

RAMSEY COUNTY
History
A Publication of the Ramsey County Historical Society

Geological Forces
That Shaped
St. Paul

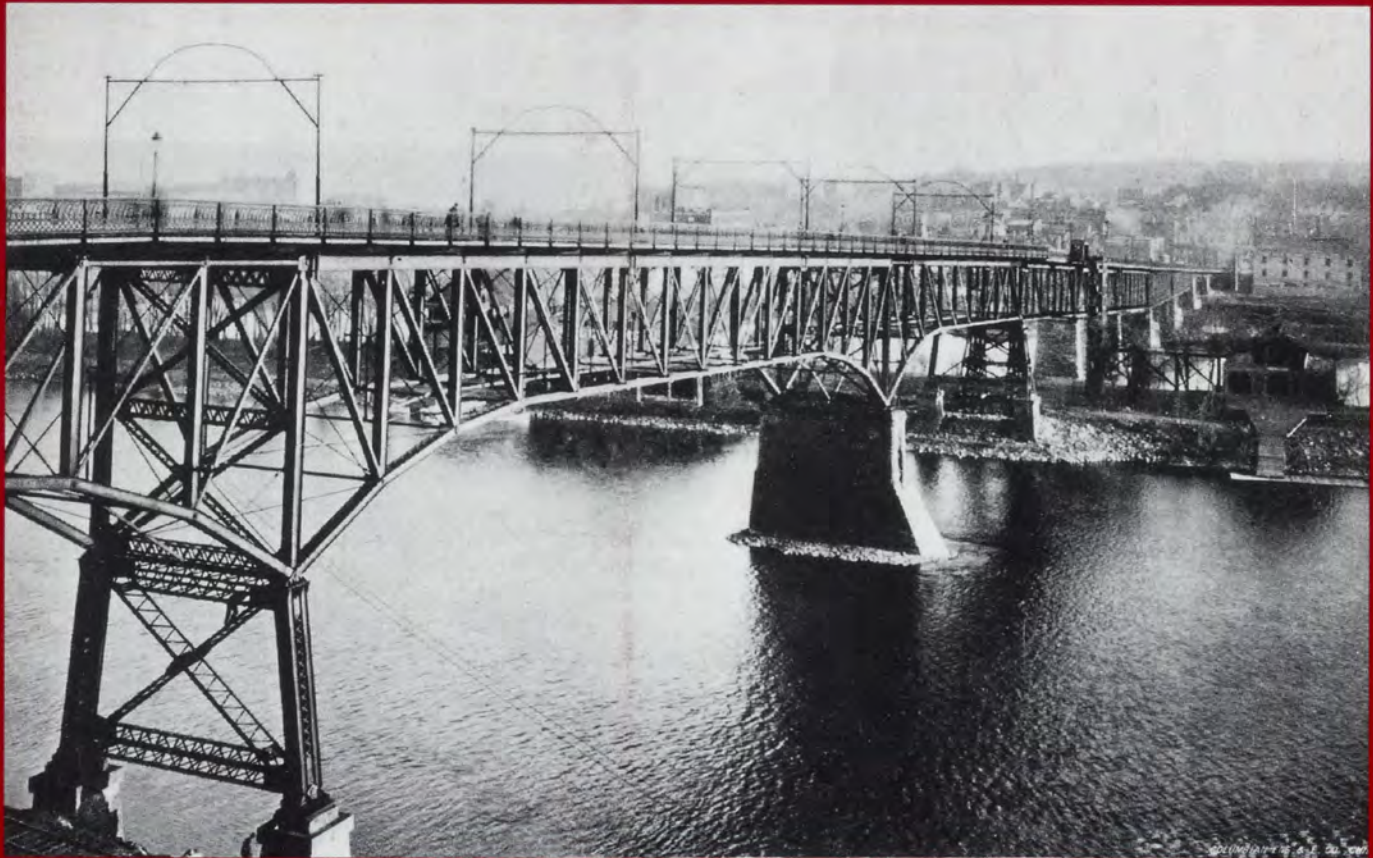
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Summer, 1997

Volume 32, Number 2

Last of Its Kind in Minnesota
The 1888–89 Wabasha Street Bridge

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The Wabasha Street Bridge, constructed between 1888 and 1889. Minnesota Historical Society photo. See article beginning on page 4.

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RAMSEY COUNTY History

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Summer, 1997

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A Message from the Editorial Board

Ramsey County History returns to the area's beginnings in this summer issue. In his article on the Wabasha Street Bridge, author Demian J. Hess not only provides a detailed history of this well-known, now-vanished landmark, but also establishes its centrality to the growth of the city of St. Paul in the second half of the nineteenth century. A companion article by Edmund C. Bray tells the geological story of the mighty natural forces that created the Mississippi river, which the Wabasha Street Bridge eventually would span.

Returning to the era before the bridge was built, Norma Sommerdorf chronicles the arrival of Harriet Bishop in St. Paul a century-and-a-half ago and describes Bishop's many contributions to the educational, moral and religious development of St. Paul's young people over a thirty-six year period. Finally, Emily Panushka Erickson recalls her years of growing up in St. Paul's West Seventh Street neighborhood. Although this issue of our magazine spans in time the Ice Ages to the present-day replacement of the Wabasha Street Bridge, its focus is squarely on how St. Paul and Ramsey County have grown and changed over time, whether measured in geological ages or human years.

John M. Lindley, chair, Editorial Board

Janet Erickson Remembers The Society in Her Will



Janet L. Erickson

Janet L. Erickson was born in St. Paul, went to school there and retired there, but a love of travel, an abiding interest in history and genealogy, and a fascination with exotic places and people, led her to live many of her years in Africa, East Asia, and India.

