

ST. PAUL

DUBUQUE

ROCK ISLAND

CHICAGO

MINNEAPOLIS

HASTINGS

RED WING

ALMA

TREMPEALEAU

LA CROSSE

GENOA

LYNXVILLE

GUTTENBERG

DUBUQUE

BELLEVUE

CLINTON

LE CLAIRE

ROCK ISLAND

MUSCATINE

NEW BOSTON

BURLINGTON

KEOKUK

CANTON

QUINCY

SAVERTON

CLARKSVILLE

CAP AU CRIS

ALTON

ST. LOUIS

Chapter Five: Downstream Dams

The Mississippi River cuts a crooked 2,348 mile path in its journey from Lake Itasca to the Gulf of Mexico. Except at the delta, the 1,179 miles south of St. Louis is deep enough to carry large commercial barges. Above St. Louis the navigable portion of the river has been divided by the Corps of Engineers into three segments.¹ The river from the mouth of the Missouri River to mile marker 300 above the Ohio River, a distance of 105 miles, has been assigned to the St. Louis District. The next 314 miles is the responsibility of the Rock Island District. The last 786 miles fall within the jurisdiction of the St. Paul District. In this last segment, a stretch of 244 miles, between mile 614 above the Ohio River and the Soo Line railway bridge in Minneapolis, is a channel for commercial traffic. The history of this part of the river can be divided into five periods:

I. *1830-77: Steamboat Era.* During this period an attempt was made under the jurisdiction of the Rock Island District to clear the upper river of its worst obstructions—snags, shoals, sand bars, rocks, trees and rapids.

II. *1878-1906: Four and a Half-Foot Channel.* Congress authorized the clearing of a channel by dredging, closing by-passes and building lateral canals. Harbors of refuge were also developed. During this period \$11,676,356.76 was expended under the direction of the Rock Island District.²

III. *1907-30: Six-Foot Channel.* In 1907 Congress directed the Corps to maintain a six-foot channel by improved dredging and the on-going construction of wing dams and cut-offs. This was the time when commercial transportation diminished on the upper Mississippi and pleasure boats came to dominate river usage. Over fifty-two million dollars was spent on channel improvements in this period.³

IV. *1930-39: Nine-Foot Channel.* During the thirties a nine-foot channel between St. Louis and St. Paul was authorized through a system of twenty-six locks and dams. This huge construction project transformed the

The Mississippi River above St. Louis is divided into three sections. The St. Louis district is in charge of the first 105 miles, the Rock Island District the next 314-mile section, and the St. Paul District is responsible for the upper Mississippi watershed above Guttenberg, Iowa. The design of a nine-foot channel called for the eventual construction of twenty-nine dams with slack-water pools as depicted in the profile shown here.

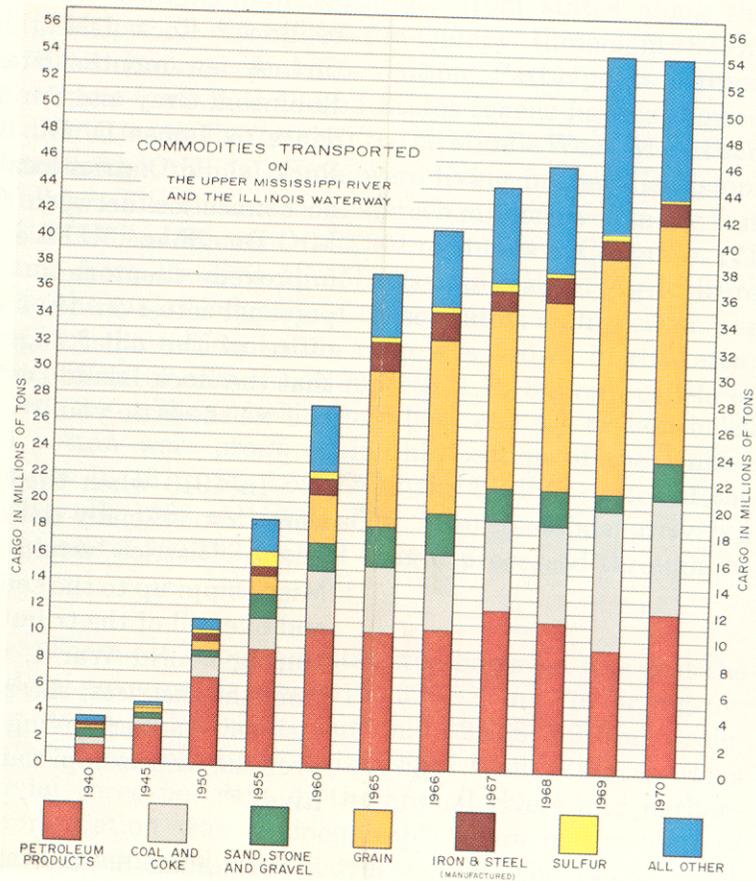
Mississippi into a slack-water canal. Eventually twenty-nine dams were built over 669 miles of the river. In 1930 the St. Paul District was for the first time assigned responsibility for a portion of this development.

V. 1940-76: *Commercial and Recreational Waterway.* During World War II commercial navigation began to revive on the Mississippi. The activity of the Corps was concentrated on operating the locks and dams, dredging the channel, building commercial terminals and pleasure-boat harbors, and providing public access to recreational facilities.

In 1967 two ten-year studies began. One program anticipated the possibility of year-round navigation. The shipping season is now limited to about forty-two weeks. Provisions for operating the locks in winter, methods for handling ice floes and the passage of ice through the locks, de-icing systems and new approaches to ice-breaking were scheduled for investigation.⁴ In 1974 winter navigation studies on the river above Burlington, Iowa, were discontinued because of lack of economic feasibility. The second study concerned the enlargement of the river to a twelve-foot channel. Hearings held in 1967 revealed strong opposition of railroads, drainage districts and conservation and recreational interests to the latter plan. A combination of three alternatives was studied: renovating the existing lock and dam network, contracting the channel with dikes and deepening the channel by dredging.⁵ Studies of the twelve-foot channel proposal were suspended in the early 1970s because of public opposition and a probable lack of economic feasibility.

The major work of increasing the Mississippi channel to a six-foot depth was done by dredging.





It was not until after World War II that navigation once again made an impact on the upper Mississippi.

Rock Island Overlap

From 1873 until 1919 the Rock Island District was responsible for the main channel of the Mississippi River as far as St. Paul. In order to administer this responsibility the Rock Island District established two suboffices in the St. Paul District for its assistant engineers, one at La Crosse and the other in St. Paul. This arrangement caused some misunderstandings, both for Corps officers and for their public constituents. Further complications came from the fact that the St. Paul District was responsible for the tributaries that flowed into the Mississippi between the Twin Cities and the Chippewa River.

Major Francis Shunk in 1909 tried to simplify the division of labor between the two districts by suggesting

that the responsibility for dredging and equipment maintenance remain with the Rock Island District, while the St. Paul engineer would indicate where the work was to be done.⁶ Rock Island rejected this intrusion onto its turf. A few months later, Shunk informed the firm of Robinson, Gray and Sunde to address all their correspondence to James D. Du Shane, assistant engineer of the Rock Island District located in St. Paul, because "there is no connection between this office and that in charge of Mr. Du Shane."⁷ Five years later relations had not improved. Lieutenant Colonel Charles Potter wrote a personal letter in 1914 to Colonel Henry Taylor in the office of the chief engineer expressing his displeasure that the Rock Island District has "always been the great I and we the little you."⁸

In 1913 when the boundaries of all Corps districts were first officially defined it was agreed that the Rock Island District would continue jurisdiction over the Mississippi up to the southern limit of the city of St. Paul, and over all of the tributaries below the Chippewa River.⁹ During World War I, when Corps officers were absent from the districts, the boundaries were divided in a more rational manner, giving the St. Paul District full control over the Mississippi and its tributaries to the Wisconsin River.¹⁰

Conflicts between the districts were not wholly solved by this division, however. For example, the St. Paul office complained in 1926 that Rock Island was letting contracts for brush-cutting operations out of La Crosse, which was in the St. Paul District.¹¹ Part of the difficulty stemmed from the fact that snag removal on the Mississippi and its tributaries was performed by Rock Island. That district spent \$1,579,507 in snagging operations from 1888, when Congress authorized a perpetual \$25,000 annual appropriation, until 1935, when the project was terminated.¹² In 1930 the Mississippi river above St. Louis was divided into three sections to facilitate the development of locks and dams for the nine-foot channel. The boundary between Rock Island and St. Paul was then established in its present location at Lock and Dam Number 10, and a new era of mutual co-operation was initiated.¹³ By 1957 Rock Island had the smallest staff of any Corps district and its work load had diminished to the point where incorporation into the St. Paul District was considered. Only strong political pressure kept the Illinois Corps office open.¹⁴

Commercial Realities

Commercial representatives from states along the Mississippi River basin met in Quincy, Illinois, in 1879 at a River Improvement Convention. Participants learned that post-Civil War United States census figures showed a dramatic population shift to the Middle West. More than twenty-two million people were living in the Mississippi Valley, while a minority of sixteen million lived in the rest of the United States. Of the 301 members of Congress, 171 came from states in the Mississippi Valley. Agriculture was the major industry of these states; eighty-seven per cent of the national farm crop was grown in this area. According to convention reports, 1.13 billion bushels of corn, 2.9 million bushels of wheat and 4.4 million bales of cotton were produced in this section of the United States in 1876. St. Louis was the trading center of the valley. By 1888, statistics show 2,810 steamboat arrivals a year and 6,350,393 tons of freight processed through its port.¹⁵

The most important statistic, however, was that the federal government spent \$100,378,822 in 1876 for improving rivers and harbors, but only \$2,668,769 were designated for projects in Mississippi Valley states. This trivial three per cent of the annual rivers and harbors appropriation was an inequitable share in the view of these commercially-minded delegates. The 14,086 miles of navigable waters in the Mississippi basin received less money than was required to improve one portion of New York City's harbor.¹⁶

The Quincy convention drew up a number of resolutions petitioning the federal government for funds to improve inland waterways. Delegates voted funds for a special lobbyist to work for their interests in Washington. Linking economic prosperity and effective water transportation, the convention went on record in favor of a reservoir system in northern Minnesota, restrictions on commercial use of private wharves and other construction, and legislation to prohibit cities from using water power created by federal river improvements.

These resolutions contained certain contradictions. It seemed logical to demand a fair share of river and harbor improvement money, but why did a convention of businessmen oppose private wharves and municipal power development? Commercial statistics reveal that the real

TABLE 9 DES MOINES RAPIDS CANAL TRAFFIC

	1891	1895	1899	1903	1908	1913
Steamboats	577	760	882	713	1,180	1,082
Barges	191	272	381	158	261	625
Launches	—	—	—	—	—	667
Passengers	10,260	21,778	27,488	47,893	34,242	98,379
Merchandise in tons	12,228	40,365	25,105	15,838	7,878	23,116
Grain in tons	63,210	54,345	6,902 bu.	1,278 bu.	2,500 bu.	—
Lumber in feet	140,654,084	101,649,575	78,857,657	9,500,000	600,000	—
Logs in feet	24,514,000	13,616,000	32,142,560	3,400,000	10,903,000	30,000
Shingles	61,141,137	28,866,520	24,564,721	3,200,000	100,000	—
Lath	39,476,926	28,834,228	18,502,200	900,000	100,000	—
TOTAL Freight tons	4,200,000	2,250,000	2,900,000	4,545,129*	2,581,857*	2,145,215*

*These figures include government rock and gravel hauled, and other river maintenance traffic.
From: Office of the Chief of Engineers *Annual Reports*, for respective years.

campaigners for Mississippi River improvements were the lumber companies. The upper river was not used for shipping large quantities of merchandise, grain, fuel, and farm products and very early the railroads captured most of the grain business.¹⁷ In 1885 Minneapolis received over thirty-two million bushels of wheat and shipped by water less than a thousand barrels of flour.¹⁸ The upper river was dominated by forest product traffic from 1870 to 1910. Speaking for the lumber industry, such publications as the *Mississippi Valley Lumberman* took the lead in promoting the improvement of the river to meet their needs.

The prominence of lumber traffic can be seen in Table I. In 1880 over 614 million board feet of lumber were cut and shipped by water from sawmills between St. Cloud and Hannibal.¹⁹ This business peaked in 1890 when 1.23 billion board feet were produced (see Table 10). In 1891,

TABLE 10 LUMBER MANUFACTURE ON THE MISSISSIPPI RIVER FROM ST. PAUL TO ST. LOUIS FOR NINE YEARS

YEAR	LUMBER	SHINGLES	LATHS
	Feet	Number	Number
1886	934,735,854	274,581,750	267,888,340
1887	988,361,094	363,239,750	—
1888	1,048,951,386	423,655,050	—
1889	1,044,555,298	463,132,700	—
1890	1,231,678,960	508,986,705	—
1891	814,228,707	332,666,750	207,722,350
1892	931,806,305	357,014,775	228,042,910
1893	811,576,588	285,897,000	190,394,000
1894	673,572,000	204,198,000	158,586,000
TOTAL	8,479,466,192	3,213,372,480	—

From: Office of the Chief of Engineers *Annual Report*, 1895, p. 2106.

TABLE 11 LUMBER PRODUCTS RECEIVED AT ST. LOUIS FROM
UPPER MISSISSIPPI RIVER DURING 1886, 1887, 1888 and 1889

	Feet	Feet	Feet	Number	Number	Number	Number
1886	124,154,170	3,925,500	128,079,670	48,483,000	37,154,600	862,330	86,499,930
1887	136,490,066	6,436,000	142,926,066	70,370,735	43,034,705	448,060	113,853,500
1888	70,311,387	8,734,000	88,045,387	25,743,500	14,650,367	273,744	40,667,611
1889	71,935,820	11,951,345	83,887,165	43,350,500	21,386,350	401,932	65,138,782

From: Office of the Chief of Engineers *Annual Report, 1890, p. 2032*

140 million board feet of lumber went through Des Moines Rapids Canal.²⁰ In 1894 there were 100 sawmills between Minneapolis and St. Louis operated by eighty-four wholesale lumber firms with an investment of fifty million dollars. These firms owned seventy-five towboats.²¹ Five years later there were eighty-five towboats, but only eighty sawmills and sixty wholesale lumber firms with an investment of forty million dollars.²² During this period, less of the lumber was going to St. Louis (see Table 11). The decline in through traffic was also reflected in the tabulations kept by the Corps on steamboat, barge and raft traffic going past bridges on the Mississippi (see Table 12). Although many of the logs from the north were

TABLE 12 MISSISSIPPI RIVER TRAFFIC
PAST KEY BRIDGES, 1885-99

	STEAMBOATS				
	1885	1888	1891	1894	1899
Hastings	1009	521	503	709	1110
Winona	5126	4740	3687	3715	3975
La Crosse	4775	5242	3547	3017	3148
Rock Island	2331	2699	2694	2110	3350
Quincy	1959	1959	1604	1757	1811
Hannibal	2135	2125	1637	1792	820
	BARGES				
	1885	1888	1891	1894	1899
Hastings	1316	424	510	900	384
Winona	848	684	1108	1422	1508
La Crosse	475	279	568	883	1221
Rock Island	153	143	571	613	1104
Quincy	602	595	615	640	577
Hannibal	458	234	590	1193	282
	RAFTS				
	1885	1888	1891	1894	1899
Hastings	4	26	43	116	293
Winona	1973	1894	1495	1172	1087
La Crosse	1797	1683	1265	908	748
Rock Island	747	828	634	509	379
Quincy	298	317	180	131	104
Hannibal	N. R.	315	319	177	75

From: Office of the Chief of Engineers
Annual Reports, 1888, 1891, 1892, 1895, and 1900

**TABLE 13 LUMBER MANUFACTURE ALONG THE
UPPER MISSISSIPPI RIVER
FROM MINNEAPOLIS TO ST. LOUIS IN 1894**

LOCALITY	LUMBER	SHINGLES	LATHS
	Feet	Numbers	Numbers
Minneapolis	491,256,793	121,323,750	93,940,123
Hastings	2,750,000	2,000,000	1,000,000
Red Wing	8,059,000	3,147,000	1,300,000
Alma	900,000	1,000,000	150,000
Winona	119,500,000	53,000,000	38,550,000
Lansing	15,000,000	9,000,000	3,000,000
Prairie du Chien	12,500,000	10,000,000	2,500,000
Guttenberg	14,000,000	4,700,000	2,114,000
Cassville	1,000,000	900,000	240,000
Dubuque	51,650,000	17,550,000	7,280,000
Bellevue	2,037,000	—	1,076,000
Lyons	12,006,000	1,440,000	1,330,000
Clinton	101,662,000	11,239,000	13,500,000
Fulton	14,120,000	4,550,000	2,811,000
Moline	28,188,000	3,457,000	4,236,000
Davenport	50,500,000	7,300,000	9,100,000
Rock Island	84,500,000	17,174,000	21,970,000
Muscatine	56,000,000	11,000,000	17,000,000
Burlington	27,000,000	5,000,000	14,000,000
Fort Madison	16,000,000	12,720,000	4,800,000
Keokuk	10,000,000	5,000,000	2,000,000
Canton	4,700,000	4,521,000	2,029,000
Quincy	21,500,000	10,000,000	3,600,000
Hannibal	20,000,000	9,500,000	5,000,000
TOTAL	1,164,828,793	325,521,750	252,526,125

From: Office of the Chief of Engineers *Annual Report, 1895*, p. 2106

processed at Minneapolis, one can see in Table 13 that by 1894 much of the raw timber was also floated to small sawmills along the Mississippi. Power dams and private wharves built for freight traffic restricted the free movement of these logs, but the timber traffic still dominated the Mississippi. Twenty years later, lumbering along upper Mississippi tributaries had ended.

**TABLE 14 UPPER MISSISSIPPI TONNAGE
RECEIVED AND SHIPPED FROM ST. LOUIS**

	1886	1887	1888	1889	1890	1891
Received	140,000	132,400	114,940	113,305	128,960	90,865
Shipped	47,670	36,170	50,315	47,560	22,547	18,630
Total	187,670	168,570	165,255	160,865	151,507	109,494

1891—Upper Mississippi steamboats and barges—
713 arrive, 649 depart

From: Office of the Chief of Engineers
Annual Report, 1891, p. 2146;
Annual Report, 1892, p. 1763.

