Chapter 8

The Decline of River Traffic and the 6-Foot Channel

Critics of the Corps of Engineers have pointed with irony to the fact that as the Engineers of the Rock Island District continued to improve the river, traffic on it continued to decline. They have suggested that the methods adopted by the Corps were wrong, that the work done was too small to make a difference, and came too late. or that river improvements were futile and expensive attempts to artificially keep alive an older form of transportation whose decline was mural and inevitable.

At least one District Engineer supported these views. Colonel Curtis McD. Townsend, District Engineer at Rock Island from 1898 to 1903, felt that the decline of river traffic was "due to natural law."[1] He felt that the river had had the advantage when animal power (such a3 a team of horses) was used for both knd and water transportation. A team of horses could haul 200 tons on a canal boat. but only 10 tons over steel rails. But steam power and later engine3 made power relatively unimportant. At this point, Townsend felt, railroads had the

advantage because they could be put down wherever the need was, while water routes never really coincided with commercial routes.[2]

What happened to commercial traffic on the Upper Mississippi between 1890 and 1920 was much more complex than such critics would suggest. In fact, although it is usual for accounts of this period to talk about a decline of traffic, there was not so much a decline in use of the river as a shift in the pattern of use. The towboat and its barges are often snowed under by the dramatic and real figures which marked the end of the lumber industry.

Lumber. The moment of glory on the Upper Mississippi was undoubtedly the period from 1875 to 1915 when millions of board feet of logs and lumber floated down the river to markets and sawmills as far south as St. Louis. Logging was the largest industry in the Upper Midwest, and it made it3 impact felt not only on the economy but on the shape and size of bridges along the rivers, and on the kind of improvement engaged in by the Rock Island District Engineers. In determining the amount of curve a bead could have or the shape of a channel crossing, Engineers had to pay attention not only to the maneuverability of a 300-foot packet, but to the far less maneuverable log or lumber raft which might be 300 feet wide and 1,500 feet long.

Lumbering had already become a part of the Upper Mississippi economy when Colonel Wilson arrived in 1866, but by 1878 it was dominant. More than 100 steamboats were employed in rafting. That year 363 log rafts passed the Winona Bridge. The 73 sawmills between the mouth of the Chippewa River and St. Louis had a sawing capacity of 600,000,000 board feet per day.[3]

Ths lumber industry remained remarkably steady, reaching a peak in the early 1890's, even though the forests were rapidly giving out. Between 1,100 and 2,100 rafts passed the Winona Bridge each *year* between 1890 and 1899, variations in the number being due almost entirely to the depth of

water in a given year. In 1899, with 10 years of the virtual end of logging in northern Minnesota and Wisconsin, sawmills manufactured 2,120,562,000 board feet of lumber and 619,901,000 shingles, with a total value of about $32,006,000. During 1899, 86 sternwheel raftboats were engaged in moving logs. During this same year, only 16 packet boats and 35 pleasure boats operated on the Upper Mississippi.[4]

Beginning in 1900, rafting declined rapidly. By 1902 only 75 raftboats remained; the following year 70 were left. In 1904, 50 boats towed rafts; by 1906, 20. In 1913 four raftboats remained, and by 1915 these had disappeared.

Prior to the Civil War, rafts were simply strings of logs tied together and floated down the river, steered by raftsmen with poles and long sweeps. The crew lived on the raft, cooking in the open and sleeping in a cabin built at the stern. By the time the Rock Island District was established, bridges and increased steamboat traffic made such natural locomotion unsafe, and sternwheel boats were used to push the rafts downstream and provide some guidance, Later, when even more bridges and the narrow, improved channel at the Rock Island Rapids and the canal at Keokuk were built, a bow boat was added to aid steering. The bow boat was a small steamer tied sideways to the front of the raft in such a way that it could move the raft to the right or left.

Locking through the Des Moines Rapids Canal was often a day-long operation for these log rafts, since the strings of the raft had to be separated to fit the lock chamber. Rafts from the Chippewa River [made up at Beef Slough] were composed of six "strings" each 40 feet wide, while those coming down the St. Croix River [made up at Stillwater) were four strings wide, with each string being 60 feet in width. A Beef Slough raft 600 by 240 feet required 12 lockages through the canal, while a Stillwater raft of the same size required eight lockages because it utilized the dimensions of the lock chamber better,

One problem which rafts caused to other navigation was loose logs floated from the tributaries into sloughs or chutes of the Mississippi to be made up into rafts. These loose logs became a special problem in the 11 miles of river horn the mouth of the Chippewa downriver to West Newton Slough. Formerly, these logs had floated into Beef Slough, but that was closed by sandbars in 1890.