Born in 1920 into a family with Swedish and Norwegian ancestry, she graduated from the University of Minnesota's School of Nursing in 1941 on the brink of the United States' entry into World War II. For the next four years, she served with the army's 26th General Hospital through the North African campaigns, the landing at Anzio, and the fighting in Italy. She ended the war as a first lieutenant, then returned to the University of Minnesota to earn a master's degree in nursing in 1947. During the next few years, she taught at Syracuse University and the University of California at San Francisco, but far places beckoned.

In the mid-1960s, she joined the Agency for International Development and served in Sierra Leone for three years before joining the World Health Organization and a post first in Ahmedabad, India, and next in Bangkok, Thailand. In 1974, she was ordered to Delhi to fill a vacant Regional Nursing Advisor position, an assignment that took her back to Thailand, but also to Burma, Bangladesh, Sri Lanka, and the Maldives. In her many letters to family and friends, she vividly described some of her experiences:

"...I saw the mountains which ring

The Last of Its Kind in Minnesota

The Old Wabasha Street Bridge And How It Linked

Demian J. Hess

Spanning the Mississippi in St. Paul, the old Wabasha Street Bridge played a major role in the development of the city's downtown business district and its West Side for more than a century. Until it was demolished in 1996 to make way for a new span, the bridge was the state's only surviving example of a nineteenth century cantilevered truss.

The Wabasha Street Bridge, however, wasn't the first crossing of the river at that site. The St. Paul Bridge Company constructed a toll bridge there in 1859 with the intention of drawing trade and travelers into downtown St. Paul from land that was slowly being settled across the river. In 1888-1889, the bridge was replaced by a new span totaling approximately 1,200 feet in length, its northern half composed of a three-span steel cantilever structure. From north to south, this section consisted of a sixty-five-foot suspended span attached to a sixty-foot cantilever arm, a 280-foot continuous truss, a forty-foot cantilever arm, and a 150-foot suspended span.

Measured from bearing point to bearing point, these components formed three clear spans of 125 feet, 280 feet, and 190 feet. With the exception of the first suspended span, which was rivetted, all truss connections in the northern half of the bridge were pinned. The southern half of the bridge, built in 1899-1900, consisted of three 170-foot, steel pin-connected Pratt deck trusses, and one seventy-eight-foot steel-girder approach span. The bridge carried a forty-foot-wide concrete roadway throughout, flanked by eight-foot-wide sidewalks. Its superstructure was supported by two sandstone abutments and six piers, with the first and sixth piers standing on the river banks and the third and fourth piers sited on Raspberry Island (known for a time as Navy Island) in the middle of the river. The river channel piers were solid stone, with granite ice-breakers; the others, two-legged stone piers with steel bents.

As one of the bridges that have crossed the Mississippi from Wabasha Street to the West Side, the old Wabasha Street Bridge was closely tied to the growth of St. Paul. The story of how the city acquired ownership of its forerunner in 1867 and how that early bridge was replaced and repeatedly rebuilt is so closely tied to the development of St. Paul and its West Side that any history of the Wabasha Street crossing must begin with the founding and early growth of the city itself.

The Founding of St. Paul

In 1819, the United States army established a fort on the west side of the Mississippi river at its confluence with the Minnesota river. The post, soon to be known as Fort Snelling, was part of a larger military reserve that had been created through negotiations with the Native American tribes living in the region. While this tract was intended for military use only, civilians quickly set up homes in the shadow of the fort, a trespass the army suffered in silence until 1838, when it finally resurveyed the reservation boundaries and expelled the civilian "squatters." The dislocation did not render the settlers landless, however, for in the same year Congress ratified treaties with the area's Ojibwa and Dakota bands that opened the region between the Mississippi and St. Croix rivers to development. Joined by other land seekers, the squatters moved approximately four miles downstream and founded a new community, initially known as "Pig's Eye" in honor of Pierre "Pig's Eye" Par-

rant, a local fur trader and whiskey-seller, but later rechristened St. Paul. The original settlement stood on what is traditionally known as the east bank of the Mississippi, although in terms of compass orientation it actually is the north bank, the river flowing east-west at this particular location.

The community proved to be well sited. Its proximity to the military reserve gave it a measure of protection, and for all practical purposes, it lay at the head of navigation on the Mississippi. St. Anthony Falls, located some thirteen miles upstream, barred travel further north, while the river between the falls and St. Paul was too rocky and shallow for safe navigation. Steamships plying the river made St. Paul their northern terminus, landing at a low bench of land called the "Lower Levee" at the foot of bluffs lining the east shore. A business district developed on top of the bluffs, connected to the Lower Levee by a cartway that followed a natural ravine. When the Territory of Minnesota was organized in 1849, St. Paul became the seat of government. Incorporated as a town in the same year, the community boasted a population of 1,294, nearly a quarter of the territory's inhabitants.

In 1851, the federal government concluded negotiations with the Dakota Indians to open the territory west of the Mississippi to settlement. Newcomers immediately rushed into the area, contributing substantially to St. Paul's growth. Because of its location at the head of navigation on the Mississippi, the city became the gateway for immigration and the region's major trade center. The number of steamboats landing at St. Paul rose from 194 in 1850 to 300 in 1854 to 560 in 1855, when its population also had swelled to 4,716. Minnesota became a

East to West

state in 1858 and St. Paul remained its capital.

Although the opening of land on the West Side to settlement brought growth and prosperity to St. Paul, it also brought challenges. New towns springing into being rivaled St. Paul for the area's trade. Minneapolis, established in 1854 a few miles upstream from St. Paul had become a major sawmilling center by the mid-1850s, due to its proximity to St. Anthony Falls. Because of the difficulty of navigating the river above St. Paul, however, Minneapolis initially presented only a minor challenge as a center of trade. A more significant competitor was Hastings, located about twenty miles downstream on the west side of the Mississippi. Settlers in southern Minnesota preferred to haul their wagons directly to market at Hastings rather than take a ferry across the river to reach St. Paul.

