The Francois Chouteau Bridge

The Francois Chouteau Bridge is located in both Kansas City, Jackson County, Missouri, and North Kansas City, Clay County, Missouri. However for shelving purposes at the Library of Congress, Kansas City, Jackson County, Missouri, was selected as the "official" location for the Francois Chouteau Bridge.

<table>
<thead>
<tr>
<th>Location:</th>
<th>Spanning the Missouri River at Chouteau Trafficway Kansas City, Missouri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quad:</td>
<td>North Kansas City, 7.5 minutes series.</td>
</tr>
<tr>
<td>UTM:</td>
<td>Zone 15 N433302-E367481.</td>
</tr>
<tr>
<td>Present Owner:</td>
<td>The City of Kansas City, Missouri City Hall 414 East 12th Street Kansas City, Missouri 64106</td>
</tr>
<tr>
<td>Present Use:</td>
<td>The Francois Chouteau Bridge carries vehicular traffic.</td>
</tr>
<tr>
<td>Significance:</td>
<td>Originally constructed as a railroad bridge for the Chicago, Milwaukee and St. Paul Railroad, the Francois Chouteau Bridge was designed by pioneer engineer Charles L. Strobel. It was with this bridge that Strobel introduced the Z-Bar and Z-Bar Column. In addition, the Francois Chouteau Bridge was constructed by Keystone Bridge Works, an internationally-known company based in Pittsburgh, Pennsylvania.</td>
</tr>
<tr>
<td>Historian:</td>
<td>Cydney E. Millstein, M.A., Art History</td>
</tr>
</tbody>
</table>
CHRONOLOGY

1885
The matter of extending the Chicago, Milwaukee and St. Paul Railway from Ottumwa, Iowa to Kansas City, Missouri was resolved by the board of the railroad. In connection with the extension of the railroad line, it was also resolved to construct a bridge across the Missouri River.

1886
Herman Clark and Company, New York, was awarded contract to construct the railroad line from Ottumwa to the Missouri River at Kansas City.

Contracts for the construction of the bridge were awarded to the following: The Keystone Bridge Works, Pittsburgh, Pennsylvania for the construction of the superstructure; SooYSmith and Company, New York, for the construction of the piers. Charles L. Strobel (1852-1936), consulting engineer and agent for the Keystone Bridge Works in Chicago from 1885-1893, was named as designer for the structure.

Grading for the bridge commenced in October.

1887
With the completion of the bridge, the Chicago, Milwaukee and St. Paul Railway officially open its "Chicago and Kansas City Line" on December 5.

1903
The trestle at the extreme southern portion of the bridge was washed out in a flood.

1911
New counter rods were added to the deck truss span and expansion joints in the floor system were modified.

1915
Reinforcements made to the forty-five floorbeams of the three 400-foot spans.

1918
"Concrete jackets" were added to the top portion of pier Nos. 2 and 3.

1928
Because of financial difficulties, the Chicago, Milwaukee and St. Paul Railway changed it name to the Chicago, Milwaukee, St. Paul and Pacific Railway.

1944
The Harry S. Truman Bridge, a new drawbridge across the Missouri River at Kansas City, was planned by the Rock Island line and the CMSt. P&P.

1945
The Harry S. Truman Bridge was dedicated on July 1. This bridge shortened the Chicago, Milwaukee, St. Paul and Pacific route to Kansas City by 2.2 miles and actuated the closing of the CMSt. P&P bridge.
Thirty-five representatives of the Northeast and Blue Valley Industrial Districts urged the City Plan Commission, Kansas City, Missouri, to approve the proposed conversion of the Milwaukee Railroad Bridge to provide another State Highway entrance into the city. Councilman George J. Miller presented the plan.

1947

The Milwaukee Railroad offered to sell its bridge to the City for $100,000 plus a release from grade separation costs on the approach to the new bridge. Under the proposed agreement, the city could obtain a 200 foot right-of-way for 400 feet from each end of the bridge plus a narrower right-of-way for another 3800 feet southward.