Mediating between logging and packet interests became one of the touchy responsibilities of the District Engineers at Rock Island.[5]

The 1900 River and Harbor Bill stated "that it shall not be lawful to float loose timber and logs, or to float what is known as sack rafts of timber and logs in streams or channels actually navigated by steamboats in such a manner as to obstruct, impede, or endanger navigation." Lumber interests, as might be expected, tried to get this amended, and they met with some sympathy from the Rock Island District engineers, Lagging interests, they felt, were the most important of any on the river.[6]

Sympathy for logging interests, however, did not always mean friendly relations. When the Corps in 1889 refused to dredge the blocked opening of Beef Slough, the Weyerhaeuser Mississippi River Logging Company responded by blowing up a Government darn across the entrance to West Newton Slough in order to use that area to tie up logs from the Chippewa River. Major Alexander Mackenzie took the company to court, but dropped the case after two years when it got nowhere.[7]

The Decline of Commercial Traffic. The Golden Age of steamboating on the Lower Mississippi came in the 1840's and 1850's — an age of the huge sidewheelers, the showboats, the floating palaces. A decline for these "monuments to human ingenuity"[8] had already set in before the Civil War.

On the Upper Mississippi, however, the real flood of immigration, industry, and manufacturing came immediately after the Civil War. This expansion

was such that river traffic thrived in spite of the difficult and dangerous conditions on the river and competition from railroads crossing the river and spreading up and down each side. The St. Louis Merchant's Exchange in 1874 reported 1,063 steamboat arrivals from the upper river, but only 752 boats from the south and 104 from the Missouri River.[9] The primary commodity on board was grain and produce, but ranged from hogs and horses to malt, wines, cement, and grease. A list of manufactures shipped from Moline, Illinois, in 1879 shows agricultural implements (mainly from the John Deere factory] worth $2,850,000, followed by wagons, malleable iron, paper, scales, pump organa, lumber, shingles, lath, pails, washboards, churns and tubs.[10]

Steamboat traffic remained at a high level throughout the 19th century. In 1879, 3,760 steamboats passed the Winona Bridge. The number rose to 4,593 in 1880, and ran between 4,000 and 5,400 until 1894, when it dropped back to 3,700 boats. A few boats on the Upper Mississippi were beginning to use barges to increase their capacity, but the highest number of barges through the Winona Bridge during these same years was 1,600 in 1887.[11] The tonnage carried by these boats was 2,300,011 tons in 1878, the year the 4½-foot channel project began. The tonnage reached its peak in 1896, when 6,051,786 tons were registered. By 1907 the figures had dropped back to 3,919,440 tons. However, those figures are somewhat misleading; they include lumbar and log rafts, and much of the decline between 1895 and 1907 in these figures was due to the loss of the raft traffic.

Low water also did much to affect river traffic. The decade of the 1880's had been one of high water, but during the 1890's low water occurred throughout the Upper Mississippi Rivsr. During the extremely low water of 1894, Colonel Mackenzie reported that he could buy any boat in the river cheaply. In the 1880's a boat with crew could be rented for $60 to $100 per day. By the mid-1890's a boat, crew, and all meals ranted for $30 per day.

From 1900 on, the raw statistics show a decline both in freight and in the total number of boats. What these figures don't reveal is that this decline was primarily in lumber and raft boats, and that the decline of other cargo was really a decline only in long-haul freight. The logs ran out, and the railroad took away the long-haul business, affecting waterways such as the Illinois and Mississippi Canal, but short-haul carriers actually increased.

What happened, rather than an out-and-out decrease, was a shift from the larger and more glamorous long-haul packetboats to smaller short-haul workboats hauling sand, gravel, coal, and other bulk commodities short distances up and down the river. From 1880 to 1908, freight carried by the various packet lines (long-haul) did decline from 567,180 tons in 1880 to 66,255 tons in 1908, a dramatic decrease. But during this same period the local and short distance freight hauled on the Upper Mississippi increased from 197,922 tons in 1880 to 1,783,470 in 1908. Traveling short distances, these small boats did not always pass the "Winona Bridge" or any other bridge when they were counted officially. By comparison, with mother waterway, the average yearly tonnage hauled on the Illinois River in this same period was 22,600 tons.

While the raft boats disappeared completely durin3 this period, the number of towboats and packets actually increased. In 1899 there were 16 packets operating on the river. By 1913 this had risen to 20 packets and 40 towboats. The number rose to 22 packets and 56 towboats by 1915, a year in which traffic records were broken in every division in the Rock Island District, except for the section between Hannibal, Missouri, and the mouth of the Missouri River. (The decrease in this division was due to abandonment of a sand and gravel plant at Hannibal.)

Passenger traffic, too, held up much better than later accounts suggest. The number of passengers carried by all boats in 1915 was 2,008,560. This included 779,683 ferry passengers, but even the remaining number is substantial.