A bridge obviously was necessary to link St. Paul firmly to the west side lands. James M. Goodhue, editor of St. Paul's *Minnesota Pioneer*, "took up the cudgel to obtain a bridge" as early as 1849. Goodhue advocated locating the crossing just above, or west of, the Lower Levee. Here a small island in the river channel could serve as a stepping stone for the bridge, reducing the expense of building piers in the river. A high bluff towered over the Mississippi on the east shore, and Goodhue envisioned the bridge descending gradually from the bluff toward the west side river flats, high above the level of steamboat traffic. Due to the river's course, the bridge would run on a north-south line, the north end lying on the east shore and the south end connected to the west shore.

City officials and entrepreneurs did not immediately respond to Goodhue's call. Building a bridge was an expensive undertaking, and few cared to bear the



The 1859 Wabasha Street Bridge in 1885 before it was demolished. Below the bridge is Raspberry Island and the Minnesota Boat Club. Minnesota Historical Society photo.

cost. However, the opening of land on the west side of the river had been accompanied by development of trade with the interior, and many began to realize the business potential of operating toll bridges.

St. Paul Bridge Company

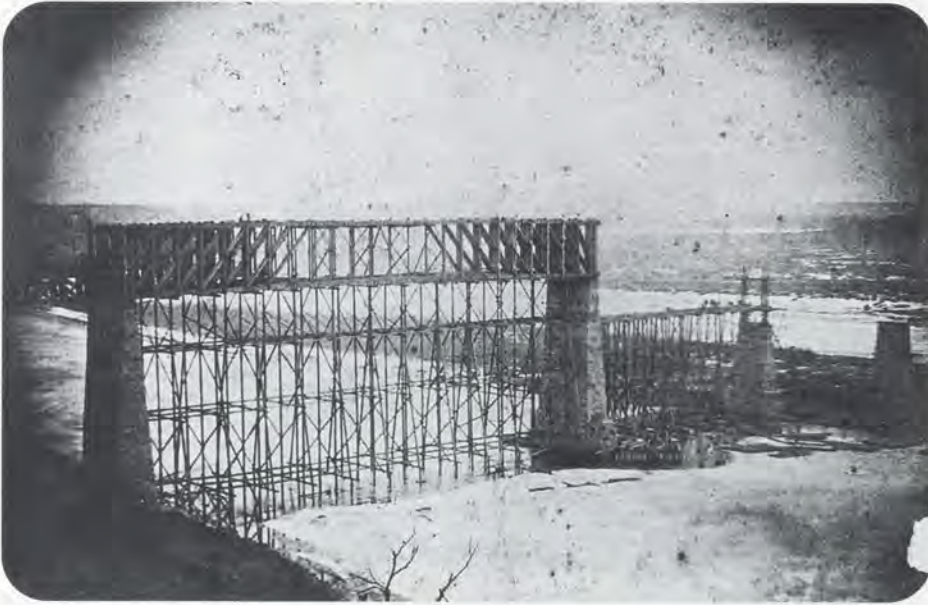
In 1852, the territorial legislature granted its first charter to a company that would build a toll bridge across the Mississippi at Minneapolis. In 1853, it issued charters to three more companies, including the St. Paul Bridge Company which received a thirty-five-year franchise to bridge the Mississippi at St. Paul. The government required construction to begin by March, 1856, and all work to be completed within five years. Failure to start or finish the bridge within the time allowed would result in the loss of the franchise.

Many of St. Paul's most prominent citizens were founding members of the enterprise, including William R. Marshall, who served as the company's president and was later the state's fifth governor; Lyman Dayton; Auguste L. Larpenteur; Louis Robert; John R. Irvine; and William Gates LeDuc. LeDuc's involvement in the bridge company was something of a hedge, for he was also a heavy investor in Hastings real estate.

Despite its distinguished list of

founders, the company failed to attract investors and could not begin construction on time. In March, 1856, the legislature granted an extension, moving the deadline back to July 1, 1857. Even then, however, the St. Paul Bridge Company managed to raise only \$49,237 in stock subscriptions. Although the amount was clearly not enough to build the bridge, the company could not delay any longer. During the summer of 1856, it proceeded with its plans. In June, it secured Joseph S. Sewall to serve as the chief engineer for the project. A resident of St. Paul since 1854, Sewall prepared many of the early city plats and eventually would supervise the construction of at least two other Mississippi river bridges in the St. Paul area: the steel, cantilevered, deck-truss Fort Snelling highway bridge (1880) and the steel-arch Marshall Avenue bridge (1889). To construct the crossing's substructure, the company selected the local firms of J. and J. Napier and Sanford A. Hooper. A St. Paul contractor named Rudolph H. Fitz appears to have erected the superstructure.

As suggested by Goodhue, the St. Paul Bridge Company planned to bridge the Mississippi on a north-south line where a small landmass called Raspberry Island (known at one time as Navy Island) divided the river into two channels. Since the section between the island and



The Wabasha Street Bridge, then known as the St. Paul Bridge, when it was under construction in 1859. Minnesota Historical Society photo.

the west shore was too shallow for navigation, river traffic was confined to the east side. This passage, generally referred to as the "main channel," measured approximately 360 feet in width. The company planned to place two stone piers in the main channel, the first to be twenty feet and the second to be 240 feet from the east bank. The contractors began work by building the second pier, sinking pilings and placing stone during the winter of 1856–1857.

The St. Paul City Council raised objections to the placement of the piers in January, 1857, and brought suit against the St. Paul Bridge Company in March to halt all construction. The council argued that if the company completed the piers as planned, it would seriously obstruct navigation by narrowing the main channel to 220 feet. This violated the company's charter, which specified that the bridge would allow a clear opening of at least 300 feet. The company admitted that it had not conformed to the letter of its charter, but denied that the bridge piers would inconvenience river traffic. After negotiations, the company eventually agreed to increase the channel width to 240 feet. Because the second pier already had been started and could not be moved, the additional clearance was obtained by building the first pier on the

east shore, out of the main channel. Mollified by the compromise, the city dropped its suit in April.

