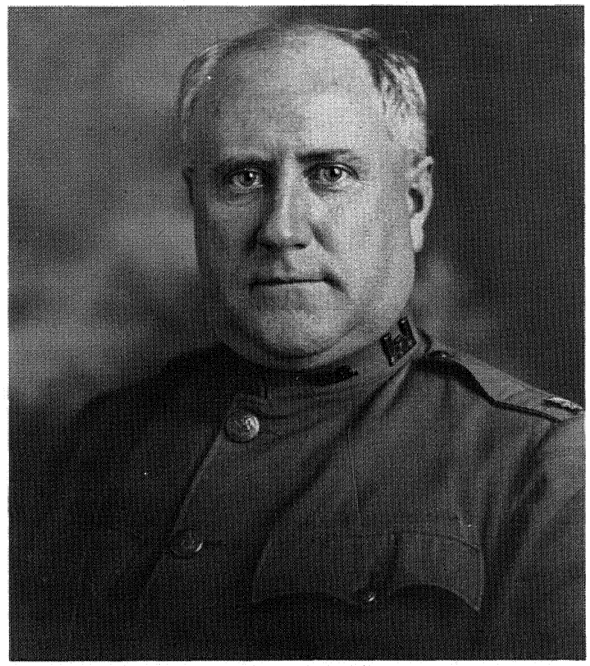
Up to Olean Staccato throbs of a high power motor drew the Senecas to the banks of the Allegheny, where they saw the graceful motorlaunch *Monongahela* skimming upriver through Kinzua gorge between towering hills rising like walls on both sides of the stream. The Indians smiled when they heard the crunch of contact with rock, the racing motor, and then silence. They watched with amusement as the 24-foot launch drifted back downstream while the whites worked frantically in its stern. Only one prop blade had been damaged, however, and the whites soon had the prop back in the river and the motor restarted. The launch again moved upstream, at reduced speed, towards Olean.

Seated next to steersman E. H. Beechley was raftsman Louis Cook, who had piloted some 1500 wooden barges and rafts down the Allegheny before 1924. Cook peered through binoculars at the river ahead of the *Monongahela*, trying to see the channel. Pittsburgh District Engineer Jarvis J. Bain sat behind the pilot studying maps made by Thomas Roberts in 1878, but he could not be sure of the channel because islands had moved, old chutes were blocked.

The *Monongahela* scraped hull time and again on the rocks in Kinzua gorge. When all else failed, Colonel Bain seized a pike and felt for the bottom. When the Colonel yelled "rock," Beechley moved the boat from side to side until the Colonel felt a channel. By crisscrossing the river, they reached Corydon on the afternoon of April 9, 1929, and there Captain George Barton, who once rafted from Salamanca to Pittsburgh, replaced Cook beside the helmsman. The voyage continued north into New York. Once, Barton lost the channel, the launch piled onto a bar, swung broadside to the rushing current, and began to roll over. Colonel Bain and the occupants jumped to the high side of the boat to stabilize it; Beechley eased the boat back off the bar, swung the bow into the current, and renewed his hunt for a channel.

Clouds were spitting snow, darkness coming on, when the *Monongahela* pulled into the bank at Salamanca. Without a pilot familiar with the river above Salamanca, Colonel Bain reluctantly ended the trip, eighteen miles short of his goal, the head of Allegheny River steamboat navigation at Olean. But he would be back; Bain was a stubborn man.

The peripatetic Colonel Bain was a constant headache to Pittsburgh District river rats, especially Captains William H. Shannon, Silas Sayre, and E. H. Beechley, who commanded the *Swan*, *Kittanning*, and *Monongahela*. He had the habit of calling the Boatyard at Lock 4 on the Monongahela at any time night or day and ordering a boat to meet him, often forcing the crews to load in a hurry and run all night to get to a point the Colonel could reach in an hour by auto. Colonel Bain wished to see every



Lieutenant Colonel Jarvis J. Bain

navigable river in his charge, preferably from the deck of a boat, and he became obsessed with the idea of ascending the Allegheny to Olean in a powered boat, a feat not accomplished since the steamer *New Castle* got up on a flood in 1837.