Here again, however, long-range packet service did suffer. By 1918 there were no longer any packets running between St. Pad and St. Louis. All that remained was one short-line boat from Rock Island to St. Pad, one between Rock Island and Quincy, Illinois, and one from Quincy to St. Louis. With the passing of the large packets, the glamour disappeared from the river, but the work remained, shifting to less exciting, small gas and steam launches with barges. By 1920 the five large passenger packet boats remaining on the Upper Mississippi had all been converted into excursion boats; without overnight accommodations.

Shipping of all types on the river did fall off rapidly during World War I, due partly to the difficulty of getting crews. When the economy recovered after the War, industry had lost the habit of shipping by water, and river traffic remained low. In 1925 the Inland Waterway Corporation began a campaign to re-introduce the Mississippi to the Nation, and the decline in river traffic, though never as great as popularly imagined, stopped, and shipping began a slow climb back up.

The 6-Foot Channel

As the 4½-foot channel neared completion with construction of the Moline Lock, it became clear to both river interests and Congress that the shift in river traffic to barges, and the increasing competition from railroads meant a deeper channel was needed if the Upper Mississippi were to remain competitive. Further, it had always been the intention of Congress to increase the 4½-foot channel to 6 feet at some future date. Accordingly, the River and Harbor Act of March 3, 1905, provided for an estimate to be made for securing a 6-foot channel.

Impetus for renewed work on the Mississippi came from the railroad crisis of 1906. Until then railroads had been able to handle nearly all of the produce and merchandise to and from Midwestern farmers. That year a record crop throughout the Midwest overburdened the railroads and left them

with too few freight cars to move the harvest. Even the railroad man James J. Hill suggested making mere use of the waterways.[12] As a result of this crisis, a St. Louis convention in November of 1906 formed the Lakes-to-Gulf Deep Waterway Association. They sent a representative committee to Washington to urge President Theodore Roosevelt and Congress to create a commission to draw up a plan for comprehensive, basin-wide improvement of the inland waterways. This petition was seconded by every important river town along the Mississippi, and on March 14, 1907, President Roosevelt formed the Inland Waterways Commission.

The Commission of nine members with representatives from the Corps of Engineers, conservation groups, and others interested in river planning, began active work in the spring of 1908 by taking a trip down the Mississippi. Roosevelt went along with the group from Keokuk to Memphis, occasioning the largest steamboat parade in history.

Meanwhile, the Act of March 2, 1907, authorized the 6-foot channel, to be done by wing dams, dredging, and additional locks. The 6-foot channel, however, was more complicated than merely digging the 4½-foot channel deeper. Not only would the project cost an estimated $20,000,000 over a 10-year period, it would have further effects on the shape of the river. The 4½-foot channel project had been a single-purpose improvement limited to navigation concerns, but in establishing the Inland Waterway Commission, Roosevelt wrote, "It is not possible to properly frame so large a plan as this for the control of our rivers without taking account of the orderly development of other natural resources."[13]

In addition to dredging and new locks, the Rock Island District estimated that the 6-foot channel would need an additional 2,000 wing dams, 100 to 300 feet long, and 130 miles of bank revetment.

Two locks were projected as part of the improvement. The first of these was at the Des Moines Rapids Canal at Keokuk. For many years the canal had performed well, exceeding expectations. During

high water a steamboat could make the trip down the rapids in less than forty minutes, compared to one and one-half to two hours needed to travel the canal, but the dangers of the natural channel especially at night, outweighed the time advantage and 85% of boats coming down the river used the canal. Up river, against the current, boats almost always preferred the canal. Only the massive log rafts floating down river found the canal difficult. They had to be broken up and reassembled below the canal, a procedure that often took 40 or 50 hours.

The beginning of the and for the Des Moines Rapids Canal came shortly after the turn of the century when the Keokuk and Hamilton Water Power Company requested permission of Congress to build a dam across the Mississippi at Keokuk to generate electricity. As part of its project, the power company proposed to replace the three locks of the canal with a single lock at the dam site. This new lock, with a lift of 40 feet, would be turned over to the Corps of Engineers after completion.

Such a dam across the Mississippi marked a serious shift of direction for navigation improvement. Several earlier dams had been proposed at various locations but none had ever been built. Bridges had caused much interference with navigation, but in 1900 the entire length of the Mississippi below Minneapolis was free of dams. On the other Rand, the lock and dam proposed by the power company would fit nicely with the 6-foot channel then being proposed.

The River and Harbor Act of June 13, 1902, authorized a survey of the Mississippi at Keokuk "to determine whether a dam constructed at the foot of said rapids would be a benefit or impediment to the navigation of said river." The subsequent detailed and careful examination and report by Montgomery Meigs was favorable to the project. Meigs' investigation of the potential effect of the dam showed that it would slow down the boats (15% of the total) that by-passed the canal and went directly over the rapids, and it would prove a hardship to rafters

[who were clearly coming to an end anyway in 1902—there was only one sawmill left below Keokuk), but that it would save time for a vast majority of the river traffic. Meigs estimated that between 1890 and 1901, a single lock at Keokuk would have saved a total of 12,000 hours over the three locks of the anal, a savings of $\frac{9}{10}$ of a cent per tan of freight.[14] In addition, the pool mated by the new dam would flood the entire Des Moines Rapids, cutting both time and expenses by 20% over the canal.