Work on the bridge piers continued through 1857, although hampered by high water during the spring. New problems appeared in September, however, when the contractors refused to continue construction until they received payment for work performed to date. The company could not meet these demands because it had not succeeded in disposing of all its stock. In desperation, it petitioned its recent adversary, the city council, to purchase its remaining subscriptions, amounting to slightly more than \$100,000. The city agreed and issued bonds to cover the cost, receiving assurances from the company that projected toll revenues would be sufficient to cover the interest "so that the taxation of the city shall not be increased."

The influx of money allowed the St. Paul Bridge Company to press construction to completion without further incident. Originally called the "St. Paul Bridge" but later renamed the "Wabasha Street Bridge," the structure opened to traffic in June, 1859. The bridge began at Wabasha Street at the edge of the business district and then ran southward to cross the river in nine spans, slowly descending from the height of the east side

bluffs to the level of the west side river flats. All of the spans were carried by stone piers measuring seven by thirty feet at the top. The east shore abutment at the north end of the bridge consisted of a low bench cut into the river bluff, while a stone abutment supported by piles stood on the opposite shore. The first pier, as agreed, stood at the very edge of the east shore, partially resting on the native rock of the bluff and partially supported on wooden piles. The second and third piers were located in the main navigation channel, the second being 240 feet from the east bank, and the third standing near Raspberry Island. The fourth and fifth piers were built on the island proper, while the remainder stood in the shallow water of the far channel. The superstructure, from north to south, consisted of one 100-foot span, one 240-foot span, and seven 140-foot spans. With the exception of the main channel span, all were wooden Howe deck trusses. The main span was a wooden Howe through truss. The crossing also included an approach on the west shore river flats consisting of a fifty-foot timber stringer span and a 330-foot timber trestle. The bridge appears to have supported an eighteen-foot-wide roadway flanked by sidewalks seven feet wide.

Although the St. Paul Bridge Company legally owned the Wabasha Street Bridge, the City of St. Paul appears to have had practical control over its operations. The city had contributed \$114,870 to the bridge's total cost of \$161,855. By virtue of this substantial investment, St. Paul claimed all toll revenues to repay the cost of its bonds, and also exercised substantial power over toll rates. When a group petitioned to waive tolls for State Fair exhibitors in 1862, it addressed itself directly to the city council and not the bridge company.

Even the St. Paul Bridge Company's nominal command of the bridge eventually ended, largely due to the venture's unprofitability. Despite the fact that many other toll bridges were enjoying high returns, especially the crossing at Minneapolis, the Wabasha Street Bridge suffered from low traffic and disappointing profits for many years. By August, 1866, revenues totalled only \$31,219.94.

By contrast, total accrued interest on the city's bonds during the same time period amounted to \$89,019.90. Unhappy that revenues were not repaying interest on bonds as promised, city authorities entered into negotiations with the bridge company in August, 1866, to take over the bridge. Owning the crossing would obviously give the city more direct control over its operations and possibly reduce expenses, allowing more revenue to go toward bond payments. In March, 1867, the company finally turned the bridge over to St. Paul in exchange for one-third the face value of its stock.

The Bridge and the City

St. Paul continued to operate the Wabasha Street Bridge as a toll crossing to recover as much of the cost of construction and maintenance as it could. While returns were never high enough to cover all expenses, they did rise after the city's takeover, largely as the result of increased traffic. Whereas bridge receipts had averaged only \$5,000 per year between 1859 and 1866, they reached a total of more than \$10,000 per year during the late 1860s and early 1870s. St. Paul owed the rise in bridge traffic, at least in part, to the construction of railroads into the city, beginning in 1862. The rail lines tied St. Paul even more firmly to the interior markets to the west and the industrialized cities to the east, leading to greater economic development and higher levels of traffic between the city and the surrounding countryside.

As traffic over the Wabasha Street Bridge increased, so, too, did pressure to make it a toll-free crossing. St. Paul business leaders and newspaper editorialists had argued from the outset that bridge tolls discouraged travel into the city to the detriment of the economy. Another group opposed to tolls proved to be West St. Paul Township residents in Dakota County, immediately across the river from the city. Due to their proximity, these people used the bridge more frequently than any other group and felt the burden of tolls most keenly.

Despite numerous requests and criticisms, St. Paul did not remove the tolls for several years. The main obstacle was cost. Maintaining the bridge proved to be

expensive, and no group was willing to help defray the cost if tolls were lifted—putting all of the burden on municipal coffers. In 1871, for example, in response to a petition from Dakota County, St. Paul agreed to make the bridge a free crossing if the county would pay one-third of the maintenance. Dakota County taxpayers balked at this stipulation, however, leaving the matter at an impasse.

The deadlock over the bridge eventually broke in 1874. In April of that year, a special committee reported to the St. Paul Common Council (successor to the city council) that "the subject of making the bridge over the river free to all is now under advisement, and will end, probably, in making said bridge free." By this time, the status of the bridge had become entangled in a plan for St. Paul to annex part of Dakota County lying immediately opposite the city on the west shore of the Mississippi. The area included all of the land between the river and the south line of Sections 7, 8, and 9 of Township 28, Range 22, comprising a parcel of approximately 2,800 acres.

This territory had been platted as the townsite of West St. Paul in 1856, and the legislature granted it a corporate charter in 1858. William Gates LeDuc, a founder of the St. Paul Bridge Company,

owned land within the townsite and was a leading figure in its organization. The fortunes of West St. Paul were closely tied to the bridge, for its proximity to that structure and downtown St. Paul were its primary attractions. The new city, however, did not prove to be as popular as its promoters had hoped. While a modestly sized community did grow, totalling 662 residents by 1860, it did not develop a substantial tax base. As a result, the city repeatedly failed to meet its bond payments. In 1862, the state legislature revoked West St. Paul's charter. The surrounding township, also named West St. Paul, absorbed the former city's territory.