**TABLE 15
TOTAL FREIGHT
ON THE UPPER
MISSISSIPPI**

1890—4,400,000 tons
1895—3,000,000 tons
1900—2,900,000 tons
1905—4,089,000 tons*
1910—1,900,000 tons*
1915— 729,723 tons*
1920— 630,951 tons*
1925— 980,605 tons*
1931— 864,583 tons*

*Includes government dredging work and local commerce

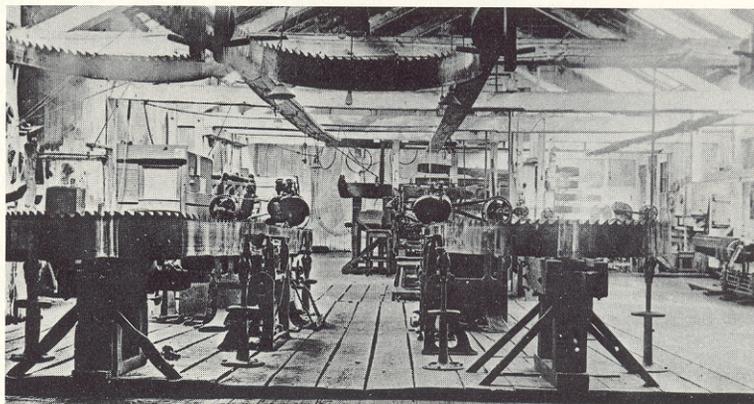
From: Office of the Chief of Engineers
Annual Report, for respective years.

With the decline in lumber products came an overall decrease in freight shipped on the river. The decline of freight shipped and received in St. Louis can be seen in Table 14 . This decrease paralleled the freight loss on the upper Mississippi; at the height of the lumber trade, over four million tons were shipped on the river. In 1924 only five freight boats were making regular trips from St. Louis to St. Paul. The Mississippi and Ohio Steamboat Company had one boat, the River Transit Company had three self-propelled barges, and the St. Louis and Tennessee River Packet Company ran one. The Eagle Packet Company and Carnival City Packet Company ran occasional steamers during the fruit season.²³ By 1930 only one-half million tons of freight were shipped on the river, and most of it consisted of sand and gravel (see Table 15) . During the late 1920s a Federal Barge Line was organized and this association accounted for a slight rise in river freight traffic.²⁴

As the lumber industry and freight shipments declined on the river, the passenger business grew. Des Moines Rapids Canal tabulations indicate that the excursion boat industry took over the idle river. By the 1920s over two million passengers were registered on pleasure packets and “other wild boats.”²⁵

The total cost for construction and maintenance of the six-foot channel from the Wisconsin River to Minneapolis between 1878 and 1930 was \$15,123,462 or \$67,818 per mile or \$1,305 per mile per year.²⁶ It would take a very detailed study to appraise the benefits of this expenditure. In spite of the Corps of Engineers’ efforts to maintain a clear channel, from 1890 to 1930 the commercial traffic on the river decreased year by year until the government dredging plant itself became the single greatest carrier on the upper Mississippi.

Sawmills once flourished along the Mississippi from Grand Rapids, Minnesota, to Hannibal, Missouri. The interior of a sawmill was a noisy, dusty, dangerous place to work.



Bridges Over The Mississippi

It is no secret that the Corps of Engineers' support of navigation was strongly opposed by railroad corporations. Their hostility to Corps programs had deep historical roots. In the post-Civil War period the Corps and the railroads were divided over two issues—bridge construction and the location of terminal facilities. The precedent for their clash was set when the Corps opposed the construction of the James Eads bridge over the Mississippi at St. Louis. This classic confrontation, however, had its origin in Corps policies in the St. Paul District office.

In June, 1866, Congress asked the Corps of Engineers to prepare a report on the construction of railroad bridges over the Mississippi River between St. Paul and St. Louis. Major G. K. Warren, then district engineer at St. Paul, was assigned the task, and he used the opportunity to prepare a book-length argument favoring steamboat rather than railroad needs in bridge building.²⁷ His report, based on the prevailing steamboat design of high pilothouses and tall chimney stacks, recommended that all bridges over the Mississippi have high-water clearances up to 100 feet and wide spans up to 500 feet. Warren's study became a standard reference for Corps policy for fifty years.

Because of Warren's duties and his declining health, his report was not published until 1878. By that time railroad bridges had been constructed at St. Paul, Winona, La Crosse, Prairie du Chien, Dubuque, Clinton, Rock Island, Burlington, Keokuk, Quincy, Hannibal and St. Louis.²⁸ All of these bridges except those at La Crosse, St. Paul and St. Louis caused problems for steamboat traffic. Most of them were drawbridges. Joseph Reynolds, president of the Diamond Jo Line of packets and towboats, complained in 1881 that the Rock Island bridge had caused two accidents to his steamboats with damages in excess of \$12,000. Reynolds estimated that each trip from St. Paul to St. Louis cost his company about \$600 per journey because of delays and damages due to inadequate railroad bridge design. Ironically, it was Major Warren who was responsible for the design and construction of the bridge in 1869-70 at Rock Island, the only one of the eleven built by the United States government. His recommendations were published eight years after the bridge was erected.²⁹

Railroad companies used their influence in attempts to modify Corps bridge policy. D. J. Whittemore, chief engineer of the Chicago, Milwaukee and St. Paul Railway, wrote to Lieutenant Colonel William R. King in 1897 that the railroad contemplated new construction on the Prairie du Chien pontoon bridge but was "not prepared to inform the general public" of the intended changes. He also went to Washington to get in touch with the office of the chief of engineers and certain congressmen. He wanted assurances from King and others that they would approve his proposed bridge improvements.³⁰ All this was done by Whittemore before C. W. Durham, the Corps' assistant engineer in charge of the section of the river including Prairie du Chien, was asked to make an objective investigation and formal report.

The forty-foot pier built in the Mississippi River and St. Paul by the Milwaukee and Northwestern Railroad in 1885 was one of the unauthorized bridges that became a source of aggravation to steamboat pilots.

On the other hand, in bridge matters railroads often ignored the Corps altogether. The Minnesota and Northwestern Railroad Company built a forty-foot pier in the middle of the Mississippi at St. Paul in 1885 under the bridge authorization of Minnesota state law.³¹ This was only one of numerous cases which put the Corps of

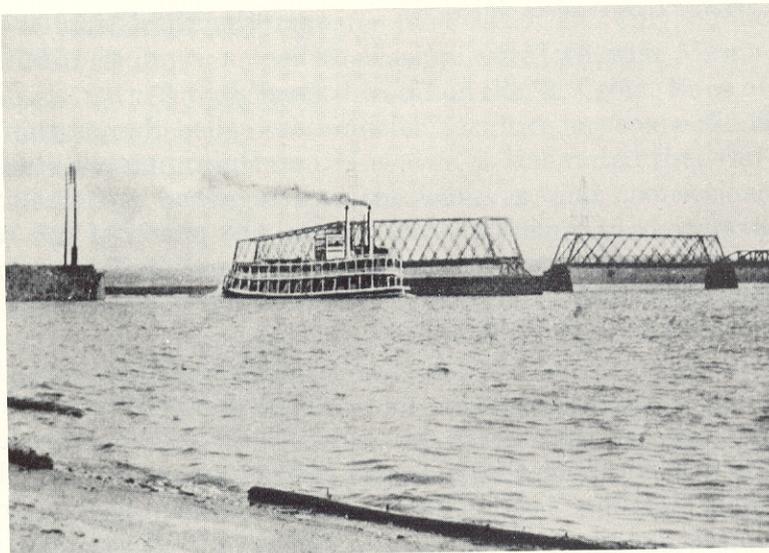


Engineers in an ambiguous position. First of all, the Corps was responsible for regulating commerce on all "navigable rivers." However, Congress never provided a list of "navigable rivers." According to Major Francis Shunk, the Supreme Court had ruled that such a list was unconstitutional and that a river was navigable only if it was "navigable in fact." The War Department declared logging a form of navigation.³² Thus, if any logs could be floated on a freshet, it was possible to declare that brook a navigable stream. However, if some individual, government body, or corporation built a bridge across a river without congressional authorization, the Corps did not have the power to interfere, for its jurisdiction did not extend beyond specific congressional legislation. Thus, many railroad bridges were "unauthorized structures," that is, not authorized by the Corps, but allowed to exist until someone decided to make a complaint.³³ At that point the secretary of war could ask the attorney general to investigate a reported obstruction to navigation. If the attorney general's investigation did indicate an obstruction, and an outside settlement was not negotiated with railroad lawyers, the matter would be put in the hands of the United States district court. The Corps itself was not a policing agency nor an investigative body. It only issued guidelines for construction and permits for authorized structures which had received prior congressional approval.

Drawbridges also became a problem for railroads when gas-powered launches and pleasure boats began to cruise the river around the turn of the century. C. F. Loweth, chief engineer of the Chicago, Milwaukee and St. Paul Railway, asserted that opening and closing the Prairie du Chien drawbridge thirty-eight times in one day for boats was too much to expect of a business enterprise.³⁴ But William A. Thompson, the government engineer, favored the boatowners.

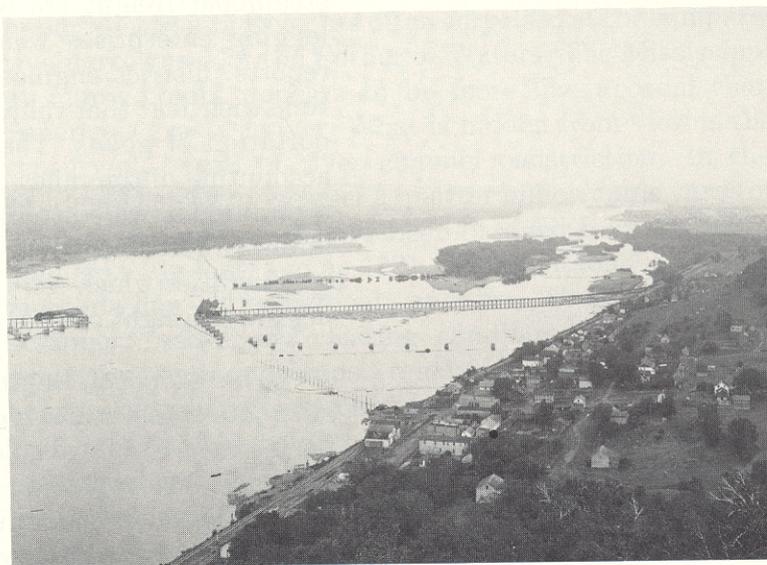
Collecting tolls from bridge users was an additional nuisance for bridge-owners. The regulation of rates for toll bridges came under the authority of the secretary of war. Sheep and cattle crossed bridges for two cents. A bicycle rider went across for five cents, a threshing machine for one dollar. District engineers, asked to set a toll for automobiles, decided that the round-trip bridge toll for a two-seater auto with driver and female passenger would be twenty-five cents, and each additional passenger would also pay a quarter.³⁵

Drawbridges such as this one at Hudson, Wisconsin, were so controversial that they nearly caused open warfare between rail and water transportation interests.



Another area of conflict between railroads and the Corps was the construction on railroad rights-of-way along the banks of the Mississippi. J. C. Day of La Crescent complained that railroad embankments caused lowland flooding and were responsible for depositing sand on good hay fields³⁶ The adverse effects of embankments were also discussed in conjunction with a controversy over the location of the Chippewa Valley and Superior Railway bridge in 1882 between Reads Landing and Wabasha. Captain Joseph Buisson, a river pilot, obtained the signatures of fifty-one rivermen who felt that “the numerous bridges built across the Mississippi regardless of location have seriously injured our business.” They opposed the building of a bridge at Reads Landing because it would

The Reads Landing pontoon railway became a center of controversy between river pilots and railroad officials in 1882. The completed structure below the confluence of the Chippewa and Mississippi Rivers is shown as it appeared in 1900. Note the sandbars formed by the Chippewa flowage.



span the Mississippi at the mouth of the Chippewa River, where a sandbar continually caused navigational problems³⁷ J. M. Turner, a well-known Chippewa Valley lumberman, called the petition a "sham and a fraud," charging that Buisson actually wanted a bridge built at Wabasha where he had his home³⁸ Such arguments naturally played into the hands of the railroad, for the emphasis of the controversy shifted to urban rivalry rather than railroad construction practices.

On the other hand, at times civilian personnel working for the Corps showed partiality to the lumber interests. In December, 1896, when an unusual midwinter thaw and heavy rains caused flooding on the Chippewa River, over forty million feet of logs went rampaging down the Mississippi River. Six miles below Wabasha the Mississippi River Logging Company closed its boom to save the logs, thus obstructing the main river channel. Ice built up behind the logjam and the eight-foot river channel froze solid from top to bottom, forming a huge dam. Water backed up the Chippewa River sixteen miles to Durand, Wisconsin, flooding lowland farms and homes. Upon investigating the destruction, William A. Thompson, a civilian engineer in the Corps sub-office at LaCrosse, Wisconsin, who used the title "Captain" wrote, "I don't see as the United States has anything to do with the matter. I know of no Government property being destroyed and the logging company say they will surely remove obstructing piles by the time navigation opens up."³⁹

By the turn of the century it was evident that the steamboat freight era was over and the end of massive logging enterprises was in sight. In their 1906 annual reports, district engineers discussed openly for the first time their fear that railroads would monopolize the transportation of goods. Their reports began to give a close accounting of ton-miles of traffic. In 1911 it was clear that the railroads were attempting to capture river freight by lowering rates on north-south business, cutting rates on commodities which were also shipped by water, and offering lower freight charges during the navigation season.⁴⁰

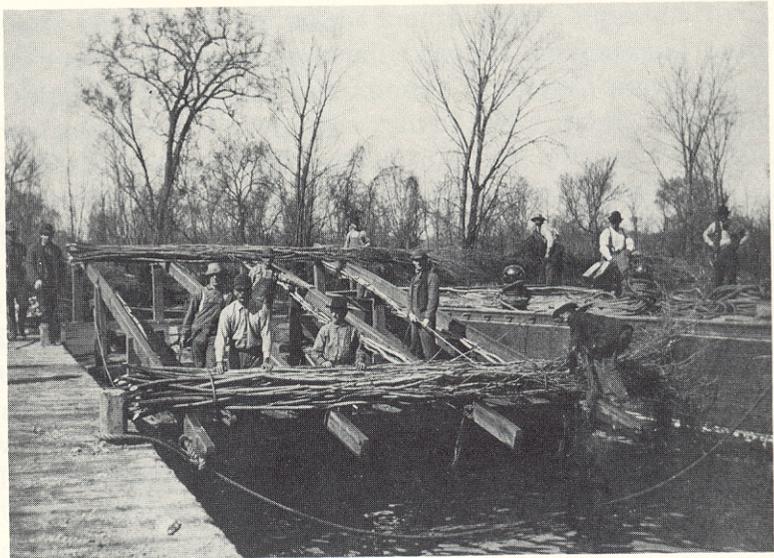
The Corps of Engineers soon realized that without adequate transfer and terminal facilities in the major river ports, most freight would of necessity be shipped by the railroads. From 1915 to 1928 each annual report emphasized the need for more public terminals. By 1918 the chief of engineers asked each district to make a survey of river

port terminals and transfer facilities.⁴¹ The only public terminals on the upper Mississippi were located in Minneapolis, St. Paul and at Stillwater on the St. Croix. None of them had mechanical transfer facilities or connections between rail and water. However, it was noted that railways were contiguous to the wharves, and connections would be rather simple if the railroads wished to co-operate. The only facility having rail transfer was the municipal dock in St. Paul at the foot of Market Street, which had only poor connections with the paved city thoroughfares.⁴² Annual reports in the 1920s kept the terminal question alive. They noted that the only functional transfer point between water and rail was at Alton, Illinois, and was controlled by the Illinois Terminal Railroad. In 1928 plans were approved by the War Department and the Inland Waterways Corporation for modern river terminals, municipally owned, at Minneapolis, St. Paul and Dubuque, Iowa. Local contributions were expected. But the river towns were hard-pressed for capital; cities during this period were expanding their sewer and water systems, paving streets, and providing citizens with numerous other public services in the areas of education, health, recreation, public safety and welfare. Thus, commercial river traffic was hampered by inadequate terminals until after World War II. No commercial facilities solely funded by the federal government were ever built.⁴³

Wing Dams And Floating Plant

Visitors flying in modern commercial jets over the upper Mississippi River are often surprised at the comparative narrowness of the Father of Waters. The Mississippi at many points appears to be more like a canal than America's greatest river. What is hidden from view is the century-old work of river channel constriction. In the St. Paul District alone over a quarter billion cubic yards of rock, gravel and sand have been dredged from the main channel.⁴⁴ As long ago as 1871 the "Montana," a government dredge and snagboat, and the "C. J. Caffrey," a scrapper, were busy clearing sandbars, building wing dams, extracting stumps, removing trees and pulling snags and other debris out of the channel. In that year both vessels logged over 7,000 miles in attempts to provide steamboats with a three to three and one-half-foot channel depth.⁴⁵ In 1908 federal legislation designated a channel width of 300 feet from St. Paul to the mouth of the St.

Wing dam construction began with the building of willow mats (Kirchner crew, 1895).



Croix; from the St. Croix to Lake Pepin the channel was restricted to 600 feet. Further downstream at the Wisconsin River the channel limit was 700 feet, and at Rock Island 900 feet.⁴⁶

The major method of channel constriction was by wing dam construction. To supplement dams, cutoffs were dug, secondary channels closed and shoreline revetments ripped. Between 1866 and 1930, hundreds of wing dams were constructed. In the twenty-mile stretch from Reads Landing to Minneiska, Minnesota, for example, 257 dams were built.⁴⁷ Wing dam construction was a year-round activity. Work was commonly begun in winter with the dumping of stone and brush on the ice. The techniques

The completed mats were submerged into the river (Kirchner crew, 1894).



of wing dam construction evolved over a seventy-five-year period, and in the 1920s detailed specifications were published.⁴⁸ The dams, usually built in pairs, extended at a slight angle into the current from opposite sides of the river, thus restricting the width of the channel. Wing dams were built of alternate layers of brush mats or fascines and rock. The rock came from private contractors and government quarries along the river. Over the years, sediment and sand have filled the spaces between the dams and now trees and brush grow to form wildlife habitats where the river once flowed.