Meigs held a meeting at the Keokuk Engineer Office on April 24, 1903, to receive objections to the proposed lock and dam, but there were none. Local residents and commerical interests all favored the plan.

In 1905 Congress authorized the Keokuk and Hamilton Water Power Company to proceed with the design and construction of the project. The Corps of Engineers made several changes in the original bill permitting construction of the dam. They added a dry dock to be constructed at the power company's expense, and provisions that the company provide free power to operate the locks and dry dock, and that the company construct suitable fishways as might be required by the United States Fish Commission. The lock was to be of sufficient dimensions to meet the requirements of an improved 6-foot channel, preliminary examinations for which were also authorized in 1905.

Part of the agreement with the power company stipulated that there be no delay of navigation during construction. In the end, the company paid damages to one packet company for the loss of one week.

From the beginning, relations between Government and power company employees were both cordid and helpful. Montgomery Meigs and Hugh Cooper, chief engineer of the project, worked together to avoid obstruction to navigation and to consider all the varied river interests in their planning.

Actual construction began in January 1910. Throughout the project, two complete crews worked, one from the Illinois side building the dam, and the other from the Iowa side building the dry dock, the lock, and the power house. For three years the dam slowly grew across the river, a cofferdam to keep the construction site dry proceeding just ahead of the work.

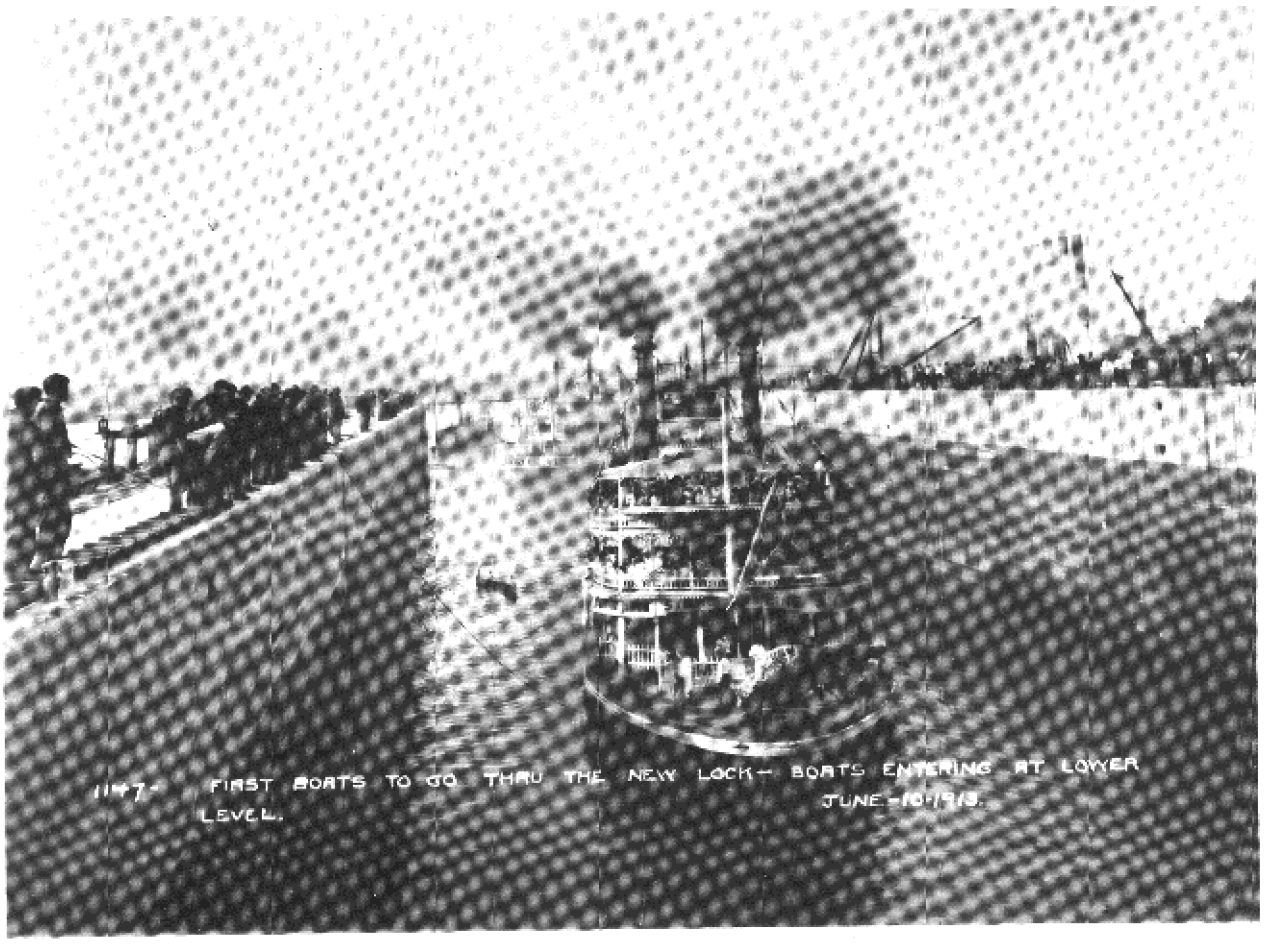
Construction on the Iowa side was more complicated because it became involved with a number of projects, and the canal had to be kept open to navigation. One of the first steps was the construction of a 90-foot temporary drawbridge across the canal just north of the lower lock to permit access to the worksite for workmen, train tracks, and other heavy equipment. This bridge was completed in March 1911.