St. Paul's interest in the City of West St. Paul reportedly stemmed from its concern over law enforcement. The area lay outside the jurisdiction of the St. Paul police, so that criminals often evaded apprehension simply by crossing the Wabasha Street Bridge. By annexing the land, the city hoped to bring law and order to the west side of the Mississippi. One obstacle to the plan was the fact that St. Paul lay in Ramsey County while the old City of West St. Paul was in Dakota County. For the territory to become part of St. Paul, it first had to be transferred to Ramsey County. The change in jurisdiction required the approval of Dakota County



The Robert Street bridge, with railroad tracks and bridge running underneath, about 1890. Photo from Album, J. R. H. Cruikshank, Vancouver, British Columbia, and the Minnesota Historical Society.

voters, who did not look with favor on the loss of such a large tract of land. To woo voter support, St. Paul offered to make the Wabasha Street Bridge a free crossing if it could annex the parcel.

St. Paul had another motive for trading its toll revenues for the West St. Paul territory. Industrial sites which were adjacent to downtown and had access to rail and river connections were becoming increasingly scarce on the east side of the Mississippi in the 1870s. The west side river flats, by contrast, were undeveloped and obviously had tremendous industrial potential. By acquiring the west side lands, the city council hoped to assure St. Paul's future industrial and manufacturing growth.

St. Paul's offer of a free bridge evidently satisfied Dakota County residents. On November 3, 1874, voters in both Ramsey and Dakota counties overwhelmingly approved the proposition to transfer West St. Paul to Ramsey County. The *St. Paul Daily Pioneer* did not even bother reporting the election returns the next day "as the vote was so nearly unanimous that it is unnecessary. There were not thirty votes cast against it." The former City of West St. Paul thus became the Sixth Ward of the City of St. Paul, although it was still commonly called "West St. Paul." In keeping with its promise, the city council declared that the Wabasha Street Bridge would be free to all, beginning at noon on November 18, 1874.

The removal of the bridge toll lifted a major psychological and economic barrier that long had separated St. Paul from the west side of the river. West St. Paul, which formerly had seemed remote, increasingly beckoned as an attractive residential and commercial area. Between 1875 and 1880, the population of the Sixth Ward more than doubled to 2,688 people. Many of the new residents settled in the "Lower West Side," a neighborhood that stretched across the flood plain from the foot of the bluffs to the river shore. Prone to flooding, the land was inexpensive and primarily attracted recent immigrants from Ireland or Germany with limited means. After 1882, the ethnic composition became increasingly dominated by Eastern European Jews. A commercial district also developed along

South Wabasha Street (then called Dakota Avenue) at the south end of the bridge. In the heart of the growing West Side neighborhood, yet close to downtown, this area was ideal for shops and offices; it contained more than twenty brick retail buildings by 1885.

As many had foreseen, the West Side proved to be a congenial location for manufacturers, especially after the city began constructing a flood wall along the river front in the 1880s. Industrial growth was further encouraged by the Minnesota and Northwestern Railroad, which built a bridge over the Mississippi in 1886 to introduce rail service to the area. Concurrent with this project, the company graded a large tract of land to the east of the Wabasha Street Bridge. Due to these improvements, a large number of factories located along the west shore, including, to either side of the Wabasha Street Bridge, the Twin City Fence and Wire Works and the St. Paul Roofing and Cornice Company.

Wooden Trusses

The rise in traffic over the Wabasha Street Bridge from the mid-1860s to the 1880s created constant maintenance problems for the City of St. Paul. The St. Paul Bridge Company originally had built the crossing out of wood in order to reduce cost. The wooden members quickly deteriorated due to wear and weather. The through truss over the main navigation channel, as the longest span, proved to be most susceptible. In 1869, the city council contracted with William P. Farrell, a St. Paul builder, to replace the 240-foot wood span with a combination wood-and-iron Howe through truss. Specifications for the new span were prepared by Judson W. Bishop, engineer for the St. Paul and Sioux City Railroad. M.T. Thomas, a local engineer, supervised construction. Farrell completed the span by March, 1870.

While inspecting the new through truss, a committee of engineers took the time also to examine the rest of the Wabasha Street Bridge. In the spring of 1870, they reported that all of the wooden deck trusses were in poor condition and needed to be replaced. Although city authorities were initially reluctant to shoulder

this additional expense, they finally decided, in the winter of 1871-1872, to contract with George W. Sherwood of St. Paul to carry out the necessary repairs. Using the original plans and specifications for the bridge, Sherwood rebuilt all of the deck trusses as well as the approach trestle on the south end.

The repairs to the main span lasted only until 1875, at which time the city once again faced the task of rebuilding. Convinced that wooden members would continue wearing out too quickly, the city decided to replace the main span with a wrought-iron Whipple through truss. L.W. Wellman, the city engineer, and Joseph S. Sewall, consulting engineer, prepared specifications for the truss and reviewed all bids received. On December 8, 1875, the city council awarded the contract to a Milwaukee bridge builder named L. Soulerin for \$20,160. Soulerin completed construction by the next spring, and on July 20, 1876 the special committee appointed to inspect the work reported that "we are satisfied that the city has got a 240 foot span of Iron Bridge that is not surpassed by anything in the North West."

Although the main truss members were constructed of iron, the bridge deck was still wood, as were all members of the remaining spans. These components of the bridge continued to wear rapidly, particularly as traffic surged over the bridge following the removal of the toll. In 1880, the St. Paul Common Council, received a letter from one concerned citizen questioning whether the Wabasha Street Bridge was safe. The following year, a group of St. Paul residents submitted a petition decrying the crossing's "rotten, dilapidated condition." Besides requesting the repair of the existing crossing, the petitioners also urged the city to construct additional bridges over the Mississippi. The common council's Committee on Roads and Bridges was of similar mind. In 1880, it recommended that the Wabasha Street Bridge be repaired and observed that "St. Paul can never utilize the large and valuable territory on that [west] side of the river without at least three more bridges."