The Mississippi River, as Mark Twain so poetically described it, constantly attempts to alter its channel. Farmers along the river have been continually aware of the powerful erosion capabilities of spring floods. Horace Beach, for example, wrote Representative Joseph Weeks Babcock in 1900 that the steamboat channel was directly above a place where he once had raised crops. Over forty feet of his land had washed away during one spring flood. He asked congressional permission to drive piles into the channel and build a wing dam to force the water away from

After lowering the mats, rocks were placed on top. The crew pictured here is at work around 1905.



Completed wing dams on a bend in the Mississippi around the turn of the century.



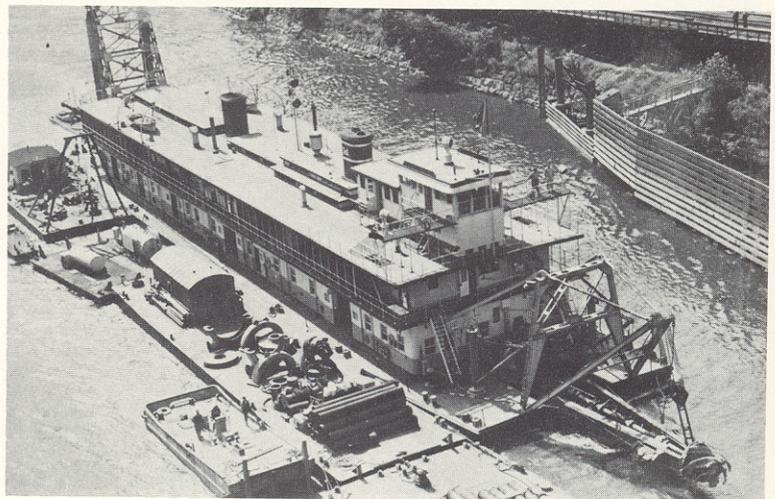
The pump dredge "Vesuvius" at work on the Mississippi River at Fountain City, Wisconsin.



his shoreline.⁴⁹ When his letter was referred to the Corps, an assistant engineer was sent to investigate and make recommendations for action by the dredging crew. Yearly maintenance work on the river was absolutely essential to commerce. From 1885 to 1887, when congressional politics stalled rivers and harbors legislation, the river became very nearly impassable in some sections.⁵⁰ As a result, Congress in 1888 provided a continuing annual appropriation to keep the Rock Island District dredges operating on the upper Mississippi.

Only five dredging plants were operated under the control of the St. Paul office before 1930. They were the dipper dredge "Otter Tail" working on the Red River of the North, the suction dredge "Warroad" on the Lake of the Woods, the orange peel dredge "Oriole" on the Mississippi above Aitkin, the "St. Croix," a hydraulic pump

The dredge "William A. Thompson" passing under the Roberts Street bridge in St. Paul in 1946. From 1936 to the present this large piece of equipment has been the backbone of the dredging operations in the St. Paul District.



**TABLE 16 FLOATING PLANT IN THE
ST. PAUL DISTRICT, 1899**

Name	Type	Tonnage
Red River of the North		
Ogama	Sternwheel Steamboat	106
Otter Tail	Dipper Dredge	120
Quarter Boat No. 2	Houseboat	31
Slide Scow No. 1	Deck Barge	20
Barges No. 1, 2, 3, 4, 5	Barge	20
Red Lake River		
Derrick Boat No. 1	Hand Powered Derrick	16
Quarter Boat No. 1	Houseboat	30
Lighter No. 1	Barge	8
St. Croix River		
St. Croix	Hydraulic Pump Dredge	130
6 Barges	Barge	10-25
Reservoirs		
General Poe	Sternwheel Steamboat	60
Mid-Mississippi		
Barge No. 1	Barge	24

From: Major F. V. Abbot to Office of the
Chief of Engineers, April 1, 1899.

dredge, on the lower St. Croix, and the huge 200-cubic-yard clamshell dredge "Manito" which worked below the federal reservoirs in northern Minnesota.⁵¹ None of these vessels was on the Mississippi downstream from St. Paul. When the nine-foot channel was authorized in 1930, the St. Paul District became responsible for the dredging to clear sediment out of the main channel, a necessary and sometimes formidable task. Some two million cubic yards of sediment has been removed per year, at an annual cost of about one-half million dollars, to keep the channel from St. Paul to Guttenberg, Iowa, clear.⁵² Since 1937 this work has been done by the dredge "William A. Thompson" and derrick-boat number 767, later named the "Hauser." In 1972, these two vessels removed 1,862,088 cubic yards from thirty-eight locations at a cost of \$887,784.⁵³

The construction of closing dams and the filling in of backwaters sometimes adversely affected property-owners along the river. The McCarriel Mill dispute illustrates how Corps work could both benefit and frustrate riparian owners. McCarriel owned land around Boulanger Slough by Island Number 16 about three miles

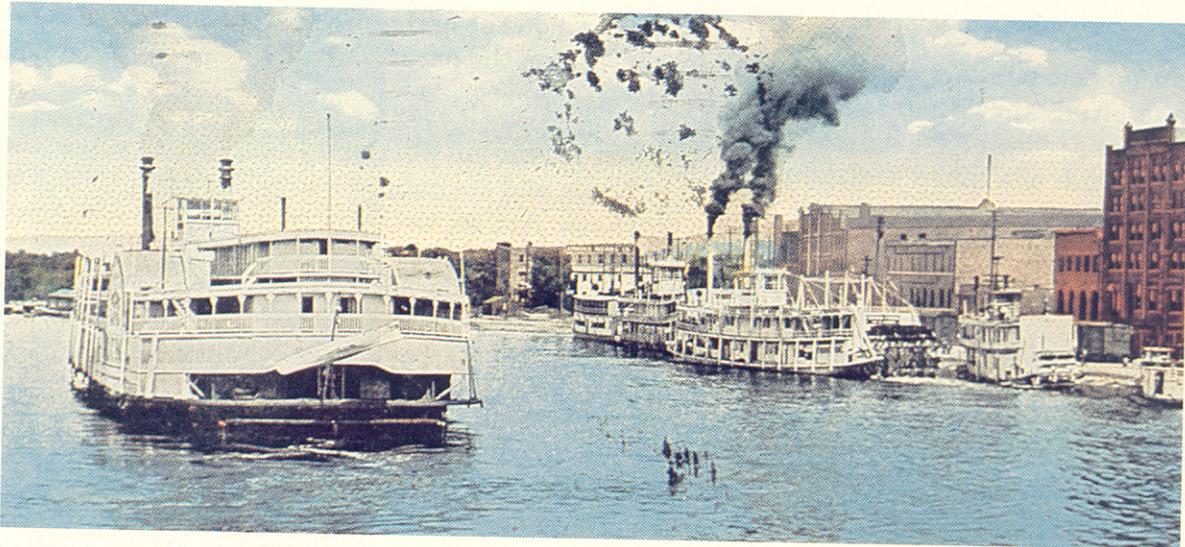
from Hastings, Minnesota. The property, purchased in 1968, had small, worn-out grist and sawmills located on it. In 1881, when Boulanger Slough, McCarriel wanted the dredging crew to fill in the slough. He continued to ask for this improvement in successive years. In 1884 he rebuilt the sawmill to cut timber for his own buildings. In 1899 McCarriel's lawyer filed a complaint charging that the federal government's closing dam had put his sawmill out of business by constricting the water power and the free flow of logs. Actually, the dam provided a head of water sufficient for McCarriel to continue grinding about forty barrels of flour every day at his grist mill.

Upon investigation, James D. Du Shane, the Corps assistant engineer, discovered that the sawmill was in disrepair, the maps prepared by the county surveyor were incorrect, McCarriel had never had contracts to purchase logs, and "the closing of Boulanger Slough by Dam Number 3 increased the value of the McCarriel mill property instead of having destroyed it." It was also suggested that McCarriel did not intend to operate a business but to improve his riparian property by having the federal government fill in his low floodplain land.⁵⁴

Pollution, Dumping, And Aesthetics

The Mississippi River and its tributaries is the primary drainage system for the North American continent. The basic task of the Corps of Engineers has been to adapt this waterway to commercial and recreational use. Yet man's objectives have never displaced the primary role of the Mississippi as the nation's largest drainage ditch. Early in the history of the St. Paul District, the Corps became concerned with the human as well as the natural deposits of solid waste in the river channel. Mention has already been made of the sawdust controversy of the 1880s (see Chapter Four). In the 1890s, attention was focused on the growing pollution of the river harbors.

La Crosse, a case in point, was the most important river town between St. Louis and Minneapolis. Captain William A. Thompson noted in a memo to Lieutenant Colonel William R. King in 1896 that more steamboats were owned and controlled in La Crosse than in any other Mississippi port.⁵⁵ There were sixty-six steamboats (totaling 5,139 tons) based at La Crosse in 1896. This Wisconsin



La Crosse harbor became the largest port for steamboats on the Mississippi River between St. Paul and St. Louis in the nineteenth century. The harbor also became one of the most polluted bays in the upper stretch of the river.

city was second only to Minneapolis in processing timber into shingles, laths and boards. La Crosse, with a population of 30,000 in 1896, had many large factories and tanneries in addition to its sawmills and extensive boatyard.⁵⁶ During the 1890s the river city suffered under an “unbearable stench” in warm weather, the result of a stagnant pool of slowly dissolving wastes in its harbor.

Ironically, La Crosse was also the home office of the St. Paul District assistant engineer, Captain William A. Thompson. Thompson met La Crosse businessmen nearly every day at the La Crosse Club, and was constantly taunted about the sour condition of the harbor.⁵⁷ Abating this nuisance was no easy matter. Thompson wrote to Colonel James L. Lusk that it was the “meanest job I ever had.”⁵⁸ Forcing the tanneries to extend their sewer beyond the harbor bulkhead was only a partial solution. The main problem was a large sandbar in the La Crosse harbor which had been produced in part by the Corps itself! In order to narrow the channel above La Crosse, the Corps had built a number of wing dams, and silting behind them had built up sand in the river. Thompson was told by the Rock Island District engineers, Major Alexander Mackenzie and Lieutenant Colonel William R. King, that it would not be “good policy” to blame the problem on a previous generation of Corps engineers.⁵⁹

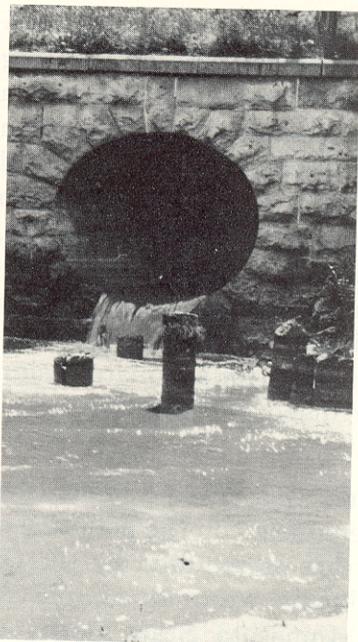
The situation was further complicated when the building of the Chicago, Milwaukee and St. Paul Railroad in 1884 changed the course of the La Crosse River and caused a sandbar to form. In 1890 the new Mt. Vernon Street bridge

further constricted the harbor, so steamboats had to enter and leave between the bar on the north and the bridge on the south.⁶⁰

Captain Thompson worked with the city engineer, the Board of Trade and steamboat men to devise a solution to these problems. Action was delayed, however, for the city of La Crosse could not provide any supplementary funds, as it was in debt to the limit of its charter.⁶¹ Congress approved Thompson's plan for building a lateral bulkhead to fill in part of the harbor and a 420-foot cross dam to force the current closer to the waterfront. The project was finished in 1904 at a cost of \$17,000.⁶²

Though Captain Thompson felt that the federal government was responsible for improving the harbor at La Crosse, he made an opposite decision on the stagnation problem at DeSoto. DeSoto was a small Wisconsin town on a backwater channel of the Mississippi. Corps records show that as early as 1866 the back channel was plagued with low water, and the 1893 river survey suggested that the water level could be raised with the construction of a dam from the end of Main Street to Island Number 141.⁶³ By building a road over the dam, the village would have access to the main river channel. The village council, steamboat operators, the DeSoto Lumber Company and the B. F. Thomas ferry service all endorsed the plan and a 950-foot dam was built.⁶⁴

A year later the DeSoto village council petitioned the secretary of war, Russell A. Alger, to have the causeway demolished and a new dam built farther downriver.⁶⁵ The old harbor, blocked by the dam from the cleansing action of the river current, had become polluted. Dr. O. Ewers, the village physician, wrote that the government dam was a public health problem, being the "source of pestilence and disease."⁶⁶ Captain Thompson made a visit to the site and agreed that the sanitation conditions were bad. But he claimed that this was a local problem not a federal case. Fishermen and villagers were depositing offal in the backwater. Furthermore, the village had not kept its promise to build a road on the dam and make it into a causeway as originally agreed. Thompson recommended no action by the federal government.⁶⁷ In 1903, after the village petitioned the new secretary of war, Elihu Root, an investigation was made by the Corps' assistant engineer, C. W. Durham. Durham recommended to Colonel James L. Lusk that the \$16,600 dam be demolished.⁶⁸



The outlet of the Starkey sewer into the Mississippi was one of many sources of pollution in the Twin Cities which led to the depletion of fish and wildlife along the river for many miles below the metropolitan area.

The 1899 Congress passed a seminal Rivers and Harbors Act which contained in section thirteen authorization for the Corps of Engineers to regulate the dumping of pollutants in navigable streams. As a result the St. Paul office investigated all complaints about the dumping of solids into rivers in its district and asked the United States district attorney to prosecute those who continued to ignore restrictions imposed by the Corps. The general manager of the Chicago, St. Paul, Minneapolis and Omaha Railway was notified in 1910 that he could not dump cinders in the Minnesota River near North Mankato.⁶⁹ In the same year the International Stock Food Company was warned about dumping dirt into the Mississippi, and the Corps instituted proceedings against the Northwest Paper Company of Cloquet for continuing to dump pulpwood, bark and other refuse into the Mississippi at Brainerd.⁷⁰ In 1912 the Minneapolis Gas Light Company refused to stop dumping cinders into the Mississippi and the case was referred to the Department of Justice. The same firm was warned in 1915 that it was dumping refuse beyond established harbor lines.⁷¹ In 1912 the Great Western Railway was informed that it could not discharge any dredged material into the Mississippi during the building of a bridge at St. Paul.⁷² During the same period the DeSoto Creamery and Produce Company of Minneapolis, the Kunz Oil Company and the University of Minnesota were all warned that they were dumping ashes and other refuse beyond established harbor lines.⁷³ The disposal of "night soil" in "liquid form" was allowed to continue, however. W. B. Brewster of the Ramsey County Sanitation Company applied for a permit from the Corps of Engineers to use river water to flush human waste through a sluiceway built with mesh grates to stop all solid substances over one inch square.⁷⁴ This was a common practice, as was the discharge of municipal sewers into the Mississippi.

Strong public reaction to river pollution came first in the 1920s. The rapid growth of metropolitan Minneapolis and St. Paul with an increasing discharge of pollutants in the river had a visible effect for miles south of the Twin Cities. Fishermen complained of the lack of game fish as far south as Lake Pepin.⁷⁵ In November, 1924, Thaddeus Surber, Minnesota state fish biologist, presented a paper entitled "The Effect of Stream Pollution on Fish Life" to the American Water Works Association at its annual meeting in Minneapolis. Surber concluded that people were "prone to exaggerate" stream pollution, and that the condition of

the rivers of Minnesota was not as bad as many thought. He cited a study of brook trout in the area near Spring Valley, suggesting that "barnyard pollution" was not a major problem for fish life. Fish depended upon the growth of small crustaceans. These entomostraca were destroyed by carbonic acid but fed on aquatic vegetation. The main sources of the pollution were not barnyards but creameries, gas works, tanneries and large metropolitan sewage systems. Surber asked for stronger laws to eliminate this "public nuisance." He especially called upon sanitary engineers to take some responsibility for adequate design of water treatment and sewage disposal systems.⁷⁶

Major Charles F. Williams was asked a short time later to report to the chief of engineers on the pollution of streams in the St. Paul District, as required by the Oil Pollution Act of 1924.⁷⁷ Williams wrote to Harold A. Whittaker, director of the Minnesota State Board of Health, for a tabulation of municipalities which had sewage systems discharging into the rivers of the district. Whittaker supplied a list and commented that "there is no critical condition in any of the rivers mentioned in your letter with the exception of the Mississippi River below Minneapolis."⁷⁸ Consequently, Williams reported to the secretary of war on April 14, 1925, that pollution in navigable rivers of the St. Paul District was "insufficient to endanger or interfere with navigation or commerce or fisheries."⁷⁹

Many people were unsatisfied with this report, as was the Department of Commerce. Thus, nine months later, Major Williams was obliged to clarify his position. He admitted that sewage from the Twin Cities and especially from the South St. Paul stockyards was "deleterious to fish life" for some distance below St. Paul. He believed, however, that Lake Pepin, which was twenty-three miles long, one and one-half miles wide, and twenty-five feet deep, was "capable of purifying many times the quantities of sewage now being discharged into the river." He went on to state that the lack of fish south of St. Paul was as much the result of extensive fishing as of pollution.⁸⁰ Many fishermen and others concerned with the pollution of the Mississippi disagreed with Williams' conclusions. In response to their complaints a joint interim legislative committee from Minnesota and Wisconsin was formed to make a thorough study of the situation.⁸¹