At both the Iowa and Illinois sites, workers' camps were built along with warehouses and construction yards. At each site, work crews built a rock crusher plant and a concrete mixer plant designed to put out 1,500 cubic yards of concrete a day. Sand for the concrete was pumped out of the Des Moines River, while quarries for rock and cofferdam material were opened along each shore.

Construction on the Iowa side began in the spring of 1911 with the powerplant. A cofferdam surrounding 23 acres was built out from the canal embankment. Here work on the powerplant and lock progressed during 1911 and 1912.

By the middle of 1912 the dam was three-quarters of the way across the Mississippi. At its peak, the project employed 1,200 men and used three steam shovels, five derrick cars, 30 dump cars, and 15 locomotives operating over 20 miles of track.

In order to make way for the final stages of construction, Government employees closed the Des Moines Rapids Canal for good on October 31, 1912. The lower lock and lock grounds were then gradually filled in with waste from the new dry dock excavation immediately east of the lower lock. A sea



The *G. W. Hill* and the *Sidney* become the first boats to go through the new lock on June 10, 1913.

wall was built from this new dry dock across the canal to the Iowa shore. By the time the dry dock was completed in 1914, the lower lock of the canal lay under nearly 50 feet of fill.

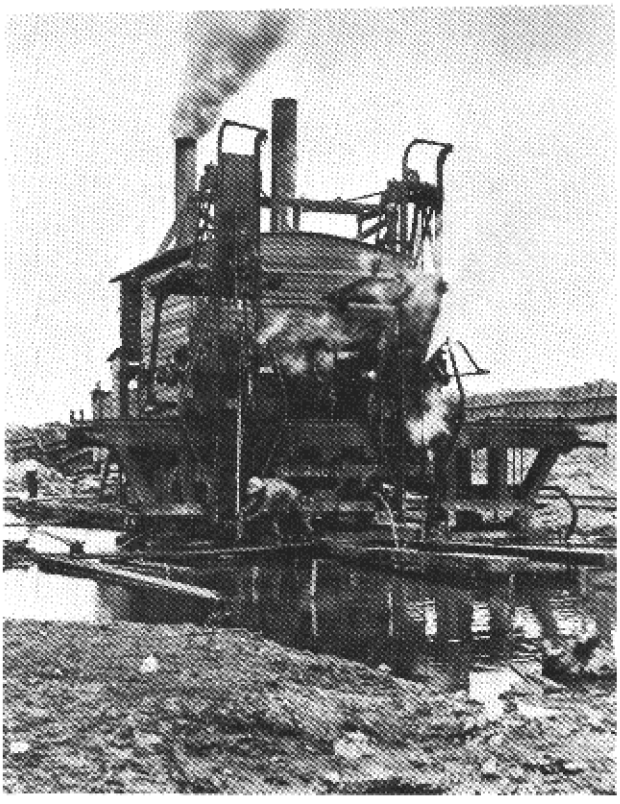
The last concrete was poured in the dam in May of 1913. On May 31, the company, now called the Mississippi River Power Company, held a locomotive parade across the new dam from Illinois to Iowa.