In 1881, St. Paul secured permission from the state legislature to construct a



St. Paul in 1962 and the two downtown bridges linking the east and west sides of the Mississippi. Photograph by the Minnesota Department of Transportation, Ramsey County Historical Society files.

new bridge over the river at Robert Street, just east of the Wabasha Street Bridge. Completed in 1886, this structure connected the downtown business area to the river flats and became the main link to the West Side. The city began a third bridge in 1887, locating it west of the Wabasha Street Bridge at Smith Street. Generally known as the "High Bridge," the structure connected St. Paul with the bluffs on the west side of the river.

While the city constructed new bridges, it also turned its attention to repairing and upgrading the Wabasha Street Bridge. In 1883, St. Paul contracted with the Missouri Valley Bridge Company of Leavenworth, Kansas, to replace the bridge's third, fourth, and fifth spans with 140-foot wrought-iron Pratt trusses. At the same time, Horace E. Horton, a bridge builder from Rochester, Minnesota, received a contract to replace the sixth span with a 140-foot wrought-iron Pratt truss. All of this work appears to have been completed before the end of 1883.

New Abutments

In 1884, the Missouri Valley Bridge Company received another contract to re-

place the first, seventh, eighth, and ninth spans with wrought iron trusses. The seventh and eighth spans remained 140-feet in length, but the ninth was shortened to 110 feet and the first to ninety feet. The company also replaced the long trestle on the west shore with two wrought-iron Pratt through trusses, each measuring 115 feet in length. For the installation of the spans, the company constructed new abutments and piers. Work under this contract appears to have been completed by the spring of 1885.

Despite the extensive rebuilding program, the Wabasha Street Bridge continued to be a source of concern. In February 1888, L.W. Rundlett, the city engineer at that time, warned the St. Paul mayor that the bridge's 240-foot, wrought-iron main span, erected in 1876, was in imminent danger of failure. The problem, Rundlett observed, was that the truss had been built at a time "when the requirements of iron bridges were not as well understood as they are at the present time." Rundlett had alerted the common council to structural deficiencies in the main span as early as 1883, when he reported that the truss members were unevenly stressed. Five years later, he believed that the situation

could no longer be ignored, and he urged the city to immediately place load restrictions on the structure. The council authorized Rundlett to prepare plans to repair the main truss. Although ostensibly an effort to replace only one span, the project quickly blossomed into the first phase of a major redesign of the entire bridge.

Reconstruction, 1888-1900

Rundlett initially planned to rebuild the main span to the dimensions of the existing bridge, namely with an eighteen-foot-wide roadway and two seven-foot-wide sidewalks. In February, 1888, however, he was approached by a citizens' committee from the West Side and by a delegation from the St. Paul Chamber of Commerce urging him to widen the span to accommodate increased traffic levels. Both groups hoped that the rest of the bridge would soon be widened as well.

Rundlett sympathized with the request, and on March 8, 1888, he submitted two proposals to the common council to rebuild the north end of the bridge to carry a thirty-six-foot-wide roadway and two ten-foot-wide sidewalks. Rundlett observed that the old bridge piers would need to be taken down and replaced to accommodate such a widened span, as "it is much more difficult to design a new structure to fit old work and get economical results than it is to design entirely new work." According to his first scheme, Rundlett proposed replacing the bridge from its north abutment to the end of the main channel span. A second option was to rebuild the bridge to the end of the fourth span on Raspberry Island. On March 20, the council authorized Rundlett to prepare plans and specifications according to the second option.

The task of designing the new north half of the Wabasha Street Bridge fell to Andreas Wendelbo Munster, head of the Public Works Department's Bridge Division. Born in Bergen, Norway, and educated at the Chalmers Institute in Gothenburg, Sweden, Munster had emigrated to the United States in 1883, arriving in St. Paul in 1884. In his short time working for the city, Munster already had designed the wrought-iron truss Sixth Street Viaduct (1887), as well as the Colorado Street Bridge (1888), a skewed

stone and brick arch that attracted national attention for its unorthodox design. In later years, Munster would establish a well-respected engineering consulting practice in the Pacific Northwest. At the time of his death in 1929, he was serving as city engineer for Seattle.

Munster decided to replace the four northern spans with a three-span structure, thus reducing the expense of construction by eliminating one pier. His design for these spans was largely dictated by several unusual site conditions. The primary issue was the need to keep the main river channel open for navigation. While Munster could build the first and third spans on falsework, he could not block the main section of the river to erect the second, and longest, span. He partially overcame this problem by assembling the central portion of the second span on the deck of the old bridge. The old wrought-iron truss, however, could not carry the full weight of the new work. Munster therefore decided to build the ends of the second span by the cantilever method. According to this plan, workmen built from the piers at the ends of the main span toward the center without using any falsework. For support, each end of the span hung from its respective pier, anchored by the weight of the adjacent truss. Once the ends and center were built, all three sections could be attached and the old truss removed.

Although British engineers had suggested using the cantilever method to erect bridges as early as 1846, the technique apparently was not attempted until the 1870s, despite several proposals along these lines in the intervening years. Early projects built by the cantilever method included James B. Eades's bridge over the Mississippi at St. Louis, begun in 1873, and the Kentucky River High Bridge near Dixville, Kentucky, completed in 1877. After the success of these bridges, the technique was widely accepted and employed in the 1880s.

In building the main truss by the cantilever method, Munster transformed the bridge's first three spans into what was essentially a single continuous truss. To leave the bridge in this state, however, was to court future problems, for continuous construction did not readily accom-



The Fort Snelling bridge in 1906, another example of a cantilever bridge. This view is looking toward the St. Paul side of the river. Minnesota Historical Society photo.

modate thermal expansion and contraction of its members, nor shifting in its substructure. Continuous spans were also "indeterminate," meaning that their internal stresses were extremely difficult to calculate.