Conservationists and outdoor sports associations concerned with the river as a refuge for wildlife obtained an "important landmark" in 1924 when Congress appropriated one and one-half million dollars for the purchase of bottom lands along the upper Mississippi River. This legislation was the first large federal attempt to acquire a general wildlife reservation.⁸² According to Ira Gabrielson's study, *Wildlife Refuges*, the Army Corps of Engineers greatly enhanced this significant migratory fowl refuge and fishing resource when the nine-foot channel was constructed. According to district records, conservation groups first opposed the idea of slack-water navigation. However, after a series of public meetings was held in the district, the Corps agreed to stabilize backwater levels and consider wildlife conservation in the operation of the proposed lock and dam network. Sportsmen, naturalists, and bird-lovers, among others, then supported Corps plans for slack-water navigation. Both the Corps of Engineers and the Fish and Wildlife Service agreed that nature is best served and preserved when it is "managed" by knowledgeable and sympathetic people.⁸³

During the 1920s members of sportsmen's organizations were not the only persons concerned about the upper Mississippi River. A midwestern environmentalist and journalist, Florence L. Clark, was one who worked for the preservation of the river's scenic beauty. During a 1922 trip upriver from her home at McGregor, Iowa, Miss Clark discovered that government barges were tied up at Hanging Rock between the mouth of the Yellow River and Waukon Junction, Iowa. The dam-building crews were loading the barges with rock quarried in that area. Miss Clark became concerned about the aesthetic quality of the river and the possible destruction of "one of the most scenic points" on the upper Mississippi. She wrote immediately to Representative Gilbert N. Haugen and to Captain William Thompson of the Corps of Engineers in La Crosse.⁸⁴ Thompson informed Miss Clark that the firm of Holtzhammer and Kaiser had a contract to furnish rock and that their quarry behind Hanging Rock was not visible from the river. The government engineer assured her that his office would work "to preserve the scenic effect of all such localities along the river." At the same time, Thompson sent Miss Clark's letter to the district office and asked for advice.⁸⁵ Major Charles F. Williams said that he had no control over where contractors quarried their stone. He noted that even if the contract were

nullified, Holtzhammer and Kaiser could blast rock there for other customers. "Pressure or persuasion" were the only means available for the Corps to preserve scenic qualities.⁸⁶

Captain Thompson decided to initiate some personal diplomacy, and took the launch "Ellen" down to McGregor. He asked Miss Clark to join him on an inspection tour of the Hanging Rock quarry. After this excursion she was "perfectly satisfied" that no injury to the scenic beauty of the area would result and she withdrew her objections.⁸⁷ As a result of her complaint, the district engineer informed all contractors that in the future they would have to designate specifically where they would quarry their rock before contracts were signed.⁸⁸

The Titus-Thompson Affair

After World War I, the St. Paul District of the Corps of Engineers was transformed into a large and somewhat impersonal bureaucracy. The building of the large dams on the Mississippi during the 1930s required a huge labor force, and the utilization of funds from depression relief programs multiplied employees, programs and paper work. As a result, job classifications became more restrictive and the relationships between the St. Paul office and field personnel were placed on a much more formal basis. The beginning of this transition from a small, closely knit group into a large bureaucratic organization can be seen in the Titus-Thompson affair which stimulated three official investigations in 1920.

The Titus-Thompson case concerns two competent Corps employees, in a relatively small organization, who developed close working relationships with their subordinates and superiors. Although they did not actually take public funds, they took private advantage of their positions and the facilities at their disposal in a way not uncommon in their organization and probably in other businesses and professions of the time. Both lived according to the "spirit of service" but both broke "the letter of the law."⁸⁹

The story begins with N. F. Titus, who worked for the Rock Island District as a carpenter, master carpenter and foreman carpenter from 1893 to 1919. During much of this time he was in charge of the United States boatyard at

Fountain City, Wisconsin. When maintenance of the Mississippi from the Wisconsin River to Minneapolis was transferred to the St. Paul District in 1919, Titus was retained as foreman of the boatyard. Shortly after the St. Paul District took responsibility for the boatyard, Major Henry J. Jewett, district engineer at St. Paul, was asked to investigate a conflict of interest and misuse of government personnel by Titus.⁹⁰

Jewett's report of May 12, 1920, revealed that Titus was involved in a retail coal business in the small town of Fountain City (population 1,000), and that he had used government day laborers to unload and deliver coal. The boatyard time sheets for April 20-22, 1919, showed, however, that the workers had not been paid for those days by the government. Jewett felt that the day laborers were justified in choosing to work for Titus at wages greater than their government pay of \$2.75 for an eight-hour day.⁹¹

Titus sold carloads of coal for fifteen percent less than his competition and Jewett hesitated to curb "any activity which operates to reduce the price of any commodity to the consumer." Titus, it was discovered, also took time out during the day to solicit coal business. Jewett's investigation revealed, however, that Titus always worked more hours than he was required to and never received overtime pay. The district engineer felt that the government service was "not embarrassed or delayed in any way on account of Mr. Titus' activities." Titus was responsible for the boatyard twenty-four hours a day, and his annual leave covered the time he was temporarily absent.

On June 9, 1920, the chief of engineers issued a policy statement covering the Titus affair. Titus was forbidden to engage in private business during working hours or to release government employees under his control to work for private concerns. The chief of engineers had no objection to Titus engaging in private business, but wished him to completely divorce it from his work for the Corps. Thus, the Corps could not be suspected of untoward activities. It was also suggested that Titus should not sell coal to his own men.⁹²

The matter did not end there. Another coal business in Fountain City was run by Paul L. Fugina, whose brother, M. L. Fugina, was an attorney and the judge of Buffalo County. On September 23, 1920, Judge Fugina wrote to the chief of engineers, claiming that Titus was selling coal

which had been consigned to the United States government, and that Captain Thompson, the assistant engineer from La Crosse, was helping Titus to break the law. Fugina accused Thompson of using government quarterboats to lodge friends and relatives, and of running government launches on pleasure excursions. The judge claimed that Thompson also asked civil service personnel to pick grapes, maintain the houseboats and operate launches on fishing trips.⁹³

Captain Thompson was asked to reply to Fugina's charge that he was committing "flagrant violations of the law." He acknowledged that both the government and Titus had ordered coal from the Cargill Coal Company, and that the coal company had confused its accounts and shipped government coal to Titus. The error had been discovered and the accounts had been rectified. He explained further that Titus had agreed to go out of the coal business after the next two carloads of coal were shipped. As to the use of quarter boats for private purposes, Thompson said that it had been common practice in the district for twenty-five years for engineers to invite friends and guests to stay on the houseboats, but outsiders had always paid for their own subsistence.⁹⁴

On October 6, 1920, Colonel Francis A. Pope, district engineer of the Duluth office, was sent to Fountain City to hold a hearing to investigate the charges against Titus and Thompson. At the hearing Judge Fugina spoke for his brother. He suggested political overtones in the affair, stating that the re-election campaign of Representative James A. Frear would be helped by a congressional investigation of Titus and Thompson. Fugina claimed that Titus had previously operated his coal company without an established office and had reduced overhead by using government buildings, phones and laborers to undersell the Fugina coal business. He asserted, too, that despite the promise of Titus to abandon the coal business, a new coal company had been organized in Fountain City which Fugina charged was a front for Titus.⁹⁵

As for politics, by the time Fugina's complaint went through the district and division offices it was too late to have any effect on the election. In a confidential letter to Colonel Pope, Colonel William V. Judson, division engineer, recommended that the district conduct all work "on the plane set for Caesar's wife."⁹⁶ Judge Fugina termed Pope's investigation a "white-wash," demanded a public

hearing, and added another charge against Thompson, that "contrary to U. S. regulations," women were being carried on the payroll. They were identified only by their first initial so superiors would not detect the violation.⁹⁷

Captain Thompson, calling Fugina's charges a "bunch of bosh," retained Andrew Lees as his attorney. In a personal letter to John Wade, Thompson explained the hiring of the women. He said that objections had been made to designating female workers as "charwomen," so he had classified them as laborers on the payroll. There was no attempt to hide their sex, and as far as he knew there was no regulation against hiring women for government work.⁹⁸

In view of the additional allegations of Judge Fugina, the chief of engineers ordered the division engineer to make a third investigation, "fix responsibility for any violations," and submit a full report.⁹⁹ On December 8, 1920, a public hearing began; all parties were represented by counsel and all had the right to call witnesses and cross-examine. A public notary swore witnesses and kept a record of the proceedings. The hearing found the charges of Judge Fugina substantially true. Titus had used government laborers to make repairs on his home, construct private skiffs, fix private launches and handle a private coal business. Colonel Judson recommended clemency for these offenses and suggested that Titus be retained on the government payroll at a ten dollar a month reduction in pay. He noted that the most serious of the offenses occurred eight to ten years previous to the hearing and would not be considered in a court of law. Titus, however, was said to have committed perjury during the hearing, and Judson reported that he was "a man of coarse fibre who might grow into evil practices if carelessly superintended."¹⁰⁰

Captain Thompson was strongly defended by General Alexander Mackenzie, former district and chief engineer, and a model of Corps leadership. In a letter about the case Mackenzie acknowledged that he himself had set a precedent by using government houseboats for private purposes and that Thompson followed an established custom.¹⁰¹ Nevertheless, regulations stated that "in no manner, nor under any pretense, is public property of any sort, or of value so little; or the use of public vessels, boats, or vehicles of any kind; or the work of public laborers, mechanics, or teams; or the use of public shops, tools or machinery, to be applied to any but the actual wants of the work in

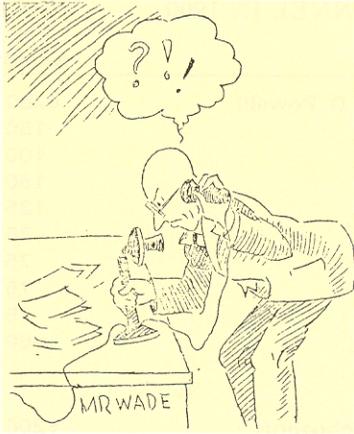


The engineering crewboats pictured here were the type of quarters that became involved in the Titus-Thompson affair. Captain William A. Thompson followed a nineteenth-century Corps tradition by allowing friends and relatives to use this equipment for recreational purposes.

progress” and that “a contrary application for the advantage, comfort, convenience, or pleasure of the superintendent or any other person is strictly prohibited.”

District engineers were well aware of Thompson’s activities. He had used a charwoman as a cook for his fishing parties, had ordered the services of a launch operator and a watchman to assist with the entertainment of a substantial number of guests, had transported friends and relatives in government steamboats from La Crosse to Fountain City and had allowed his son to use government quarter boats for a ten-day honeymoon. Judson recommended “lenient action” for Thompson, but ordered the two government quarter boats dismantled of their furniture and sold if they could not be put to better use in other districts.¹⁰²

The Fuginas were satisfied with the findings of the hearing, but extremely disappointed with the lenient treatment of the offenders. Judge Fugina wrote to Major Thomas Robins in the office of the chief of engineers “I am of the opinion however that your department is not interested in suppressing irregularities and preventing the use and misappropriation of government funds by government employees for private purposes.” He threatened to take his evidence to a grand jury.¹⁰³



This cartoon of John Wade was drawn by Corps personnel, depicting his administrative capacity for communicating effectively.

The Nine-Foot Channel

The decision to construct twenty-six dams on the Mississippi River between St. Louis and Minneapolis was the most important event in the history of the St. Paul District. The Rivers and Harbors Act of July 3, 1930, completely changed the structure, personnel and objectives of Corps activities in the district. As with most historical events, there was a significant transition period leading up to the decision. In this case, the years from 1919 to 1929 were crucial. Though the full impact of the nine-foot channel was not felt by residents of the upper Mississippi Valley until after World War II, the congressional decision had immediate consequences for those who administered and labored for the Corps of Engineers in the St. Paul District.

John Wade's life style was completely changed. Wade came to the St. Paul District in 1896, after having worked with the Corps for seven years on early surveys of the Missouri and Mississippi rivers. In 1900 he became chief clerk of the St. Paul office and served under the next twenty-two district engineers as their chief administrative assistant.¹⁰⁴ From his promotion in 1900 until 1929 he ran the internal affairs of the district, though his salary was never commensurate with his power. In 1907 Wade was earning \$175 a month, and ten years later he was still in the position of second-in-command with the same salary.¹⁰⁵ Twenty years later he was earning only \$100 more.¹⁰⁶ Many district engineers tried to obtain for Wade a title and salary advancement to equal his responsibilities, but they never succeeded. In addition to his administrative duties in the office, Wade was in charge of the regulation of the reservoirs at the headwaters of the Mississippi, the major project of the St. Paul Corps office until the nine-foot channel was initiated. Wade also had the job of acquiring flowage rights for Lock and Dam Number 1. Much of the voluminous correspondence of the Corps office for thirty years went through his hands. After the reorganization of the district office in 1929, however, Wade's responsibilities were greatly reduced and he became just another division chief in a growing bureaucratic structure. The reorganization which stripped Wade of his authority came after Congress approved the construction of the Hastings lock and dam and after the Corps was authorized to survey the upper Mississippi in order to prepare estimates for a nine-foot channel.



Major Charles F. Williams resisted orders to reorganize the St. Paul District in the 1920's. Unknown to Williams was the fact that his superiors were preparing to transform the district into a large bureaucracy for administering the construction of the nine-foot channel.



W. D. Fairchild was brought into the St. Paul District as an experienced and highly paid foreman to supervise dam construction on the nine-foot channel project. He was also concerned with the aesthetic design of public facilities around the completed locks and dams.

TABLE 17 DISTRICT PERSONNEL IN 1900

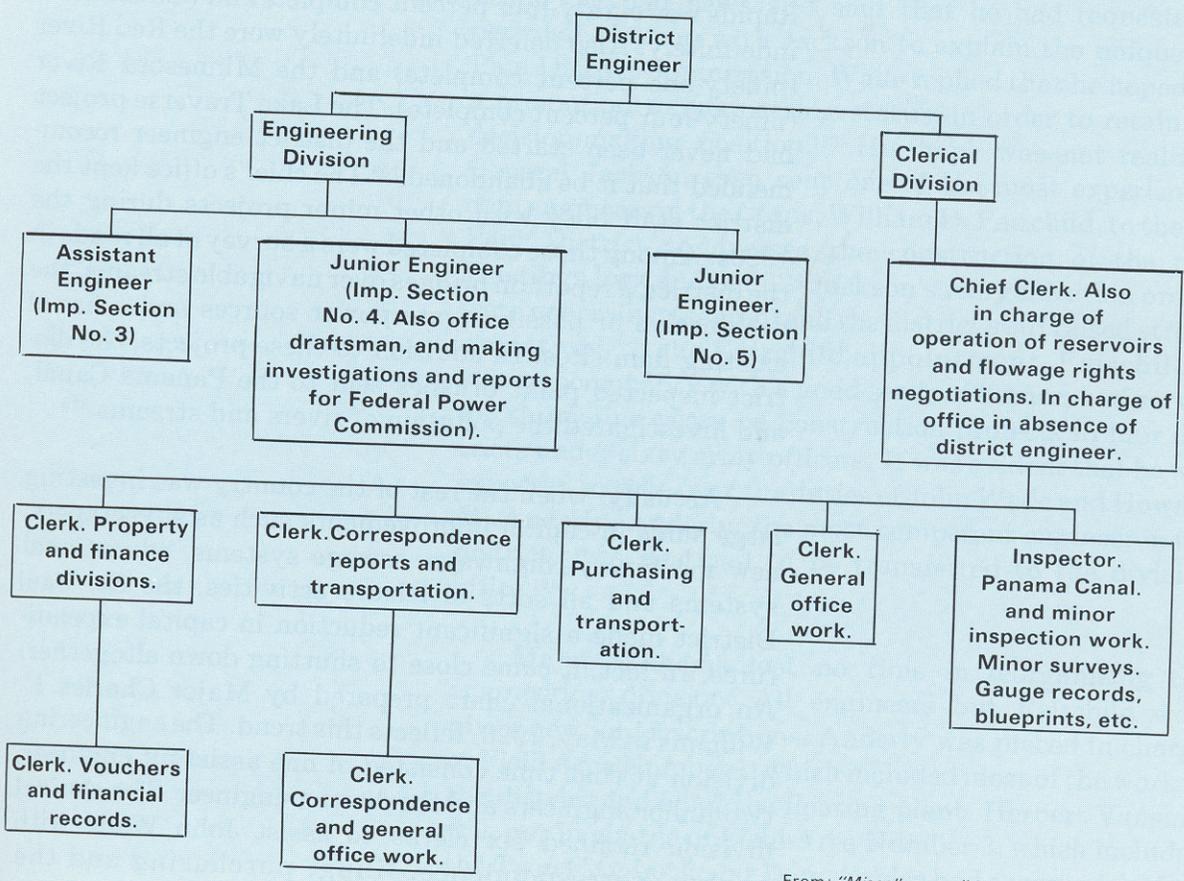
No.	Position	Salary Per Month
1	Principal Assistant Engineer (A. O. Powell)	\$200
1	Draftsman	150
1	Surveyor and Draftsman	100
1	Chief Clerk (John Wade)	150
1	Voucher Clerk	125
1	Stenographer and Typist	75
1	Property Clerk	75
1	Purchasing Clerk	75
1	Bill of Lading Clerk	75
1	Messenger	60
<u>Mississippi River Staff</u>		
1	Assistant Engineer (Archibald Johnson)	\$200
1	Surveyor	100
1	Overseer	100
1	Chief Steam Engineer	115
<u>Reservoir Staff</u>		
1	Assistant Engineer (W. C. Weeks)	\$200
1	Assistant Engineer (T. Milton Fowble)	150
1	Overseer	100
1	Master Mason	150
2	Surveyors	100
6	Transit men	100
1	Clerk	75
1	Head Dam Tender	100
4	Dam Tenders	75
5	Assistant Dam Tenders	30
2	Telegraph Clerks	10
<u>Red River-St. Croix-Minnesota River-Warroad Staff</u>		
1	Assistant Engineer (R. Davenport)	\$200
1	Pilot	100
1	Steam Engineer	125
1	Steam Engineer	85
2	Master Laborers	75
1	Steam Engineer	75

From: Major F. V. Abbot to General John M. Wilson, June 12, 1900.