The completed lock was turned over to the Government late in the spring. On June 12, 1913, Rock Island District employees opened the new lock with little fanfare, 18 days ahead of schedule. The first boats into the lock came up river: the *Sidney* of the Streckfus Line, with Captain Streckfus and 405 passengers on board, and the towboat *G. W. Hill.* Montgomery Meigs sent a wire to Major Keller at

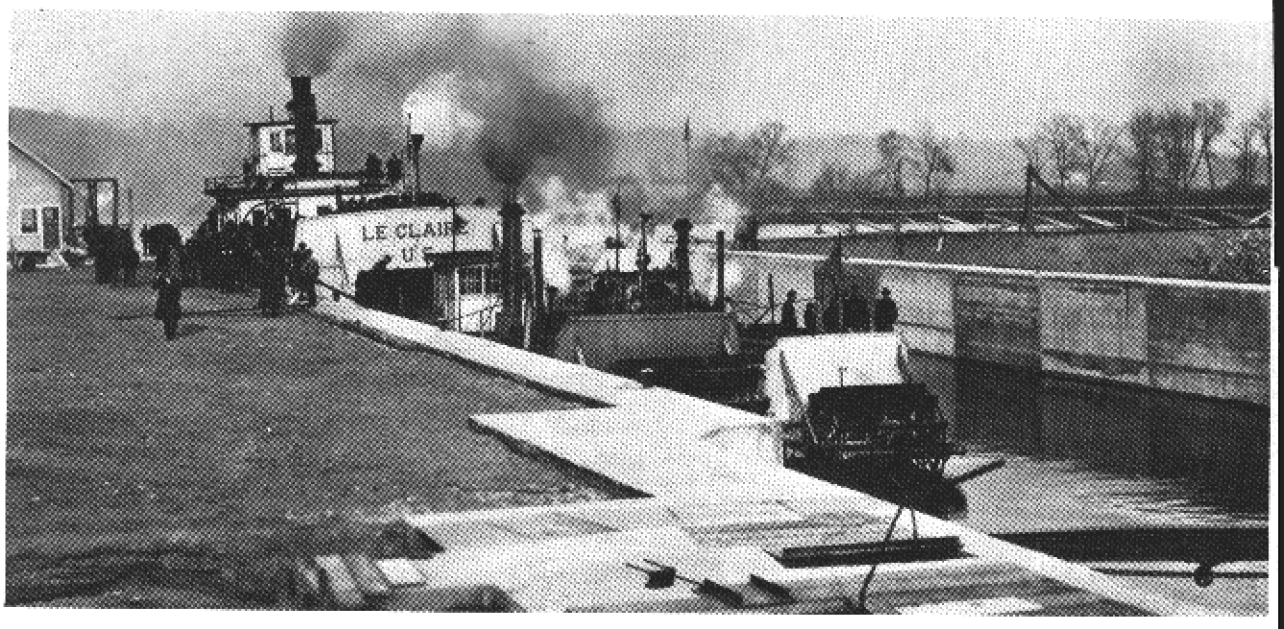
Rock Island: "The *Hill* and *Sidney* first boats through at nine A.M. Five hundred people on boats. Operation of locks perfect, twenty minutes with partial gates. Water at five nineteen eighty. We are breaking the blockade as fast as possible."[15]

In all ways, the new lock was an improvement over the canal locks. The 90-foot width authorized by Congress had expanded to 110 feet, and the 400-foot length provided a minimum depth of 7 feet over the lower miter sill at extreme low water, and a lift of 40 feet. Traditional miter gates were used at the lower end of the lock, but both lock and dry dock used floating gates that submerged to permit access from upstream. Filling and emptying were by gravity, through culverts in the lock walls and beneath the lock floor. The power company estimated the cost of the lock at $640,000.

The new dry dock was finished in the spring of 1914, complete with a sawmill, lumber shed, ice house, storehouse, and shops.



A drill car at work on construction of the Le Claire Canal, the first such machine built in the United States.



Opening day ceremonies at the new Le Claire Canal and Lock, built at the head of the Rock Island Rapids as part of the 6-foot channel project.

The Mississippi River Power Company installed lights at the lock grounds providing free power to run all the machinery, giving Meigs and his staff 20 times the light and power that had been available at the old canal.

For the next 17 years: the Keokuk lock and dry dock performed well. The lock was larger in all dimensions than the two other locks in the Rock Island District: the Moline Lock and the new Le Claire Canal Lock, completed in 1922. Its size was increasingly justified by river traffic, which began to increase after the period of decline in the early 1900's.

The Keokuk Power Dam provided navigation with an additional benefit. On November 11, 1916, the Mississippi River Commission boat Mississippi ran aground on a sandbar 6 miles below the dam. The dam gates were opened for an hour, giving the *Mississippi* a "flash" of 2½ feet, floating her off the bar.

The Le Claire Canal. The second lock to be constructed as part of the 6-foot project was a lateral canal around the Rock Island Rapids at Le Claim, by-passing the upper 3.6 miles of rapids. There was already a 200- by 4-foot channel through this chain,

but it was very crooked. In fact, aside from the section of rapids improved by the Moline Lock, the whole Rock Island Rapids posed a major problem for the 6-foot channel. Some improvement of the rapids had been attempted after the construction of the Moline Lock, but without much success. In 1910 eleven underwater sills were built in the deeper pools below the Duck Creek Chain, 500 feet apart, rising to within 6 feet of the surface at low water. It was hoped that the sills would hold back the water and increase the depth over Duck Creek Chain, but, at most, the increase in depth amounted to six inches.[16]

The Le Claire Canal project was authorized on March 5, 1914. The canal, with a low, longitudinal wall upstream, would give 6 feet of water from Le Claire to the Hampton Pool.