By the mid-1800s, engineers had determined that these problems could be resolved by inserting hinges into continuous spans. The hinges allowed bridges to expand and contract while also accommodating minor changes in pier height. In addition, the hinges broke the continuous beam into a series of cantilevered and suspended spans, which engineers could easily analyze. A German engineer, Heinrich Gerber, was one of the first to design cantilevered truss bridges to overcome the problems inherent in continuous structures. He patented his truss design in 1866 and built the first example in 1867. In the United States, a number of continuous bridges with hinge points were designed in the 1860s, but none appears to have been built at that time. One of the first to be erected was the Kentucky River High Bridge in 1877. Built as a continuous truss to simplify erection by the cantilever method, the engineers inserted hinges, creating cantilevered spans, to break up the continuity once the truss was completed.

Drawing on this precedent, Munster

placed two hinges in the Wabasha Street Bridge. He located one in the lower chord of the first span and the other in the top chord of the third span. These hinged connections created short cantilevers: one extending sixty feet northward from the first pier, thus forming part of the first span; the other reaching forty feet southward from the second pier, forming part of the third span. Beyond the cantilevers, the first and third spans were composed of simple suspended trusses. In other words, for the first span, a sixty-five-foot truss lay between the north cantilever and the north abutment. One end of the truss rested on the abutment, while the other end hung from the cantilever. The third span featured a 150-foot suspended truss: one end attached to the cantilever and the other resting on the third pier. Through this arrangement of suspended spans, cantilevers, and continuous trusses, Munster created three clear spans of 125 feet, 280 feet, and 190 feet, proceeding from north to south.

Construction Begins

Munster realized that hinges alone could not fully compensate for the expansion and contraction of truss members. He therefore placed a movable bearing on the north abutment and designed the piers on either side of the river as rocker bents.

Constructed of steel on stone pedestals, the bents were attached to the trusses by means of moveable bearings. Munster was also apparently aware that cantilever spans were prone to excessive sway and vibration, particularly in short spans. To dampen the movement, Munster used rivetted connections in the sixty-five-foot suspended truss in the first span. Rivetted connections were more rigid than normal pinned connections, and Munster apparently hoped that this would limit the vibrations in the short first span.

While Munster's design was an ingenious solution to a complicated construction problem, it was not unusual or novel for its time period. As noted, the cantilever method had been used since the 1870s, and hinged, continuous bridges had been built since the mid-1860s. Indeed, both of these features already had been employed in the Fort Snelling Highway Bridge over the Mississippi, four miles upstream from the Wabasha Street Bridge. Horace E. Horton of Rochester, Minnesota, designed the cantilevered superstructure for this bridge and erected it by the cantilever method in 1880.

Rundlett submitted Munster's plans for the Wabasha Street Bridge to the common council in August, 1888. The city opened bids for the work in September and awarded the contract for the substructure to the local firm of McMullin and Morris. The Keystone Bridge Company of Pittsburgh, Pennsylvania, received the contract to fabricate the superstructure. Undoubtedly due to his experience with cantilever construction, Horace E. Horton won the contract to erect the bridge.

Construction began during the winter of 1888-1889. As planned by Munster, Horton built the first and third spans on falsework, while he erected the center span partially by suspending it from the old wrought-iron truss and partially by the cantilever method. Workmen raised material for the central portion of the span into position from barges located in the river channel below. Rundlett later observed that the hardest part of the project proved to be placing the floor beams into position around the web members of the old truss, as each was sixty feet in length and weighed as much as ten tons.

Once the superstructure had been completed, the contractors disassembled the old bridge trusses and substructure. McMullen and Morris removed all of the masonry from the original piers, leaving only the supporting piles in the river bed. No serious delays appear to have occurred, and the contractors completed all work by the spring of 1889. The costs of the substructure and superstructure were, respectively, \$56,527 and \$102,156.

In 1892, the St. Paul city engineer's office prepared tentative plans to rebuild the remainder of the Wabasha Street Bridge. At that time, the south half of the structure consisted of seven spans: four 140-foot deck trusses, one 110-foot deck truss, and two through truss approaches, all dating from the previous decade. The city engineer's office proposed building an earthen causeway to replace the two through-truss approach spans. The rest of the south half would be replaced by five spans: three simple deck trusses and one deck truss with a cantilever that would serve as an approach span. Probably due to funding shortages, the city delayed the work for several years. In October, 1898, Munster finally resharpened his pencil and once again prepared plans and estimates for the south half of the bridge. Abandoning the earlier scheme, Munster decided to replace the southern seven spans of the bridge with three Pratt deck trusses and one steel plate-girder approach span. As before, he planned to extend the earthen causeway on the west shore to replace the two approach spans.

A Temporary Bridge

The city engineer submitted Munster's plans to the city government in March, 1899. The Committee on Streets approved the design in April, and the city opened bids for all work in May. The first phase of the project involved building a temporary bridge to carry traffic during construction. The city awarded this contract to William S. Hewett, a Minneapolis bridge builder. Charles Stone, a local contractor, and J.G. Wagner, a Milwaukee bridge builder, were the successful bidders for the substructure and superstructure, respectively.

Hewett began erecting the temporary bridge in July 1899. Following a scheme

of work developed with Munster, Hewett first constructed temporary timber piers for the bridge fifty feet downstream from the Wabasha Street Bridge. Using skids erected on pile bents, he then pushed the three southernmost 140-foot trusses of the existing bridge to the temporary piers. A trestle connected the temporary bridge to the west shore. After dismantling the remaining four spans, Hewett delivered them to a nearby city storage compound so that they would be available for subsequent reuse. The contractor opened the temporary bridge to travel in mid-November at a total cost of \$7,191.54.

Once Hewett had removed the old trusses, Stone immediately began disassembling the original masonry piers of the Wabasha Street Bridge. Stone then constructed a two-legged pier on Raspberry Island, a solid pier in the west-shore river channel, and another two-legged pier on the west shore. He also constructed a new south abutment, as well as an earthen embankment along Wabasha Street leading to the south approach. Stone took slightly more than the eight months allowed by his contract to complete the substructure and causeway, and Munster noted in his journal that the contractor "commenced work and prosecuted it in [a] desultory manner."