In 1917, after the Twin City Lock and Dam was completed, the St. Paul office had been relegated to routine duties with a minimum staff. The office staff in addition to Wade and the district engineer, Colonel Edward Schulz, consisted of Edward J. Dugan, an assistant engineer; William Carey and Herbert Vansant, junior engineers; Patrick Henry, property clerk; Frank Sweeley, purchasing clerk; Fred Blanchard, financial records clerk; and Mrs. A. J. Bergren, correspondence and filing clerk.¹⁰⁷ By 1926 the district was reduced to forty-three permanent employees and an average of forty-seven part-time workers.¹⁰⁸ Most of the employees were connected with dredging operations between the Wisconsin River and Minneapolis, the maintenance of the Twin City Lock and Dam and the management of the six reservoirs in northern Minnesota. Other projects were rather insignificant. One cut was yet to be

This organizational chart shows the small, simple structure of the St. Paul District in 1923.

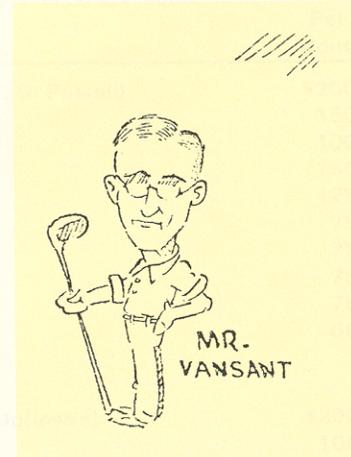
TABLE 18 ORGANIZATIONAL CHART OF THE ST. PAUL DISTRICT, MAY 24, 1923



From: "Miscellaneous" Subject File, NARG77.



The Corps cartoonist indicates that H. M. Anderly was not only a competent engineer but also an office statistician.



Herbert Vassant, a long-time civilian engineer in the St. Paul office, is pictured here by the Corps cartoonist with an instrument for measuring patience.

completed on the Mississippi and Leech River project. The Mississippi River project between Brainerd and Grand Rapids was eighty-four percent complete and was deferred indefinitely. Also deferred indefinitely were the Red River (ninety-one percent complete) and the Minnesota River (ninety-four percent complete). The Lake Traverse project had never been started and the district engineer recommended that it be abandoned.¹⁰⁹ The chief's office kept the district staff busy with other minor projects during the 1920s. Among those completed were a survey of all roads in the district, a report on bridges over navigable streams, the designation of possible waterpower sources and a list of existing dam sites. In addition to these projects, the district inspected paint brushes sent to the Panama Canal, and investigated the pollution of rivers and streams.¹¹⁰

Actually, when the rest of the country was investing large sums in capital improvements such as skyscrapers, new machinery, highways, sewage systems, educational systems and all sorts of leisure activities, the St. Paul District made a significant reduction in capital expenditures. In fact, it came close to shutting down altogether. An organizational chart prepared by Major Charles F. Williams in May, 1923, reflects this trend. The engineering division at that time consisted of one assistant engineer, two junior engineers and the district engineer. The clerical division retained six clerks to assist John Wade with budget, correspondence, filing, purchasing and the preparation of reports.

Then in 1928 began the big "shake-up" under Brigadier General Thomas H. Jackson, western division engineer. Jackson had made a study of bureaucratic efficiency and had published his views on the distinctions between line and staff positions.¹¹¹ The St. Paul District did not conform to his conception of a clear-cut bureaucratic structure. In September, 1928, he wrote to Major Robert C. Williams of the St. Paul District that one of the "greatest mistakes in creating an organization" was to organize it around a single individual. There was no doubt that Jackson had John Wade in mind. He ordered Williams to separate all engineering and administrative functions. "The district offices are engineering offices, and not administrative offices," he wrote. Jackson wanted "the chain of command" always to be in the engineering group. Administration was a "clerking" duty, not a decision-making function.¹¹²

When General Jackson's orders came, John Wade was on an inspection trip to the reservoirs. Major Williams sent Wade the bad news and said that he had requested a personal meeting with Jackson to explain the unique St. Paul District organization. Wade replied that he hoped for a promotion to engineering status, in order to retain his decision-making position.¹¹³ His hope was not realized. General Jackson then sent one of the most experienced dam engineers in the Corps, William D. Fairchild, to the St. Paul District to oversee the construction of the new Hastings lock and dam.¹¹⁴ Jackson's reorganization orders were generally resented, and the district staff raised strong objections to the Fairchild appointment. Fairchild, a strong personality with a good sense of humor, had served for thirty-five years on construction projects in four districts under sixty army officers. It was evident that he was expected to take over the duties of John Wade and Howard M. Anderly. Anderly, the most competent engineer in the district, was destined to be transferred to the division office.¹¹⁵

Major Williams lost no time in reorganizing the engineering division. All engineers but Fairchild were given new job descriptions. Anderly was placed in charge of Field Area Number 1, which included most of the work in the district and all of the floating plant. Herbert Vansant was put in charge of Field Area Number 3, which included the Twin City Lock and Dam; he also had charge of design, flowage easements, and surveys in Field Area Number 2.

Fairchild became construction engineer on the Hastings dam in Field Area Number 2. Field Area Number 4 included the reservoirs at the headwaters, and was put under the direction of Hibbert M. Hill, a recent graduate engineer from the University of Minnesota.

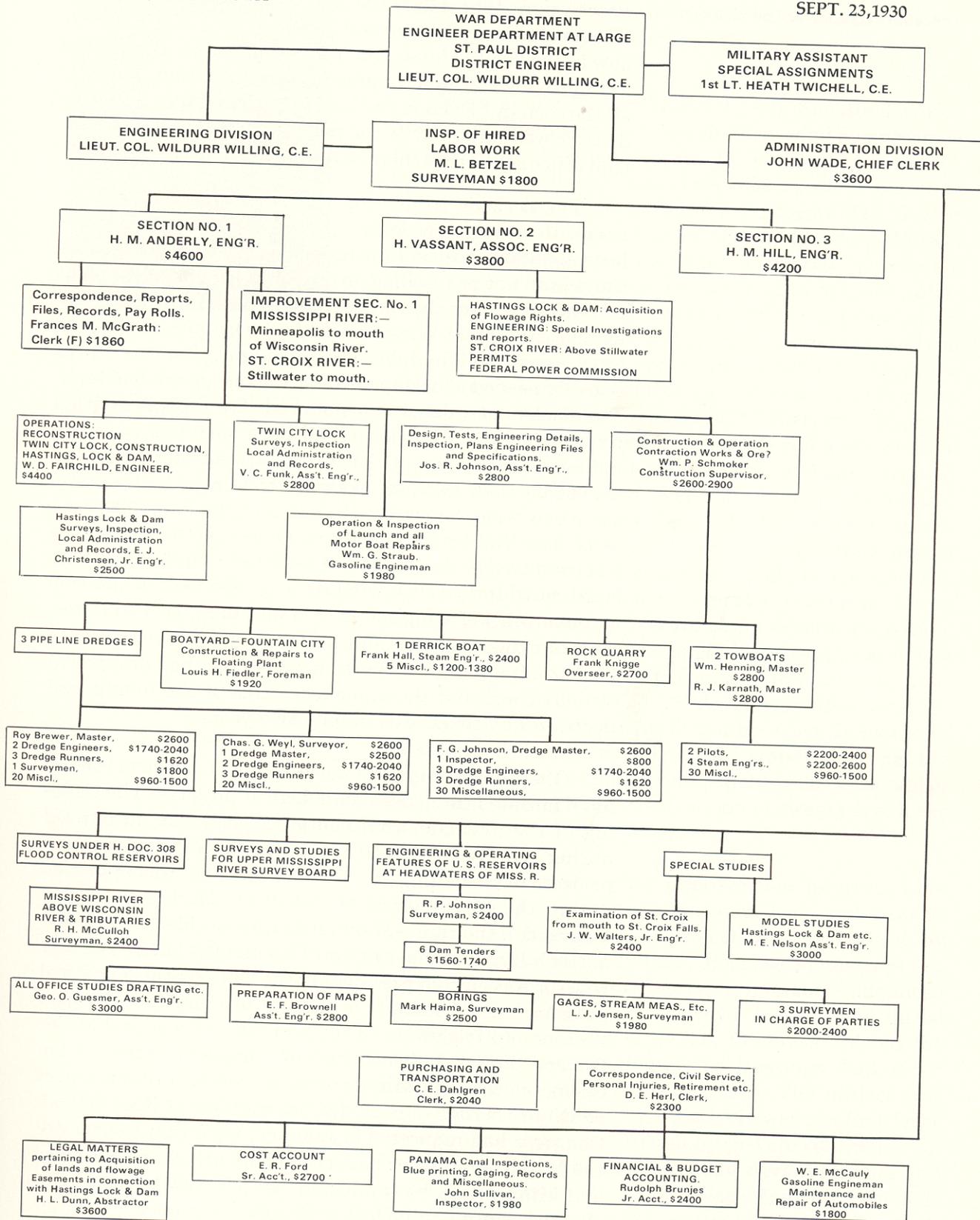
When the reorganization was completed, the district engineer decided to outflank the division office. Major Williams went over the head of his crusty division engineer and talked with Major General Edgar Jadwin in Washington about the Fairchild appointment.¹¹⁶ He argued that the St. Paul District did not need a man of the high salary range of Fairchild, and that the dam engineer was too limited in experience to be in charge of river improvements, technical studies, dam contracts, or dredging operations. The district engineer noted that Fairchild was sixty years old and a man without a technical education. In fact, it was Williams' opinion that Fairchild could not "be correctly termed an engineer." Williams claimed he was not attempting to avoid obeying General Jackson's orders, but felt "it most inadvisable to place Mr. Fairchild in a key position." He was assured by Washington that upon the completion of the Hastings dam, Fairchild would be transferred out of the district.¹¹⁷

The negotiations over district reorganization were carried on for more than nine months before Major Williams finally submitted a chart that pleased General Jackson. During this time Williams attempted to arrange a conference with Jackson but was refused. He was also informed that Anderly would definitely be assigned to the division office. Williams was instructed to make sure that Fairchild was used "to the limit of his ability," that is, he was to be more than "a glorified inspector on the Hastings Dam."¹¹⁸ On April 13, 1929, Williams submitted his final reorganization scheme. On that same day Williams learned from the *St. Paul Dispatch* that Colonel Wildurr Willing was scheduled to replace him as district engineer!¹¹⁹

It was evident that the division office and the chief of engineers in Washington knew more about the immediate future of the St. Paul District than they were willing to tell Major Williams. The nine-foot channel was on its way. An experienced dam construction specialist like Fairchild was absolutely essential. A district which was about to triple its labor force needed a sound organization. For the first time in twenty years an engineer with the rank of colonel

ORGANIZATION CHART, ST. PAUL DISTRICT (MODIFIED)
ST. PAUL, MINNESOTA

CORPS OF ENGINEERS, U.S. ARMY
SEPT. 23, 1930



was assigned to head the St. Paul District. Herbert Hoover, former engineer and secretary of commerce, was now in the White House, and the president was committed to improving the inland waterways of the nation. But why all the secrecy? Even in the final planning stages when the district was informed of the pending legislation, the division office asked that there be no publicity on the project.¹²⁰

The decision to develop a nine-foot channel was unusual, if not unprecedented. Many district projects had been abandoned during the previous twenty years because they could not be justified on economic grounds. But plans for the nine-foot channel were not based on past commercial statistics! Water traffic had been diminishing for forty years and had become so slight that the Corps scarcely needed a lock operator at the one dam it had built. Twenty-five new dams were not needed to support existing river commerce. The Corps had been spending over two million dollars annually on upper Mississippi River improvements. In 1925, for example, the Corps built ninety-three new wing dams (66,219 feet), a trailer dam (350 feet), an ell dam (395 feet), twenty-four shore revetments (43,404 feet) and twelve closing dams (5,422 feet). In the same year it extended forty-seven wing dams (4,455 feet) in addition to repairing 111 wing dams, a trailer dam, two ell dams, nineteen closing dams and nineteen shore revetments.¹²¹ By 1926, freight on this section of the river had dropped to 691,637 tons, and the monetary value of the freight had decreased by two-thirds in only two years.¹²²

Often during times of national crisis, political leaders have initiated immense technological projects. The building of the first transcontinental railroad was authorized during the Civil War and one of the largest construction projects of mankind, the Alaskan pipeline, was approved during the energy crisis of the 1970s. During the Great Depression the Hoover administration decided to build the nation's largest canal system. Two months before Herbert Hoover was elected president of the United States political pressure began to mount in support of a nine-foot channel. Letters and telegrams to the secretary of war and Major General Edgar Jadwin, chief of engineers, largely from business groups in Minneapolis, protested a recent report of Major Charles L. Hall, district engineer at Rock Island. Congress had requested in January, 1927, that a survey of the Mississippi River between the mouth of the Missouri and Minneapolis be conducted "with a view to securing a channel depth of nine feet with suitable widths."¹²³ Major



The role of President Herbert Hoover in the initiation and development of the nine-foot channel has been neglected by his biographers.

Hall's preliminary survey indicated that such a project was not economically feasible.¹²⁴

Minneapolis Mayor George Leach, Senator Henrik Shipstead, Representative Melvin Maas, and businessmen Richmond P. Warner, George C. Lambert, Charles C. Webber and William F. Davidson voiced their objection to Major Hall's recommendation.¹²⁵ T. F. Rogers of the Junior Association of Commerce wrote to Major General Jadwin that the nine-foot channel was considered "absolutely necessary" for the industrial growth of Minneapolis. Rogers told Jadwin that his organization was co-operating with the Minneapolis River Terminal Commission and the Inland Waterway Corporation to gather data to prove "that Major Hall's statement was absolutely unfair and without the basis of a single fact."¹²⁶ Warner, vice-president of Griggs Cooper and Company, a wholesale grocery distributor, wrote a fatherly letter to Major General Jadwin asking him to correct the "bias, prejudice and unfair" attitude of Major Hall.¹²⁷ As the election neared, Hall's report was returned to the district office with a request that a more comprehensive study be made.¹²⁸ The day after Herbert Hoover was elected president, Major General Jadwin wrote to Warner citing experience to show that the improvement of the upper Mississippi was not "a paying investment of public funds." He promised, however, a full economic study.¹²⁹ A more positive attitude towards the project came in December when Jadwin's office informed the Minneapolis Real Estate Board that the Corps was seriously considering canalization of the upper Mississippi through the construction of twenty-five locks and dams.¹³⁰

In the meantime, river improvement interests were encouraged by progress on the new lock and dam at Hastings, Minnesota. This project was authorized by Congress on January 27, 1927. Because funds were not appropriated at that time, "private interests" advanced money for the preliminary surveys, borings and initial design work.¹³¹ On May 22, 1928, Congress ordered the Corps to begin construction of the Hastings dam and a contract was let on October 16, 1928. The project was completed on November 20, 1930.¹³² It was the first large Corps project to be constructed by private contractors in the St. Paul District. The six headwaters reservoirs and two locks and dams on the upper Mississippi had been built with government plant and contract labor.

Another positive step towards a nine-foot channel took place on May 29, 1929, when the secretary of war, James G. Wood, appointed a special board of engineers with an initial allotment of \$100,000 to survey the upper Mississippi. The board was ordered to re-evaluate a second report of Major Hall who still opposed the building of a nine-foot channel. The board consisted of Brigadier General Thomas H. Jackson, Lieutenant Colonel George R. Spalding, Lieutenant Colonel Wildurr Willing, Major Charles L. Hall and Major John C. Gotwals.¹³³

Minneapolis politicians and businessmen were not the only ones anxious about the development of the nine-foot channel, however. Henry B. Ward, president of the Izaak Walton League, wrote to both President Herbert Hoover and Major General Jadwin in June, 1929. He explained the concern of sportsmen that "one of the largest and one of the most potentially productive wildlife refuge and recreational areas on the entire continent" would be destroyed by the construction of slack-water navigation dams. The 300-mile Upper Mississippi Wildlife and Fish Refuge had been approved by Congress on June 7, 1924, and the Departments of Agriculture and Commerce had acquired over 100,000 acres along the river for refuge and recreational development at a cost of \$600,000.¹³⁴ Brigadier General Jackson recognized the sportsmen's concerns on August 7, 1929, by directing Major Hall "to study the discharges of the Mississippi River, the influence on wildlife of the project; water supply, sewage and sanitation."¹³⁵

The views of the Izaak Walton League received further reinforcement later that month when Major Hall addressed the School of Wildlife Protection in McGregor, Iowa. He told this group that canalization of the Mississippi would "radically change" the flora and fauna of the region. Animals would be driven away, the dams would produce a "succession of stagnant or sluggish pools," sewage disposal would be a problem, oxidation would diminish game fish, and finally, it was impossible "to determine by engineering means whether the proposed improvement was economically justifiable."¹³⁶

Minneapolis businessmen were quick to respond to Major Hall's remarks. A conference was called the next week by the Mississippi and St. Croix River Improvement Commission of Minnesota. Among those participating

were Charles C. Webber, H. M. Hill, Arth R. Rogers, Arne C. Wiprud, Richmond P. Warner and George C. Lambert. They wrote to the secretary of war of their concern that the rivers and harbors bill under congressional consideration contained "mostly Eastern projects and harbor improvements" and that the survey for a nine-foot channel directed by Congress on January 21, 1927, had been delayed by an individual who was "not in sympathy with the project." They were especially distressed because General Jackson had included in the survey of the project the influence on wildlife, water supply, sewage and sanitation.¹³⁷ The *Minneapolis Journal* summarized the attitude of these promoters. Questions of sewage, water supply and sanitation were "quite outside the proper purview of an Army officer." The editorial stated bluntly that Major Hall's "duties are neither floral nor faunal, but engineering."¹³⁸

While Major Hall was being attacked by midwestern newspapers and businessmen, another officer of the Corps faced similar problems in Washington. President Hoover decided to replace Major General Jadwin. Passing over the conventional recommendations of ten senior officers the president appointed Major General Lytle Brown as chief of engineers.¹³⁹ Warner of the Mississippi Valley Association thought this was excellent news. He believed that the nine-foot channel should "go down in history as a monument and memorial to Herbert Hoover and the accomplishment of the Republican Party."¹⁴⁰ The secretary of war had assured Warner that Hoover would pressure both the Corps and Congress for immediate action.¹⁴¹ It did not take General Brown long to act. Within two months of his appointment he sent a confidential telegram to Colonel George Spalding at St. Louis informing him that an "early commitment" of \$1,500,000 in new funds would be coming Spalding's way.¹⁴²

The Corps began preparing Congress for a new surge of construction activity. The chief of engineers provided Representative William E. Hull a five-year budget projecting the need for over a hundred million dollars in additional funds.¹⁴³ A new secretary of war, Patrick J. Hurley, informed the Minneapolis Real Estate Board that he was too busy promoting the needs of the nine-foot channel in Congress to visit the Twin Cities.¹⁴⁴ The Corps also began to prepare its districts for the infusion of new money. It asked all division engineers to make a list of priority projects that would improve tonnage on the

nation's navigable waters, and thus ameliorate "disadvantageous freight rates."¹⁴⁵ Ironically, the lists submitted by district engineers from St. Paul, Rock Island, and St. Louis did not include any proposals for the development of a nine-foot channel!¹⁴⁶

On April 30, 1930, President Hoover sent a letter to the secretary of war asking for a list of all public works projects authorized by Congress. The projects were to be ranked in three categories: those of urgent importance, those that could be spread out over considerable time and those that could be postponed.¹⁴⁷ The list compiled by the chief of engineers for the president on April 30, 1930, still did not contain the nine-foot channel project!¹⁴⁸ Yet when Congress passed the Rivers and Harbors Act on June 3, 1930, the authorization for the nine-foot channel was included. It was put into the act without the completion of a final examination and survey by the Corps of Engineers. It was a victory in which glory was shared by President Hoover, his secretary of war, the Mississippi Valley Association, the Minneapolis Real Estate Board, the Mississippi and St. Croix River Improvement Commission and congressional representatives from Minnesota.