Maps for a lateral canal on the rapids had been drawn by a Board of Engineers in 1888, but the Board did not specify on which side of the river the canal should be Guilt. Engineers for the 6-foot project decided on the Iowa side for several reasons. The existing improved channel was on the Illinois side. Building a canal there would interrupt navigation during construction. A canal on the Iowa side would also be ½-mile shorter. Finally, on the Iowa aide engineers could made use of Smith's Island, a long narrow strip of land close to the Iowa shore, as part of the dike. Using Smith's Island as part of the dike and canal wall would save nearly one mile of construction. The total length of the dike, including the island, was to be 3½ miles. The locks were designed with an 80- by 350-foot chamber.[17]

Before any construction could begin on the Le Claire Canal, war interrupted District activities. Other than greatly reducing work on the 6-foot channel because of the scarcity of hired labor, World War I mused only minor changes in the District. Military guards were established at the Keokuk Lock in 1917 to prevent possible sabotage, and the lack was declared off-limits to visitors.

There was one very minor spy scare in the District. On March 30,1917, District personnel caught

a young man sketching and photographing the Illinois and Mississippi Canal above Milan. The young man chimed to be a student at the University of Chicago working on a Master's thesis. Students were suspect even then, however, and District Engineer Hoffman wrote to the president of the University of Chicago to verify the student's story.[18]

World War I did bring back Major General Alexander Mackenzie to serve as District Engineer. General Mackenzie had retired as Chief of Engineers. He arrived in Rock Island on May 12, 1917, and served until June 1, 1919. During this wartime period, Mackenzie also served as Division Engineer of the Northwest Division. He carried out the official work of that office horn Rock Island.

Following the war, on December 31, 1919, that section of the Rock Island District from the mouth of the Wisconsin River to St. Paul was transferred to the St. Paul District. This left the District with one major project, the Le Claire Canal. In addition, work on the wing dams continued. To bring the channel up to 6 feet, old dams had to be brought up to a grade of 4 feet above low water down to Quincy, and 6 feet above low water from Quincy to the Missouri River. Many new dams also had to be built.

Construction of the Le Claire Canal began in 1921. The project was opened to navigation (though not yet complete) in November of 1922. The final dimensions of the lock chamber were 80 by 120 feet, with a low water depth of 8 feet at the upper sill and 7 feet at the lower sill. By June 30, 1924, the project wa3 92% complete, and cost $20,040,632.78,[19] just over estimate.

Work went well on the 6-foot channel during the 1920's, even though appropriations by Congress never reached the $2,000,000 per year anticipated by the Corps when the project began in 1907. By August 1, 1928, when the section of the Upper Mississippi between the mouths of the Illinois and Missouri Rivers was transferred to the St. Louis District, the Rock Island District had nearly completed

the work on its portion of the channel. In the 423 miles of river within the new limits of the District, only an aggregate of about 35.5 miles of channel was less than 6 feet deep and remained to be completed.[20] By 1930 when the 9-foot channel was authorized, the 6-foot project was 82% complete. Since its beginning in 1866, the Rock Island District had spent a total of $20,018,042.37 on improving navigation on the Upper Mississippi River.

Notes

Chapter 8

1. Colonel Curtis McD. Townsend, "Decline of Water Transportation on Western Rivers," United States Army, Corps of Engineers, *Professional Memoirs*, II (1910), p. 27.

2. *Ibid.*, p. 20.

3. *Annual Report*, 1878, I, p. 705.

4. Information in this and the following paragraph is from the *Annual Reports*, 1890-1915.

5. A full account of the role played by the Corps of Engineers in the long conflict between lumber interests and other river navigation can be found in, Raymond H. Merritt, *Creativity, Conflict & Controversy, a History of the St. Paul District U.S. Army Corps of Engineers* (Washington: Government Printing Office, [1980]), Chapter 7, pp. 253-296.

6. Colonel Townsend to Chief of Engineers, March 3, 1900, File 1652, Vol. 10, Press Copies of Letters Received ("General Letter Books"), RG77, NA.

7. Merritt, p. 269.

8. Edward Clark to Secretary of War, August 16, 1824, File 252, Plans for Removal of Obstructions From Mississippi and Ohio Rivers, 1824-25, RG77, NA.

9. *Annual Report*, 1875, I, p. 473.

10. *Annual Report*, 1880, II, p. 1489.

11. *Annual Report*, 1895, II, p. 2107.