There was some purpose to the Colonel's madness, however, for in the late 1920's new public interest had developed in support of extending Allegheny River slackwater to Oil City, perhaps even to Olean, and linking the upper Allegheny to Lake Erie by canal via French Creek or to the New York Barge Canal by canal from Olean. And an association that had organized at Apollo, Pennsylvania, in 1926, put a small excursion boat into operation on the Kiskiminetas, and urged canalization of the "roaring Kiskiminetas" and the "babbling Conemaugh" to Johnstown. All were formidable projects.

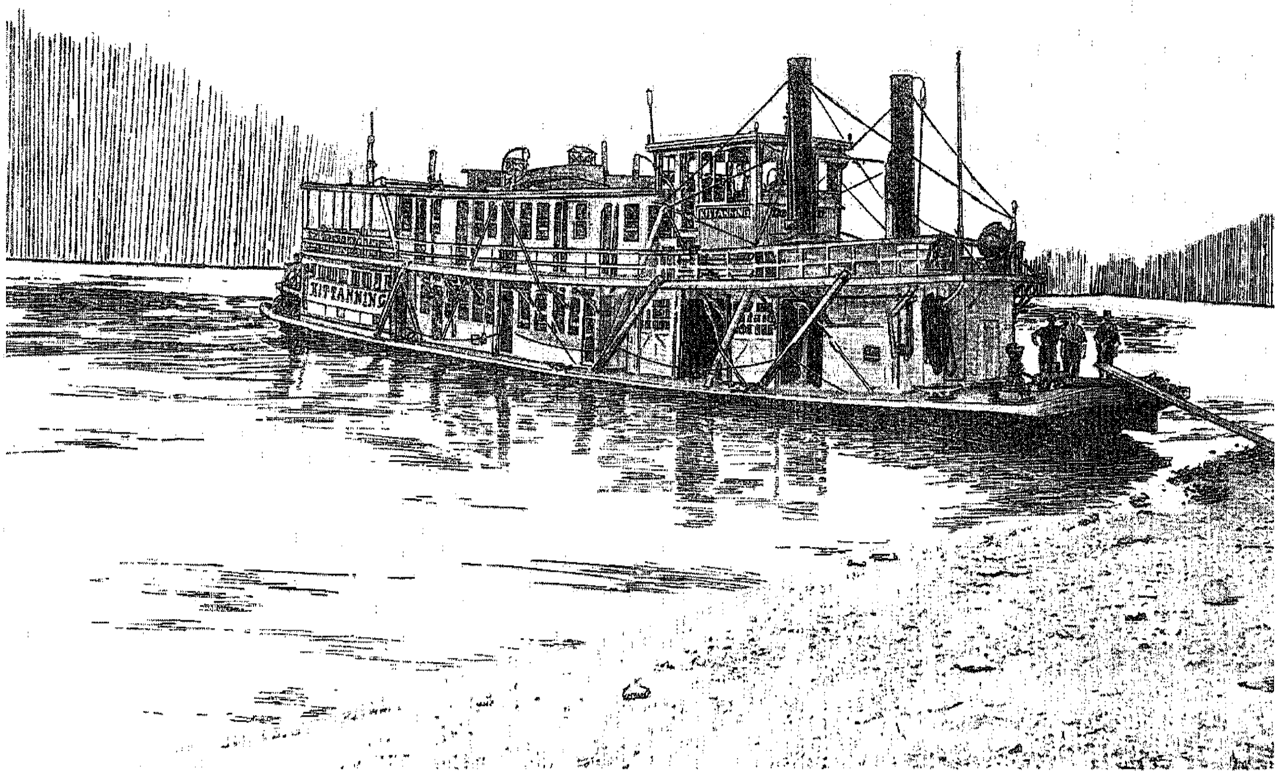
While Jarvis Bain was District Engineer, Allegheny Locks and Dams 4 and 5 opened to navigation in 1927 and Nos. 6, 7, and 8 opened in 1928, 1930, and 1931 respectively, finishing the project approved in 1912 and supplying slackwater to Rimerton at Mile 61. It was apparent by 1928 that the Ohio River project would soon be finished; funds annually committed to completion of that job could then be diverted to projects on tributary streams, and Allegheny rivermen were anxious that slackwater to Oil City be funded.