Although Congress went on record authorizing the nine-foot channel it did not appropriate funds for its implementation. The Minnesota Legislature then stepped in, memorializing Congress to pass the Shipstead-Mansfield bill which provided financing for the \$124,006,139 project.¹⁴⁹ In the meantime work on the project was prosecuted with Public Works and Emergency Relief funds. On August 30, 1935, Congress finally released money to complete the total project.¹⁵⁰ By that time the revised estimate of cost had grown to \$148,217,000.¹⁵¹

An interesting bit of contrived sham also went into the decision-making process on the nine-foot channel. On Friday, July 25, 1930, a party of officials consisting of Secretary of War Patrick Hurley, Secretary of Commerce R. P. Lamont, Senators Frederic C. Walcott, Harry B. Hawes, Key Pittman and Charles McNary, Chief of the Biological Survey, Paul Redington and other dignitaries accompanied Lieutenant Colonel Wildurr Willing on an inspection trip down the Mississippi River.¹⁵² When they reached Winona, the team found the "U. S. Webber," a commercial tug and a number of barges stuck on a sandbar and the Corps dredge, "General Allen," helping to free

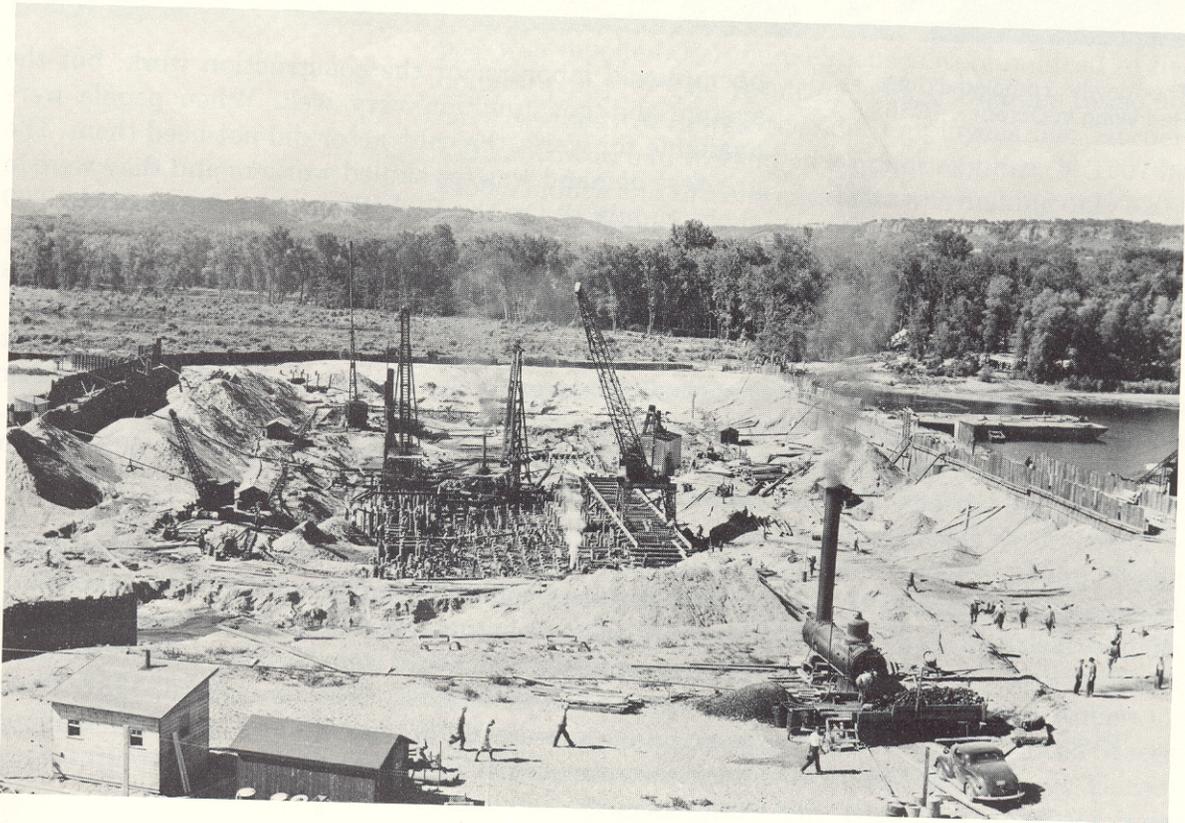


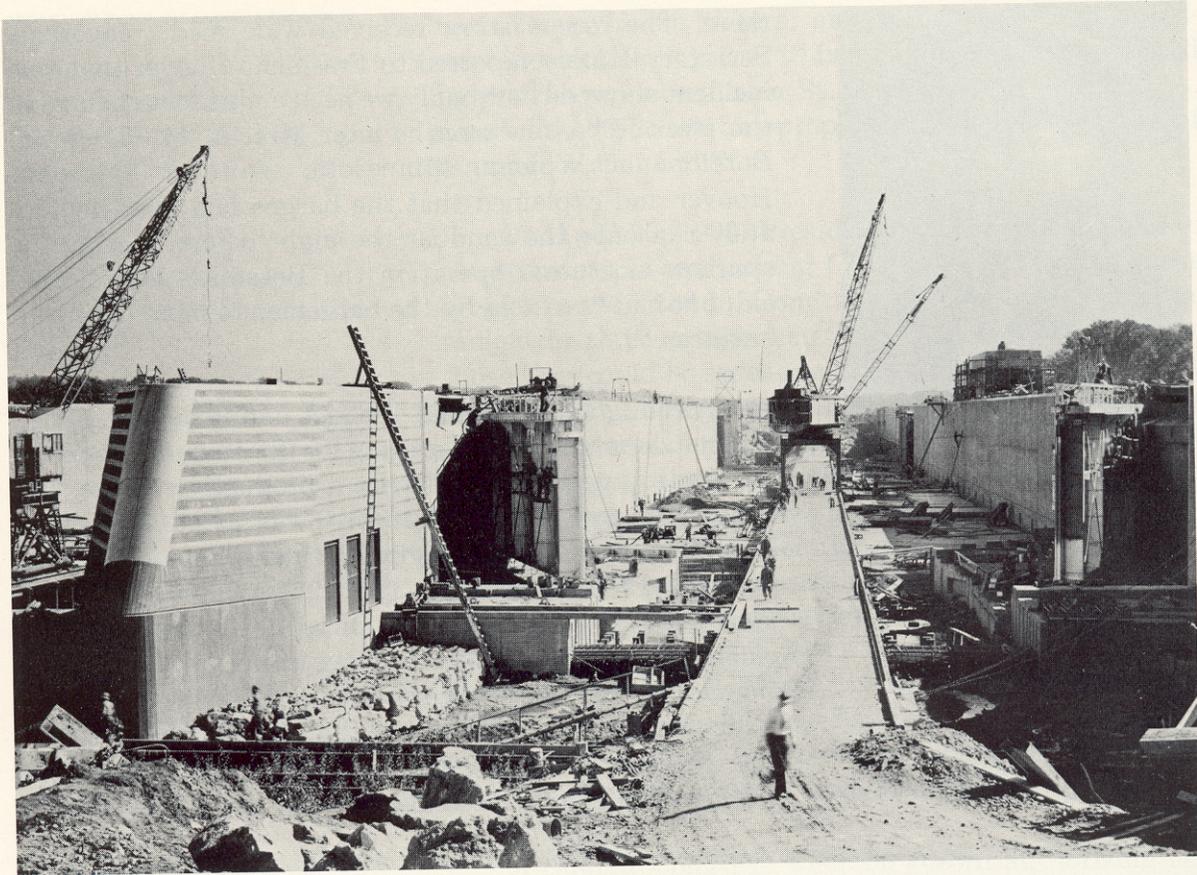
Lieutenant Colonel Wildurr Wil-ling was in charge of the St. Paul District during the construction of the nine-foot channel.

them. The rescue story received wide media coverage. Secretary Hurley reported to President Hoover that this incident showed "how badly we need a nine foot channel in the river."¹⁵³ A few months later Mrs. A. M. (Lucretia) Botsford of Winona, Minnesota, wrote to President Hoover and explained that the barges had been deliberately run onto the sandbar the night before. During the spurious nocturnal operation the Botsfords had offered aid, but had been told by the bargemen to mind their own business.¹⁵⁴

Although the St. Paul District had little part in the original decision-making process for the nine-foot channel, the project assured the district a productive future. Between 1930 and 1972, \$386,264,516 was spent on the total 669-mile project.¹⁵⁵ The original estimate for construction was 124 million dollars. By 1972, 213 million dollars had gone into new work.¹⁵⁶ The initial costs were paid by emergency appropriations to relieve unemployment during the Depression. According to the Emergency Relief Administration, ninety percent of the labor for the construction projects was to come from the relief rolls.¹⁵⁷ The National Re-employment Service set up offices to hire

Lock and Dam Number Three at Red Wing in July, 1937.





The newly completed lock at Red Wing in October, 1936.

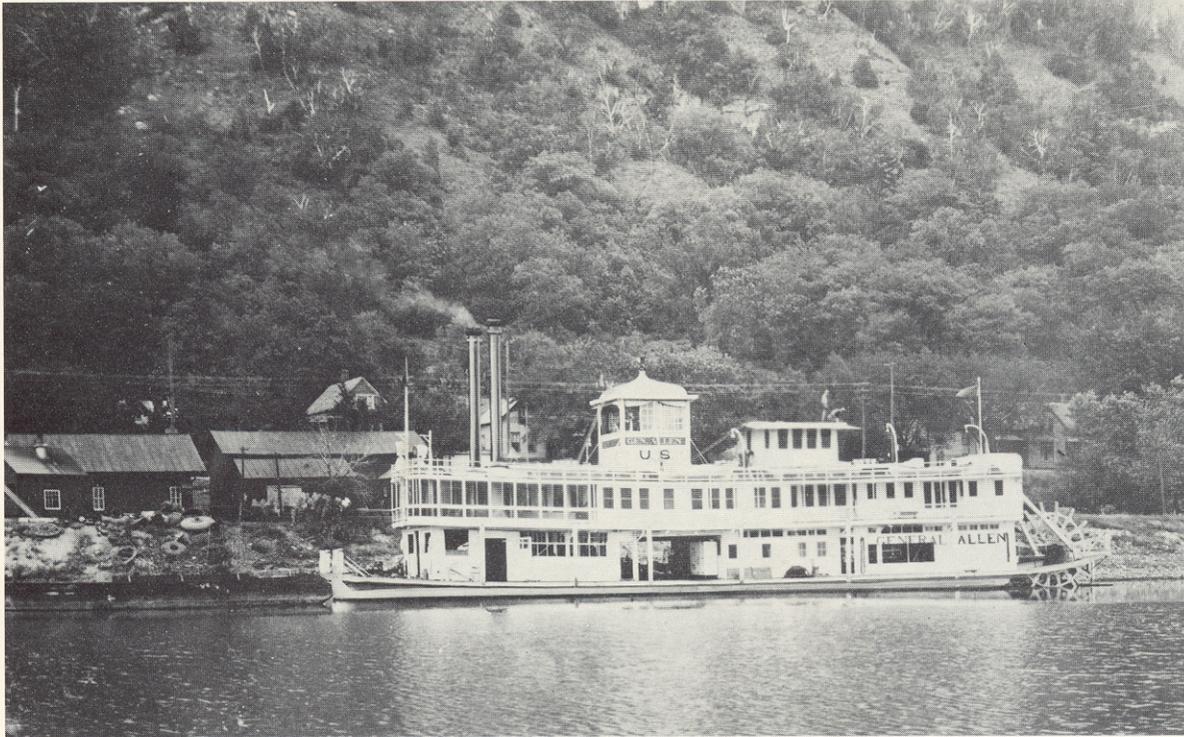
unemployed laborers for the construction work, but the system did not function very well. When people were available for work, the contractor did not need them. The greatest demand was for skilled workers and they were in short supply.¹⁵⁸ On the Red Wing dam, for example, 600 men were at work during the maximum employment period. The contractor estimated that the labor force was about sixty percent efficient. To increase efficiency workers were given two days to prove themselves competent for the job assigned. After that period they were either promoted, demoted, or released. Up to November, 1936, 1,265 men worked on the project at Red Wing, 695 of them hired from relief rolls.¹⁵⁹

When so many unskilled workers were employed safety programs had to be implemented by the contractor. Monthly safety meetings were held. In the construction of the dam at Alma (Lock and Dam Number 4) there were 421 accidents between August, 1935, and April, 1937. Three were fatal, ten were major but non-fatal, and the remaining accidents were minor injuries, largely nail punctures or eye infections.¹⁶⁰

Jobs were classified under four headings: skilled, semiskilled, unskilled and non-manual labor. The average age of the skilled workers was forty-one and they worked for about \$1.20 an hour. These skilled workmen included electricians, enginemen, iron workers, plumbers, stone-masons, sheet metal workers, welders, cement finishers and carpenters. Semiskilled workmen, paid sixty cents an hour, included drillers, form builders, oilers, jackhammer men, concrete mixers, piledrivers, and truck drivers. Unskilled workmen, who averaged about thirty-three years of age, were paid fifty cents an hour as pick and shovel men, quarry hands, teamsters, and sawyers. The non-manual workers were the youngest, averaging thirty years of age; they were paid forty cents an hour as bookkeepers, clerks, cooks, paymasters, stenographers, timekeepers, typists, watchmen and water boys.¹⁶¹

The salaries of the permanent staff increased significantly during the building of the nine-foot channel, but the austerity programs of the Hoover administration cut into employee benefits. In June, 1932, the district engineer was ordered to terminate all employees of retirement age and not to hire any additional permanent staff. All monthly and annual salaried employees were ordered to be furloughed for one month without pay and annual leave with pay was revoked. Per diem expenses were reduced to five dollars a day.¹⁶² The resulting salary changes must not have seemed too harsh to older employees like Herbert Vansant, who had worked as a junior engineer in 1907 for \$150 a month and fifteen years later was making only \$207. As an associate engineer in 1930, Vansant earned \$316 a month.¹⁶³ In January, 1933, a thorough investigation was conducted in each division and section of the district with the goal of reorganization along more efficient lines.¹⁶⁴

Along with the increase in wages came the designation of job positions by grade. A civil service board made up of a bipartisan committee chosen by the district engineer from civilian personnel in the St. Paul District had been responsible for decisions on the credentials of prospective employees since the turn of the century. John Wade usually headed this committee. Requirements for jobs in many different government bureaus were identical, but the pay and job benefits differed widely. The Corps was not noted for offering the best remuneration. Major Robert C. Williams complained in May, 1928, that the United States Lighthouse Service and the Inland Waterways Corporation both offered better pay than the Corps for boat



The "General Allen" was one of the Corps boats that worked on the nine-foot channel in 1934.

operators, and he had lost the chief engineer on the "General Allen" because of this deficiency.¹⁶⁵ In 1929, 243 rivermen in the Pilots, Masters, and Mates Association complained that the wage scales varied from one engineering district to another.¹⁶⁶ Some districts paid for board and room, others deducted it. Many required eight-hour work days, while others expected twelve and sixteen hours with no extra pay.

This situation was changed during the Depression. In June, 1932, all work was classified as educational or non-educational. The highest educational level was termed "professional and scientific service" and the salary grade ran from P-1 (junior engineer) to P-7 (head engineer). The lowest salary began at \$2,000 a year and the highest was \$7,500. The second group was called "subprofessional service" and went from SP-1 (apprentice draftsman) starting at \$1,020 to SP-8 (chief draftsman) at a maximum of \$3,200. The lowest of the educational classifications was labeled "clerical, administrative, and fiscal service" and began with CAF-1 (under clerk, \$1,260) and advanced to CAF-12 (head administrative assistant, \$5,400). The other category called "custodial service," lumped together all non-educational positions, such as overseer, foreman, lockmaster and janitor. The employees in this classification started at CU-1 (\$600 per year) and advanced through a



Major Dwight F. Johns replaced Colonel Wildurr Willing as district engineer in June, 1933, and directed the construction of the locks and dams Number 2 through 9.

large number of steps depending on job rating and longevity to CU-10 (\$3,200). This system of job classifications introduced more paper work and bureaucratic regulations, including "efficiency ratings" and their appropriate review by superiors in the chain of command.¹⁶⁷

Problems of size could be seen in many other areas of district management. A uniform filing system had to be initiated. A special number was needed to designate each project, activity and requisition. Every individual was given a number on a special badge. Routing slips, which were constantly getting lost, needed numbers. Finally, important individuals were given their own telephone numbers. The district adjusted fairly well to this numbers game, and in 1934 received a special commendation for *paperwork!*¹⁶⁸ Long gone were the days when the district engineer worried about being "cussed out" because he made an emergency purchase that exceeded the \$100 discretionary limit.¹⁶⁹

Effective communications continued to be the greatest internal problem that the district had to confront as a result of the nine-foot channel. Previously, projects had usually been undertaken using government equipment. The district engineer boasted in 1888 that he had saved \$160,614.35 by using government equipment rather than employing contract work.¹⁷⁰ The dams for the nine-foot channel, however, were done by contract. Contracts multiplied the communications problem with their detailed specifications on materials, work procedures, design, testing, quality control and change orders.