Wagner began erecting the superstructure in July, 1900. Following Munster's instructions, he began with the southernmost span and worked northward, "leaving the connection with the present bridge to the last" so as not to interfere with traffic on the temporary bridge. As specified, Wagner erected three identical, 170-foot, pin-connected, steel Pratt deck trusses. The southern approach span was a seventy-eight-foot steel girder. None of these spans was located over a navigable channel, and falsework therefore was permitted in their erection. Once completed, the new south section of the bridge featured a thirty-six-foot-wide roadway flanked by ten-foot-wide sidewalks. The bridge deck consisted of brick paving over a wooden floor. The structure reopened to traffic in August, 1900. The cost of replacing the substructure totalled \$55,189, while work on the superstructure amounted to \$96,880.

The Bridge in the Twentieth Century

Although the Wabasha Street Bridge had been under almost constant reconstruction since 1859, it was to remain virtually unchanged for nearly a century after 1900. During this time, the crossing continued to serve as an important transportation artery linking downtown St. Paul with the West Side. The structure carried two lanes of traffic as well as, until the 1940s, tracks for an electric railway that connected West Side neighborhoods with the central business district and allowed residents to commute to and from work. The bridge also was a major thoroughfare for automobile traffic in the twentieth century, eventually becoming part of US Highway 52 and State Highways 13, 55, 56, 88, and 218. The bridge proved to be particularly important as a truck route, being one of only two structures leading into downtown capable of supporting the weight of these vehicles.

The city made a number of minor changes to the bridge during the 1900s. In 1903, the city assembly approved a measure to build a stairway from Raspberry Island to the bridge. The Minnesota Boat Club had built a similar stairway in 1873 to more easily reach its clubhouse on the island. The city apparently removed this structure when it replaced the south half of the bridge in 1899-1900. The new stairway was located on the west side of the fourth span. More significant alterations became necessary as motorized traffic increased in the 1920s. At that time, trucks using the bridge were considerably heavier than earlier horse-drawn wagons, prompting the city to strengthen the bridge deck by placing cover plates on the floor beams and stringers. The engineer's office reinforced the four northern spans in 1924, and completed the remainder of the bridge in 1928.

Aside from minor repairs and maintenance, the Wabasha Street Bridge stood unchanged until 1955. For several years, however, city engineers had observed that many floor beams and stringers were badly rusted and that the thirty-six-foot-wide roadway was too narrow for current traffic. St. Paul therefore advertised for

bids in February, 1955, to rebuild the deck. Because the bridge carried a state trunk highway, the Minnesota Highway Department agreed to pay all costs for repair of the roadway and its supporting members. The Whiting-Turner Contracting Company of St. Paul won the contract for the work. The company replaced the existing paving and subflooring with a concrete and steel deck. Extra stringers were added, although the existing floorbeams apparently were not altered. As part of the work, the sidewalks were paved with concrete and narrowed to eight feet in order to expand roadway width to forty feet. The contractor also replaced the original bridge railings. With a wider roadway, the bridge carried two lanes of traffic in each direction.

After 1955, the Wabasha Street Bridge generally required only routine maintenance. Minor repairs included the replacement of worn rocker pins in the fourth pier bent in 1971, and the installation of a concrete apron in 1979, to protect the bluff on the east shore from erosion. In spite of the bridge's trouble-free history, city authorities began to entertain the possibility that the structure would need to be replaced by the mid-1980s. While the Wabasha Street bridge was structurally sound, it had a limited load capacity of only eighteen tons for a single vehicle and twenty-six tons for a combined vehicle. By contrast, new bridges were generally designed with a carrying capacity that was 50 percent greater.

A Careful Inspection

The matter came to a head in 1987. That spring, St. Paul submitted plans to the Minnesota Department of Transportation in order to receive federal funds for a variety of repair work on the bridge, including the rebuilding of expansion joints in the roadway, replacing bearing units, and repairing crumbling sidewalk concrete. While the transportation commissioner eventually approved the work, he initially delayed funding out of concern that the bridge was becoming obsolete and would need to be replaced. To answer the commissioner's concerns, municipal and state engineers carefully inspected the crossing. They determined

that while the bridge was indeed capable of carrying its posted loads, no one could predict its remaining life span. Given the lengthy and time-consuming process of applying for federal aid, the city determined that it was better to initiate the procedure immediately rather than continue waiting for the bridge to show signs of failure.

In 1988, St. Paul secured the services of Toltz, King, Duvall, Anderson and Associates (TKDA), a St. Paul engineering firm, to coordinate the replacement efforts. TKDA first studied whether the bridge could be reinforced to meet current load capacity standards. Test results indicated that this option was not feasible, necessitating replacement. Because the Wabasha Street Bridge had been listed on the National Register of Historic Places for its role in the development of the city and for its cantilevered design, the City of St. Paul agreed to document the structure prior to demolition, according to the standards of the Historic American Buildings Survey/Historic American Engineering Record. This study is intended to fulfill that obligation. At the time of this writing, a new bridge is under construction.

This article is based on a study prepared by Hess, Roise and Company, a Minneapolis-based historical consulting firm, for the Minnesota Department of Transportation, under a sub-contract with Tolz, King, Duvall, Anderson and Associated, Inc., of St. Paul. Jeffrey A. Hess served as principal investigator for the study; Demian J. Hess was project historian and author of the final report. Demian Hess holds a B. A. in American Civilization from Brown University and has worked for the National Park Service and for Hess, Roise and Company. The author of several published articles, he also is co-author of a study of the Minidoka Irrigation Project in Idaho, scheduled for publication in 1998 by the University of Idaho Press.

An annotated copy of this article, with an extensive bibliography, is available in the Ramsey County Historical Society office.



Another view of the 1888-89 Wabasha street bridge. Minnesota Historical Society photo. See article starting on page 4.

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