12. Julius Chambers, *The Mississippi River and Its Wonderful Valley* (New York: Putnam's, 1910), p. 231.

13. President Theodore Roosevelt, quoted in Norman Wengert, "The Politics of River Basin Development," *Law and Contemporary Problems*, XXII (Spring 1957), 267.

14. "Report of Mr. Montgomery Meigs, U.S. Civil Engineer," *Annual Report*, 1916, II, p. 1509.

15. Montgomery Meigs to Major Keller, June 12, 1912, Rock Island District Files.

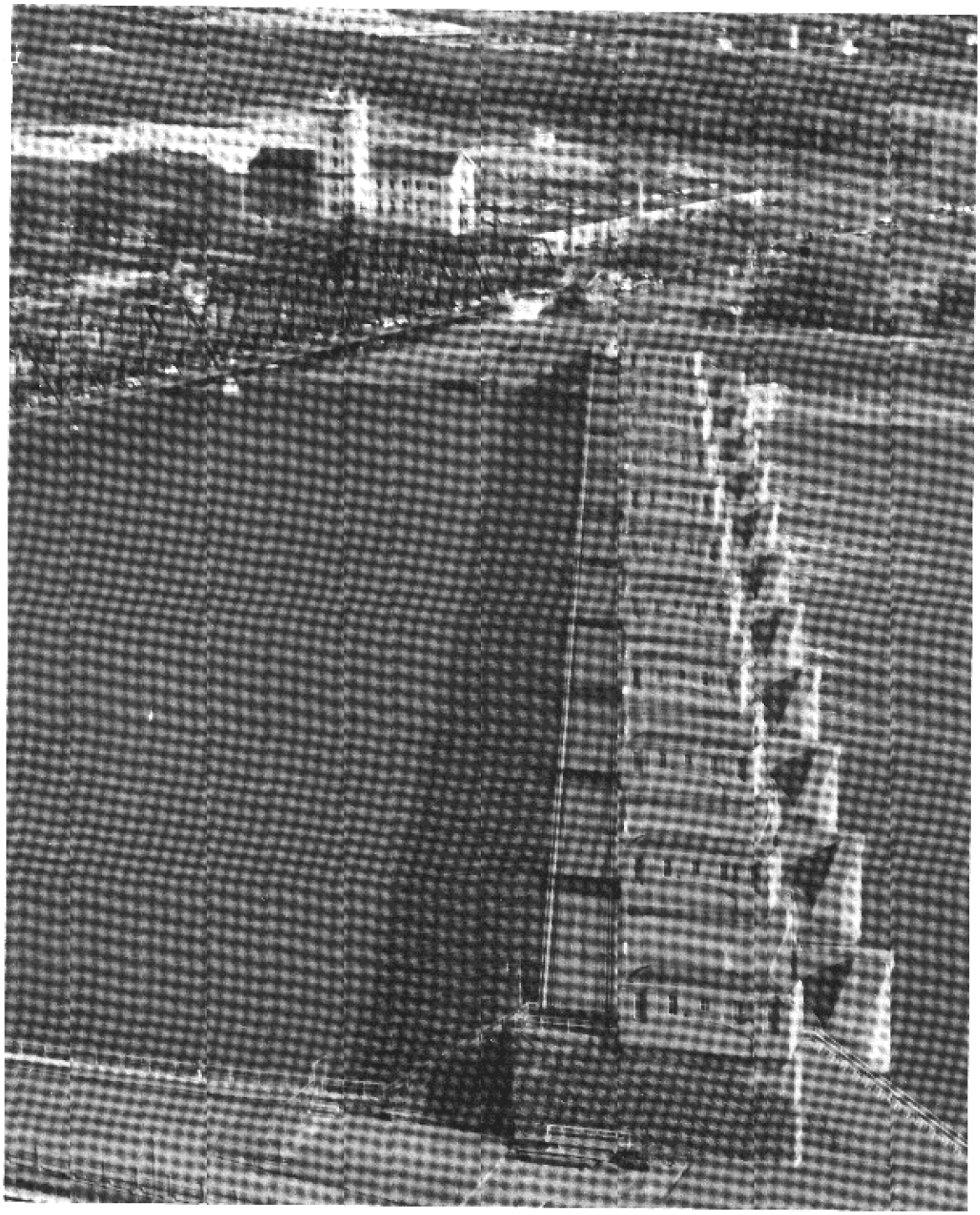
16. "K" at Rock Island District Headquarters to Colonel Walter Fisk, President, Mississippi River Commission, Feb. 4, 1911, Old Rock Island File, RG77, KCFRC.

17. *Annual Report*, 1916, II, p. 2607.

18. Major George Hoffman to President, University of Chicago, March 30, 1917, Rock Island District Files.

19. *Annual Report*, 1924, I, p. 1090.

20. *Annual Report*, 1929, I. p. 1120.



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