The number of circulars from the chief of engineers began to mushroom as regulations multiplied. The district office itself had three different classifications of office circulars.¹⁷¹ In October, 1942, the district engineer advised his section chiefs to hold periodic staff conferences to improve communication with their assistants. The chiefs were especially encouraged to have group discussions on personnel problems.¹⁷² In true bureaucratic form, a personnel committee emerged to aid section chiefs in personnel management.¹⁷³ With strong emphasis on written memos, the reproduction facilities of the district office (which consisted of blueprinting, multilithing, photostatic reproduction, mimeographing and vari-typing) were heavily burdened in 1943, and a special memo was issued on procedures for reproducing memos.¹⁷⁴

The greatest external problem caused by the Mississippi locks and dams project was the increased pollution of slack-water pools by municipal sanitation sewers. The problem was not unexpected. Major Charles Hall had alerted Corps officials and the public to the menace.¹⁷⁵ The Bureau of Biological Survey of the Department of Agriculture and the Bureau of Fisheries from Commerce both warned in 1930 that sewage and industrial wastes would make the water supply "much worse."¹⁷⁶ Those two federal agencies claimed that the impounding of water would provide "superior" conditions for the increased productivity of fauna and flora, "greatly increase the underwater areas and establish new feeding and breeding grounds for fish, birds and aquatic animals," but they also voiced concern for the health of human beings dependent upon the river for their water supply. Municipalities like Winona and LaCrosse were forced to close their beaches because of the "prohibitive costs" for new storm and sanitary sewer systems.¹⁷⁷

The situation for such river towns became critical when the United States District Attorney for Minnesota asked the Attorney General of the United States in 1930 to immediately "prevent all further discharge of sewage into the Mississippi River."¹⁷⁸ His request was based on a study by Lieutenant Colonel Wildurr Willing which showed that the 1,125 miles of sewers in the Twin Cities area had discharged 3,800,000 cubic yards of sludge and silt into the pool behind the Twin Cities Lock and Dam. The St. Paul district engineer concluded that, "if the discharge of untreated sewage into the pool continues it will be only a matter of time before the deposits will become a physical obstruction to navigation."¹⁷⁹ The division engineer refused to invoke section 13 of the Refuse Act, however. He felt that the scum, oil, sludge and floating debris were a nuisance but not yet "an obstruction to navigation." Consequently, he told the district engineer, "it is not believed that the Department has any authority to control the discharge of sewage other than to pass on the location of the actual construction involved in the outlet works."¹⁸⁰

The problem worsened. In 1932 Senator John J. Blaine of Wisconsin pressed Major General Lytle Brown to do something about what he called "the septic tanks" created by the federal government's dams.¹⁸¹ General Brown replied that he would do all he could to co-operate with health authorities and municipalities in finding a solution

to the problem, but that "there is no authority in law for the Federal Government to assume any portion of the cost of sewage disposal plants for these cities."¹⁸² Senator Blaine became irate and wrote to General Brown that it was the job of the federal agencies to solve problems of public health and not to evade responsibility.¹⁸³ When Representative William I. Nolan of Minnesota gained media support for his plan to appropriate federal funds for the construction of disposal plants in the Twin Cities, he lost the endorsement of the Izaak Walton League.¹⁸⁴ The delegates at their annual convention had gone on record in support of the added value to fish and wild life created by the locks and dams. They had also agreed that the contamination of the Mississippi was caused not by the federal dams but by municipal sewer systems and that the polluters should pay for the disposal of their own wastes.

In spite of the protests of city engineers, politicians and others concerned with the pollution problem, the nine-foot channel was built with remarkable speed and was opened in the St. Paul District by 1939. The pace was intensive. Colonel Willing asked for a furlough in 1933 to "recuperate from nervous strain due to recent work."¹⁸⁵ The construction history of each of the nine dams was compiled as each dam was built. The histories are very technical in content, documenting the cofferdam construction, the excavation procedures, the pile driving, the building of concrete forms, the pouring of concrete and grouting, the earth dike fill, the riprapping, the installation of tainter and roller gates, the placement of lock machinery, the erection of operator's houses, the surfacing of access roads and the design of parking and esplanade areas. After the dams were completed, the Corps built thirteen small boat harbors and five commercial harbors within the St. Paul District. The Corps also constructed thirty public use facilities along the Mississippi, nineteen of them in the St. Paul District. These recreational sites contained such facilities as boat ramps, comfort stations, parking lots, picnic areas and campgrounds.

By 1940 the Mississippi between St. Louis and Minneapolis was no longer a part of America's greatest free-flowing river. It had been turned into a canal, an engineered stairway with twenty-six locks and dams. Behind each step was a slack-water pool, a man-made lake with a regulated shoreline. The upper Mississippi canal is a gigantic public works project ignored by many historians

of the Great Depression, who have not recognized Herbert Hoover's role in initiating, planning and guiding this project through Congress and the Corps of Engineers. With the completion of the nine-foot channel the Mississippi River and its tributaries were well on the way to utilization as a multi-purpose resource for commercial and recreational needs of the nation.

TABLE 19 LOCKS AND DAMS IN ST. PAUL DISTRICT, 1972

Lock and Dam	Miles Above Ohio River	Miles from Nearest Town	Width of Chamber (feet)	Greatest Length Available for Full Width (feet)	Lift (feet)	Upper Normal Pool Elevation
St. Anthony Falls, upper lock	853.9	In City of Minneapolis, Minn.	56	400	49.2	799.2
St. Anthony Falls, lower lock and dam	853.3	In City of Minneapolis, Minn.	56	400	26.9	750.0
Lock and dam 1	847.6	Minneapolis-St. Paul	56	400	35.9	725.1
Lock and dam 2	815.2	1.3 above Hastings, Minn.	110	400	35.9	—
Lock and dam 3	796.9	6.1 above Red Wing, Minn.	110	500	12.2	—
Lock and dam 4	752.8	Alma, Wis.	110	600	12.2	687.2
Lock and dam 5	738.1	Minneiska, Minn.	110	600	8.0	675.0
Lock and dam 5A	728.5	3 above Winona, Minn.	110	600	9.0	667.0
Lock and dam 6	714.3	Trempealeau, Wis.	110	600	7.0	667.0
Lock and dam 7	702.5	Dresbach, Minn.	110	600	9.0	660.0
Lock and dam 8	679.2	Genoa, Wis.	110	600	5.5	651.0
Lock and dam 9	647.9	3.3 below Guttenberg, Iowa	110	600	6.5	645.5
Lock and dam 10	615.1	3.3 below Guttenberg, Iowa	110	600	8.0	639.0
						631.0
						620.0
						611.0

Depth on Miter Sill		Character of Foundation		Percent complete: Locks, Dams, and Work in Pool	Year Opened to Navigation	Estimated Cost of Each Lock and Dam Including Work in Pool
Upper (feet)	Lower (feet)	Lock	Dam			
15.7	13.7	Some limestone, mainly sandstone. No piles.	Limestone	100	—	\$18,203,000
13.7	10.3	Sandstone. No piles.	Sandstone	100	1959	12,382,000
13.5	10.1	Rock and piles in gravel.	Piles in gravel	100	1917	2,350,000
12.5	7.6	Piles in sand, silt, and clay.	Piles in sand, silt and clay	100	1930	6,499,000
16.0	15.1	Piles in sand, silt and clay.	Piles in sand	100	1948	7,311,000
22.2	13.0	Piles in sand and gravel	Piles in sand and gravel	82	1938	6,052,000
17.0	14.0	Piles in sand and gravel	Piles in sand	85	1935	6,701,000
17.0	13.0	Piles in sand and gravel	Piles in sand	86	1935	7,848,000
18.0	12.0	Piles in sand	Piles in sand and clay	61	1936	4,892,000
17.0	12.5	Piles in sand, gravel and silt	Piles in sand	100	1936	6,776,000
18.0	12.0	Piles in sand and gravel	Piles in sand and gravel	86	1937	7,728,000
22.0	14.0	Piles in sand, gravel and broken rock	Piles in sand	83	1937	8,287,000
16.0	13.0	Piles in sand	Piles in sand	84	1938	6,467,000
15.0	12.0	Piles in sand	Piles in sand	78	1936	

From: Office of the Chief of Engineers Annual Report, 1972, pp. 29-36

TABLE 21

State	River Mile	Pool	Public Use Areas	Picnic Area	Drinking Water	Launching Ramp	Comfort Station	Camping Area	Overlook
Minnesota	853.9	—	Upper St. Anthony Falls				X		X
	815.2	2	Lock and Dam No. 2						X
	799.0	3	Sturgeon Lake			X			
	797.4	3	Commissary Point	X	X		X		
	728.7	5A	Winona Landing	X	X	X	X		
	676.8	9	Millstone Landing			X			
Wisconsin	752.8	4	Lock and Dam No. 4						X
	742.4	5	Spring Lake Landing			X			
	738.1	5	Lock and Dam No. 5						X
	714.3	6	Lock and Dam No. 6						X
	712.8	7	Long Lake Landing			X			
	706.5	7	Brice Prairie Landing			X			
	704.5	7	Onalaska Landing			X			
	703.5	7	French Island Point	X	X	X	X		
	702.8	7	Airport Landing No. 1	X	X	X	X		
	702.5	7	Lock and Dam No. 7						X
	691.5	8	Goose Island Access (Central)			X			
	691.0	8	Goose Island Access (South)			X			
	685.7	8	Stoddard Landing	X		X	X		
	675.2	9	Bad Axe Landing			X			
	622.1	10	Jays Lake Landing			X			
	601.7	11	Bertom Lake			X			
	591.0	11	Grant River	X	X	X	X	X	
590.5	11	South Potosi			X				
Iowa	615.1	10	Lock and Dam No. 10						X

From: St. Paul District, "Water Resources Development in Minnesota," (1975), p. 23

Notes

1. *Annual Report, 1951*, p. 1225.
2. *Annual Report, 1906*, p. 465.
3. *Annual Report, 1931*, p. 1206.
4. Corps of Engineers, "Water Resources Development in Minnesota," January 1, 1975, pp. 29-30.
5. Corps of Engineers, "Water Resources Development in Minnesota," January 1, 1973, pp. 34-35.
6. Major Francis Shunk to Major Charles S. Riche, April 20, 1909, SPD, Letters Sent (press copies) NARG77.
7. Major Francis Shunk to Robinson, Gary, and Sunde Company, August 2, 1909, SPD, Letters Sent (press copies) NARG77.
8. Lieutenant Colonel Charles L. Potter to Colonel Harry Taylor, March 31, 1914, SPD, Letters Sent (press copies) NARG77.
9. Lieutenant Colonel Charles L. Potter to OCE, January 13, 1915, SPD, Letters Sent (press copies) NARG77.
10. On December 1, 1919, the Mississippi River from Minneapolis to the mouth of the Wisconsin River was transferred to the St. Paul District; see *Annual Report, 1920*, p. 1225.
11. H. E. Reeves to Joseph Loefflad, December 30, 1926, SPD, "Miscellaneous" File, Misc. Civilian Engineers, NARG77.
12. *Annual Report, 1935*, p. 922.
13. *Annual Report, 1930*, pp. 1197, 1225.
14. Roald Tweet, *A History of the Rock Island District Corps Engineers* (Rock Island: 1975), p. 134.
15. *Daily Quincy Herald*, October 17, 1879.
16. *Daily Quincy Herald*, October 17, 1879.
17. Charles B. Kuhlmann, *The Development of the Flour-Milling Industry in the United States*, p. 127; *Annual Report, 1888*, p. 1562.
18. *Annual Report, 1888*, p. 1477.
19. *Mississippi Valley Lumberman*, January 17, 1880.
20. *Annual Report, 1892*, p. 225.
21. *Annual Report, 1895*, p. 2105.
22. *Annual Report, 1899*, p. 2092.
23. *Annual Report, 1924*, p. 1100.
24. Mildred L. Hartsough, *From Canoe to Steel Barge on the Upper Mississippi*, pp. 238-59.
25. Compare tabulations in *Annual Report, 1914*, p. 929, with *Annual Report, 1909*, p. 527.
26. *Annual Report, 1931*, p. 1206.
27. G. K. Warren, *Report on Bridging the Mississippi River Between St. Paul, Minnesota and St. Louis, Missouri* (Washington: 1878); *Annual Report, 1878*, pp. 900-04; see also 47 Congress, 1 session, *House Executive Documents*, no. 136.
28. *Annual Report, 1879*, p. 1109; Warren, *Report on Bridging the Mississippi River*, Chapter 4; *Annual Report, 1882*, p. 1981 lists problem bridges.
29. Extract of a letter from Joseph Reynolds in *Annual Report, 1882*, pp. 1981-82; for an account of Warren's work on the Rock Island bridge see Tweet, *A History of the Rock Island District*, pp. 45-46 and Warren, *Report on Bridging the Mississippi River*, pp. 991-1002.
30. D. J. Whittemore to Lieutenant Colonel William R. King, October 6, 1897, SPD, Abstracts of Letters and Endorsements Received Relating to the Mississippi River, (hereafter cited as Abstracts Relating to Mississippi River) NARG77.
31. *Annual Report, 1886*, pp. xx-xxi.
32. Major Francis Shunk to Frank Henry, February 10, 1909, and Shunk to Robert Follansbee, June 6, 1910, SPD, Letters Sent (press copies) NARG77.
33. Lieutenant Colonel Charles L. Potter to W. W. Rabey, March 20, 1913, SPD, Letters Sent (press copies) NARG77.
34. Captain William A. Thompson to Lieutenant Colonel William R. King, July 1, 1904, St. Louis District, Letters Received Relating to "Miscellaneous" Subjects and the Mississippi River (hereafter cited Letters Received "Miscellaneous" and Mississippi River) NARG77.
35. Captain William A. Thompson to Colonel James L. Lusk, July 6, 1904, St. Louis District, Letters Received "Miscellaneous" and Mississippi River, NARG77.
36. J. C. Day to Secretary of War, Robert T. Lincoln, April 19, 1882, SPD, Letters and Endorsements Sent and Abstracts of Letters Received, NARG77.
37. *Annual Report, 1883*, p. 245; 1885, p. 268.
38. J. M. Turner to secretary of war, March 23, 1882, SPD, Letters and Endorsements sent and Abstracts of Letters Received, NARG77.
39. Captain William A. Thompson to Lieutenant Colonel W. R. King, December 4, 1896, SPD, Letters Sent, NARG77.
40. *Annual Report, 1911*, pp. 669-70.

41. OCE, circular letter, February 18, 1919, SPD, "Miscellaneous" File, Misc. circulars, NARG77. The final report is in 66 Congress, 2 session, *House Executive Documents*, no. 652.
42. George W. Freeman to OCE, March 13, 1919, SPD, "Miscellaneous" File, Misc. Civilian Engineers, NARG77.
43. See, for example, *Annual Report, 1935*, p. 898, where St. Paul was required to contribute \$40,000 towards the cost of improving its harbor and terminal.
44. In 1945, dredging amounted to 3,346,969 cubic yards, and in 1961 it was only 658,444 but the average has been close to 2,000,000 cubic yards for the past thirty-five year period. At least an equal amount was done in the seventy-five years preceding, and that does not include the St. Paul District dredging on Lake Superior.
45. *Annual Report, 1872*, p. 310.
46. 59 Congress, 2 session, *House Documents*, no. 341.
47. Major Charles F. Williams to M. M. Grier, October 22, 1925, SPD, "Miscellaneous" File, "Misc. Bridges Approved and Dams Authorized," NARG77.
48. Corps of Engineers, "Specifications for Construction of Rock and Brush Dams," August 1, 1928, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77. See also 59 Congress, 2 session, *House Documents*, no. 341.
49. Horace Beech to Representative Joseph W. Babcock, May 19, 1900, SPD, Letters Received and Sent, NARG77.
50. *Annual Report, 1886*, p. 250.
51. Major Frederick V. Abbot to OCE, April 1, 1899; Major Francis Shunk to OCE, October 2, 1910, and John Wade to OCE, May 24, 1911, all in SPD, Letters Sent (press copies) NARG77; district office memo, September 24, 1918, SPD "Miscellaneous" File, Misc. Circulars, NARG77. Lieutenant Colonel Wildurr Willing to Division Engineer, May 1, 1930, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77. The other huge dredging flotilla on Lake Superior was not incorporated into the district until 1955.
52. This is a rough average based on cost and cubic yards of spoils compiled from the *Annual Reports, 1942-72*.
53. *Annual Report, 1972*, pp. 29-32.
54. J. A. Towney to Lieutenant Colonel Alexander Mackenzie, June 8, 1899; report of James D. DuShane to Captain Curtis M. Townsend, June 27, 1899; DuShane to Townsend, July 1, July 6, 1899, all in SPD, Letters Received and Sent, Miscellaneous, NARG77.
55. Captain William A. Thompson to Lieutenant Colonel William R. King, December 11, 1896, SPD, Abstracts Relating to Mississippi River, NARG77.
56. Major Alexander Mackenzie to Brigadier General Thomas L. Casey, September 21, 1894, SPD, Abstracts Relating to Mississippi River, NARG77.
57. Captain William A. Thompson to Colonel James L. Lusk, December 24, 1896, SPD, Abstracts Relating to Mississippi River, NARG77.
58. Captain William A. Thompson to Colonel James L. Lusk, December 24, 1896, SPD, Abstracts Relating to Mississippi River, NARG77.
59. Captain William A. Thompson to Colonel James L. Lusk, December 31, 1896, SPD, Abstracts Relating to Mississippi River, NARG77.
60. Captain William A. Thompson to Lieutenant Colonel William R. King, December 11, 1896, SPD, Abstracts Relating to Mississippi River, NARG77.
61. Captain William A. Thompson to Lieutenant Colonel William R. King, December 11, 1896, Abstracts Relating to Mississippi River, NARG77.
62. *Annual Report, 1905*, p. 430, Appendix Y-7.
63. Report of Captain William A. Thompson, May 20, 1899, SPD, Letters Received and Sent, NARG77.
64. Letters of George Joseph, June 15, 1898; DeSoto Village Council, June 15, 1898; DeSoto Lumber Company, June 16, 1898; and B. F. Thomas, June 16, 1898, all to Russell A. Alger, secretary of war, in response to Captain William A. Thompson to DeSoto Village Council, June 11, 1898, in SPD, Letters Received and Sent, NARG77.
65. Petition of DeSoto, Wisconsin, to Secretary of War Russell A. Alger, April 25, 1899, SPD, Letters Received and Sent, NARG77.
66. The opinion of Dr. O. Ewers enclosed in the petition of DeSoto, Wisconsin, to Secretary of War Russell A. Alger, April 25, 1899, SPD, Letters Received and Sent, NARG77.
67. Report of Captain William A. Thompson, May 20, 1899, SPD, Letters Received and Sent, NARG77.
68. Colonel James L. Lusk to OCE, March 25, 1903, and C. W. Durham, report and memorandum on the DeSoto channel problem, St. Louis District, Letters Received "Miscellaneous" and Mississippi River, NARG77.
69. Major Francis Shunk to General Manager of the Chicago, St. Paul, Minneapolis & Omaha Railway Company, February 28, 1910, SPD, Letters Sent (press copies) NARG77.
70. Major Francis Shunk to International Stock Food Company, May 7, 1910, and Shunk to District Attorney C. D. Houpt, October 11, 1910, SPD, Letters Sent (press copies) NARG77.
71. Letters from Lieutenant Colonel Francis Shunk, May 23, 1912, and Lieutenant Colonel Charles L. Potter,

July 22, 1915, to Minneapolis Gas Light Company, SPD, Letters Sent (press copies) NARG77.