No steamboat had gotten up to Oil City since the *Nellie Hudson No. 3* made the trip in 1897, so in March 1928 Colonel Bain ordered the survey steamer *Kittanning* upriver to inspect the old open-channel dikes and dams above the head of slackwater and determine whether the channel could still be navigated. Captain Silas Sayre at the wheel was assisted by pilots John S. Faddis and Donald T. Wright, the latter an Oil City boy who had become editor of the *Waterways Journal.* Colonel Bain, John Arras, and Harry E. Anderson of the District office were aboard to inspect the old dikes.

The *Kittanning* slipped under the Emlenton bridge with a few inches to spare, bucked its way through Patterson Falls and other ripples, and steamed into Franklin with flags flying. Thousands of people waited at the Franklin wharf and followed along the bank as the *Kittanning* went on to Oil City. The Oil City radio station supplied its listeners with a blow by blow account of the progress of the steamer as it thrashed its way up to the petroleum capital. At dark, on March 31, the *Kittanning* reached its goal, where Colonel Bain, John Arras, and Donald Wright explained plans for slackwater to Oil City to the excited crowds.

The *Kittanning* argosy generated such public enthusiasm for the Allegheny project that Colonel Bain decided to duplicate the feat of the steamers *Allegheny* and *New Castle* and ascend the river to Olean. He selected the power launch *Monongahela* for the effort, but failed the first time at Salamanca in April 1929. On April 12, 1931, he tried again, shipping the *Monongahela* to Warren by truck to catch high water and launching at eleven in the morning. Beechley and Cook had learned the channel in 1929, so the boat made better speed through Kinzua gorge.

Snow covered the hills, the wind was cold, but the sun was still bright when the Monongahela pulled into Corydon to refuel and pick up raft pilot George



Survey Steamer *Kittanning,* March 1928

Barton. Captain Barton had died a few hours before they arrived. That sobering news dampened the spirits of the navigators, but they were cheered at the Seneca reservation where the Indians gave them a boisterous welcome and, in their honor, performed a war dance. Above Salamanca, where the uncharted river was obstructed by old milldams, wooden piles, and low ferry wires, progress slowed; nevertheless, the *Monongahela,* drawing thirty inches, pulled up at Olean at 6:15 that evening without having touched bottom during the entire voyage. Jarvis Bain stepped proudly ashore from the first powered boat to ascend the Allegheny to Olean, 260 miles above Pittsburgh, in a century. The Colonel had navigated every inch of river in Pittsburgh District that, to his knowledge, had ever been thrashed by a paddlewheel.

Both an intrepid riverman and an efficient administrator, Colonel Bain made the Allegheny project move again. Because the three lowermost locks and dams on the river, completed before 1909, did not provide nine feet for navigation, nor the standard 56- by 360-foot chambers for lockage, Bain recommended removal of Herrs Island Lock and Dam (No. 1), dredging a nine-foot channel to Lock 2, and replacement of Locks and Dams 2 and 3, which ice and floods had damaged, with new and standard structures. He thought extension of slackwater to Oil City uneconomical, but did approve raising Dam 8 and building No. 9 to open barge navigation to East Brady, where Vanport limestone, used as flux at iron furnaces, could be mined and shipped by river.

Chief of Engineers Lytle Brown approved Bain's plans for the Allegheny and Congress authorized the work. The Pittsburgh District, working chiefly with depression relief funds, opened nine-foot slackwater to East Brady, Mile 72, by 1938. There the project stopped, never to reach Oil City. Allegheny commerce reached 5.7 million tons in some years, but averaged around 4 million tons during the thirty years after Lock and Dam 9 was completed. Heavy traffic on the upper slackwater section, that might have justified further extension of the project, never materialized.

Rivermen grumbled about it all, but to no avail. Captain Fred Way, who launched his 18-foot yawl *Lady Grace* at Olean in May 1938 and was first "through" Lock 9, complained that the Engineers had said: "Now, boys, show us some traffic or else she goes no further." He said the Engineers were "almost stupid" to expect the development of commercial navigation on a half-finished highway like the Allegheny slackwater. "How will the river accomplish this?" he asked. "The answer to the riddle remains unsolved," he wrote in 1942. It is still unsolved.