72. Lieutenant Colonel Charles L. Potter to Rock Island District Engineer, November 8, 1912, SPD, Letters Sent (press copies) NARG77.

73. Lieutenant Colonel Charles L. Potter to DeSoto Creamery and Produce Company, March 3, 1913; to Kunz Oil Company, April 26, 1913; and to University of Minnesota, July 23, 1915, SPD, Letters Sent (press copies) NARG77.

74. W. B. Brewster to Secretary of War, February 23, 1900, St. Louis District, Letters Received, "Miscellaneous" and Mississippi River, NARG77. Before the advent of municipal sewer systems and privy vaults human excreta was often deposited in box or can toilets and emptied by collectors called "scavengers" who worked at night. Consequently, the contents of these household toilets was called "night soil." See Victor M. Ehlers and Ernest M. Steel, *Municipal and Rural Sanitation* (New York: 1927), p. 175.

75. *St. Paul Pioneer Press*, January 24, 1926.

76. Thaddeus Surber, "The Effect of Stream Pollution on Fish Life," mimeographed paper delivered at the annual convention of the American Water Works Association, November 14, 1924, SPD, "Miscellaneous" File, Federal Power Commission Misc. General, NARG77.

77. Major Charles F. Williams to J. A. Childs, November 29, 1924, SPD, "Miscellaneous" File, Federal Power Commission Misc. General, NARG77.

78. H. A. Whittaker to Major Charles F. Williams, December 10, 1924, SPD, "Miscellaneous" File, Federal Power Commission Misc. General, NARG77.

79. Major Charles F. Williams to OCE, April 14, 1925, SPD, "Miscellaneous" File, Federal Power Commission Misc. General, NARG77.

80. Major Charles F. Williams to OCE, January 15, 1926, SPD, "Miscellaneous" File, Federal Power Commission Misc. General, NARG77.

81. Corps of Engineers, "Proposed Plan for a Joint Study of the Pollution [sic] of the Mississippi Below Minneapolis and St. Paul, Minnesota," miscellaneous memoranda; see also Major Charles F. Williams to William H. Hunt, March 27, 1926; and Williams to OCE, May 3, 1926, SPC, "Miscellaneous" File, Federal Power Commission Misc. General, NARG77. For a broader discussion of this topic see Albert E. Cowdrey, "Pioneering Environmental Law: The Army Corps of Engineers and the Refuse Act," *Pacific Historical Review* (August, 1975), XLVI, pp. 331-49.

82. Ira N. Gabrielson, *Wildlife Refuges* (New York: 1943), p. 14.

83. Peter Schmitt, *Back to Nature* (Chicago: 1968); Robert H. Wiebe, *The Search for Order, 1877-1920* (New York: 1967) pp. 159-63; Gabrielson, *Wildlife Refuges*, pp. 24-31, 40-54.

84. Florence L. Clark to Captain William A. Thompson, August 14, 1922, and to G. N. Haugen, August 14, 1922, SPD, "Miscellaneous" File, Misc. Data Concerning Contract and Hired Labor, NARG77.

85. Captain William A. Thompson to Florence L. Clark, August 18, 1922, SPD, "Miscellaneous" File, Misc. Data Concerning Contract and Hired Labor, NARG77.

86. Captain William A. Thompson to the St. Paul District engineer, August 18, 1922, and First Indorsement by Major Charles F. Williams, August 24, 1922, SPD, "Miscellaneous" File, Misc. Data Concerning Contract and Hired Labor, NARG77.

87. Captain William A. Thompson to Major Charles F. Williams, (Second Indorsement), August 25, 1922, and Florence L. Clark to Captain William A. Thompson, August 26, 1922, SPD, "Miscellaneous" File, Misc. Data Concerning Contract and Hired Labor, NARG77.

88. Captain William A. Thompson to Division Engineer, August 28, 1922, and Major Charles F. Williams, to OCE (Second Indorsement), September 6, 1922, SPD, "Miscellaneous" File, Misc. Data Concerning Contract and Hired Labor, NARG77.

89. Captain William A. Thompson to Division Engineer, December 18, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

90. Major Henry C. Jewett (Third Indorsement) to OCE, May 12, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

91. Major Henry C. Jewett to OCE, May 12, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

92. Lieutenant Colonel Thomas E. Jansen to Division Engineer (Fourth Indorsement), June 9, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

93. M. L. Fugina to OCE, September 23, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

94. Captain William A. Thompson to Division Engineer, October 2, 1920, and October 8, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

95. Memorandum dictated by Lieutenant Colonel Francis A. Pope, October 12, 1920, and witnessed by James D. DuShane, October 13, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

96. Colonel William V. Judson to Lieutenant Colonel Francis A. Pope, October 25, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

97. M. L. Fugina to Lieutenant Colonel Francis A. Pope, November 1, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.

98. Captain William A. Thompson to John Wade, November 23, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
99. OCE to Division Engineer, November 16, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
100. Colonel William V. Judson to OCE, December 27, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
101. Colonel William V. Judson to OCE, December 27, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
102. Colonel William V. Judson to OCE, December 27, 1920, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
103. M. L. Fugina to Major Thomas M. Robins, February 28, 1921, and L. Fugina to Colonel William V. Judson, March 23, 1921, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
104. Major Francis Shunk to OCE, May 17, 1911, SPD, Letters Sent (press copies) NARG77; Major Robert C. Williams to OCE, September 24, 1928, SPD, "Miscellaneous" File, Employment and Employees, NARG77; "Hall of Fame" File, St. Paul.
105. Payroll list of Major Francis Shunk, December, 1907; wage scale of Lieutenant Colonel Edward H. Schulz, January 26, 1917, all in SPD, "Miscellaneous" File, Employment and Employees, NARG77.
106. Salary rates submitted by Major Robert C. Williams, November 14, 1928, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
107. Circular from Colonel Edward H. Schulz, August 15, 1917, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77.
108. Major Robert C. Williams to OCE, October 11, 1926, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
109. Major Charles F. Williams, to OCE, November 9, 1925, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77.
110. OCE Circulars on bridges, and information bulletin on real estate holdings, November, 1923; on priority highways, June 18, 1924; on pollution of navigable waters, July 23, 1924, all in SPD, "Miscellaneous" File, Misc. Circulars, NARG77. Starting in 1908, the St. Paul office inspected many supplies going to the Panama Canal, for example, by the 1920s over 100,000 brushes had been certified, SPD, Miscellaneous Records, Panama Canal, NARG77.
111. Thomas H. Jackson, "Zone of Interior Organization," *Military Engineer*, (March-April, 1927), XIX, no. 104, p. 140.
112. Brigadier General Thomas H. Jackson to Major Robert C. Williams, September 20, 1928, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
113. Major Robert C. Williams to John Wade, September 24, 1928, and Wade to Williams, September 25, 1928, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
114. Major Robert C. Williams to Division Engineer, September 24, 1928, and Williams to Major Paul S. Reinecke, April 3, 1929, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
115. Major Paul S. Reinecke to Major Robert C. Williams, April 6, 1929, SPD, "Miscellaneous" File, Employment and Employees, NARG77; see also "Hall of Fame" file, St. Paul.
116. Major Robert C. Williams to Major Paul S. Reinecke, April 3, 1929, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
117. Major Robert C. Williams to Major Paul S. Reinecke, April 3, 1929, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
118. Major Paul S. Reinecke to Major Robert C. Williams, April 6, 1929, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
119. Major Robert C. Williams to Major Paul S. Reinecke, April 13, 1929, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
120. Telegram of Lieutenant Colonel George R. Spalding to all district engineers in the Upper Mississippi Valley Division, April 28, 1930, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
121. *Annual Report, 1925*, p. 1049.
122. *Annual Report, 1927*, p. 1072.
123. Act of Congress, January 21, 1927.
124. F. Trubee Davison to George C. Lambert, August 2, 1929, OCE, Mississippi River locks and dams, File no. 7243, NARG77.
125. See telegrams to OCE dated September 4, 1928; R. P. Warner to James W. Good, September 11, 1929, all in OCE, Mississippi River locks and dams, file no. 7243, NARG77.
126. T. J. Rogers to Major General Edgar Jadwin, August 30, 1928, OCE, Mississippi River locks and dams, file no. 7245, NARG77.
127. R. P. Warner to Major General Edgar Jadwin, October 22, 1928, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
128. Herbert Deakyne to Honorable Walter H. Newton, September 11, 1928, and Lieutenant Colonel Thomas M. Robins to Harry G. Benton, December 29, 1928, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
129. Major General Edgar Jadwin to R. P. Warner, November 5, 1928, and Brigadier General Herbert Deakyne to Honorable Walter H. Newton, September

- 11, 1928, both in OCE, Mississippi River locks and dams, file no. 7243, NARG77.
130. Lieutenant Colonel Thomas M. Robins to Harry G. Benton, Secretary, Minneapolis Real Estate Board, December 29, 1928, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
131. Telegram from Colonel Charles L. Potter to OCE, November 17, 1927, OCE, Mississippi River locks and dams, file no. 7245, NARG77.
132. *Annual Report, 1931*, p. 1211; 1929, p. 1140.
133. Special Order No. 31, Major John H. Carruth, May 29, 1929, OCE, Mississippi River locks and dams, file no. 7243, NARG77; see preliminary report, 71 Congress, 2 session, *House Document*, No. 290.
134. Henry B. Ward to Herbert Hoover, June 15, 1929, and Ward to Major General Edgar Jadwin, June 11, 1929, OCE, Mississippi River locks and dams, file no. 7243, NARG77. See also Act of Congress of June 7, 1924, Statutes at Large, vol. 43, p. 650.
135. Brigadier General Thomas H. Jackson to Lachlan Macleay, August 23, 1929, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
136. *Minneapolis Journal*, August 14, 1929.
137. George C. Lambert to James W. Good, August 31, 1929, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
138. *Minneapolis Journal*, August 23, 1929.
139. Arthur E. Morgan, *Dams and Other Disasters A Century of the Army Corps of Engineers in Public Works*, p. 299.
140. R. P. Warner to James W. Good, September 11, 1929, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
141. James W. Good to R. P. Warner, September 28, 1929, and Warner to Good, September 11, 1929, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
142. Telegram from Major General Lytle Brown to Colonel George R. Spalding, December 5, 1929, OCE, Mississippi River locks and dams, file no. 7245, NARG77.
143. OCE to William E. Hull, January 8, 1930, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
144. Patrick J. Hurley to George N. Hoaglin, January 27, 1930, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
145. OCE to Division Engineer, Upper Mississippi Valley Division, April 17, 1930, OCE, Mississippi River locks and dams, file no. 7245, NARG77.
146. See report of OCE, April 30, 1930, in reply to the request of President Herbert Hoover, April 23, 1930, OCE, Mississippi River locks and dams, file no. 7245, NARG77.
147. Herbert Hoover to F. Trubee Davison, April 23, 1930, OCE, Mississippi River locks and dams, file no. 7245, NARG77.
148. Resolution Senate File No. 512, Resolution 18, approved April 24, 1931.
149. *Annual Report, 1931*, pp. 1209-11.
150. River and Harbor Act of August 30, 1935, 72 Congress, 1 session, *House Document* No. 137.
151. *Annual Report, 1936*, p. 879.
152. "Itinerary of inspection trip by the Senate Committee on Wild Life Conservation," July 14, 1930, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
153. Undated newspaper clipping in OCE, Mississippi River locks and dams, file no. 7243, NARG77.
154. Mrs. A. M. (Lucretia) Botsford to President Herbert Hoover, November 15, 1930, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
155. *Annual Report, 1972*, pp. 29-34.
156. *Annual Report, 1973*, pp. 29-34; for comparison, it is estimated that one new lock and dam in 1976 would cost 425 million dollars, which is more than the total cost of building and maintaining the nine-foot channel since its inception, *St. Paul Pioneer Press*, April 25, 1976.
157. Corps of Engineers, "History of Construction Lock No. 3, Red Wing, Minnesota," April 13, 1937, p. 115, SPD, Reports on the History of the Construction of Various Projects (hereafter cited as Reports on History) NARG77.
158. Corps of Engineers, "History of Construction Lock No. 3, Red Wing, Minnesota," April 13, 1937, p. 116, SPD, Reports on History, NARG77.
159. Corps of Engineers, "History of Construction Lock No. 3, Red Wing, Minnesota," April 13, 1937, p. 119, SPD, Reports on History, NARG77.
160. Corps of Engineers, "History of Construction Dam No. 4, Alma, Wisconsin," June 26, 1935, p. 80, SPD, Reports on History, NARG77.
161. Corps of Engineers, "History of Lock No. 3," pp. 11-12, SPD, Reports on History, NARG77.
162. OCE, undated telegram, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
163. Reports of Major Francis Shunk, "Classified Educational Postions," December, 1907; Major Edwin H. Marks, "Compensation of Civil Employees," June 15,

- 1922; and "Organizational Chart," September 13, 1930, all in SPD, "Miscellaneous" File, Employment and Employees, NARG77.
164. Report of Captain Homer B. Pettit to District Engineer, St. Paul, February 10, 1933, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77.
165. Major Robert C. Williams to Major Charles L. Hall, May 5, 1928, SPD, "Miscellaneous" File, Employment and Employees, NARG77.
166. Sam G. Smith and George W. King to John J. Cochran, January 21, 1929, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77.
167. St. Paul District, "Instructions for Preparing Efficiency Ratings," circular A-545, April 19, 1943, SPD, General Records, NARG77; "Allocation of Positions," finance circular 73, June 29, 1932, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
168. Captain M. C. Grenata, "Paperwork Commendation," memorandum, May 9, 1934, SPD, General Records, NARG77.
169. Major E. H. Marks to Colonel William V. Judson, December 10, 1921, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77.
170. *Annual Report, 1888*, p. 197.
171. St Paul District, "Code Distribution for District Office and District Circulars," circular B-80, October 19, 1942, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
172. St. Paul District, "Work Planning," circular B-81, October 3, 1942, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
173. Lieutenant General Brehon Somervell, "Statement of Principles and Policies of Personnel Management," memorandum, August 28, 1942, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
174. Lieutenant Colonel Lynn C. Barnes, circular B-85, February 4, 1943, SPD, "Miscellaneous" File, Misc. Circulars, NARG77.
175. *Minneapolis Journal*, August 14, 1929.
176. Arthur M. Hyde to Secretary of War, March 1, 1930, and J. M. Klein to Secretary of War, March 21, 1930, OCE, Mississippi River locks and dams, file no. 7243, NARG77.
177. *Winona Republican-Herald*, February 21, 1930; Senator John J. Blaine to Major General Lytle Brown, June 27, 1932, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
178. Lewis L. Drill to the Attorney General, August 5, 1930, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
179. Lieutenant Colonel Wildurr Willing to Lewis L. Drill, August 1, 1930, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
180. Secretary of War to Attorney General, April 28, 1930; Lieutenant Colonel Edmund L. Daley to OCE, September 17, 1930, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
181. Senator John J. Blaine to Major General Lytle Brown, June 27, and July 5, 1932, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
182. Major General Lytle Brown to Honorable John J. Blaine, July 1, and July 14, 1932, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
183. Senator John J. Blaine to Major General Lytle Brown, July 5, 1932, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
184. Frank M. Warren to Honorable Patrick J. Hurley, May 6, 1931, OCE, Mississippi River locks and dams, file no. 7235, NARG77.
185. Colonel Wildurr Willing to Commanding General, Eighth Corps Area, May 29, 1933, SPD, "Miscellaneous" File, Misc. Circular Letters, NARG77. Willing never returned to duty. His successor as district engineer, Major Dwight F. Johns, served until 1938 when all locks and dams, with the exception of Lock and Dam Number 10, were completed.