L.P. Cookingham, City Manager, spoke with R.J. Middleton, Chief Engineer for the Milwaukee Road, concerning the conversion of the old bridge to highway use.

The bridge is now used for the storage of railroad cars.

The proposal to link U.S. Highway 69 and U.S. Highways 40 and 50 with the bridge is part of the city's bond program passed in November. As part of the bond program, one million dollars became available for the Milwaukee bridge conversion.

1949

The city rejected the Milwaukee Railroad's terms of the proposed sale of the bridge.

R.J. Middleton makes new offer to sell the bridge for $190,000 plus a right-of-way to run approximately one mile from the bridge to the north main line track of the Kansas City Southern. North of the bridge it would take in about four and one-half miles of graded right-of-way.

The Board of Advisory Trustees approves $200,000 for the purchase of the bridge. Funds for this transaction available from the bond issue that passed in 1947.

Howard Needles Tammen and Bergendoff, Kansas City, file report with the city stating that the bridge could be converted to a two lane highway span at a cost of $482,000. The engineers recommended a "light-weight open grating construction to be used to effect a twenty-foot reinforced concrete slab with a five inch curb on both sides so that an upper deck might be added in the future."

1950

The City Council authorized preparation of an ordinance for the purchase of the abandoned Milwaukee Railroad bridge and 65.7 acres of right-of-way for $190,000.
Kansas City's first family, the Chouteaus, urged the City Council to re-name the Milwaukee Railroad bridge the Francois Chouteau Bridge. Kansas City was established by Chouteau when he built his first fur-trading post in 1821 at a site immediately west of the south end of the bridge.

City Council unanimously approved the purchase of the Milwaukee Bridge on July 17, 1950. The engineering firm HNTB awarded contract to convert the bridge to vehicular traffic.

1951
The Milwaukee Bridge was sold on January 24, 1951 to Kansas City in an official ceremony.

Robert J. Benson, 3rd District councilman-at-large, presented a check of $188,500 to William J. Whalen, Chicago General Manager of the Milwaukee Road for the purchase of the Milwaukee Bridge.

Benson made a request to the City Council to draft a resolution naming the bridge "The Francois Chouteau Bridge" in commemoration of the first family of Kansas City. Resolution adopted.

Contract was awarded to the Kansas City Bridge Company for construction of the bridge conversion. Kansas City Structural Steel was awarded the contract to fabricate the steelwork for the project.

Steel shortages and right-of-way difficulties delayed opening of stretches of the Chouteau Bridge.

1953
On September 17, a parade beginning at the Municipal Auditorium marked the celebration of the opening of the Chouteau Bridge.

1970
The complete deck of the deck truss span of the south approach of the Chouteau Bridge was replaced.

1973
The Chouteau Bridge was closed to traffic because of a major crack in the north pier (#1). Immediate repairs by Boyd, Brown, and Stude, Kansas City, Missouri, entailed the use of steel rods and concrete. Pier 4 was repaired by adding a concrete jacket to the top portion.

1975
Top portion of Pier #3 was repaired.

1987
Three areas of the deck of the South Approach were removed and replaced.
Historic documentation and feasibility studies to determine future plans of the Chouteau Bridge prepared by Harrington & Cortelyou, Inc., with Boyd, Brown, Stude & Cambern, Chartered, and Architectural and Art Historical Research, all Kansas City, Missouri firms.

The History and Design of the Francois Chouteau Bridge

The Francois Chouteau Bridge, linking the Northeast Industrial section of Kansas City, Missouri to North Kansas City and Clay County, was built in 1886-87 for the Chicago, Milwaukee and St. Paul Railroad. It spans the Missouri River in a north/south direction, four miles downstream from the confluence of the Kansas and Missouri Rivers. The historic bridge can be reached from Front Street at the south end and by Armour Road and Highway 210 at its north end. Presently, two lanes of Chouteau Trafficway are routed across the bridge.

The site of the Francois Chouteau Bridge is near the first trading post established by Francois Chouteau in 1821, the same year that Missouri was admitted to the Union. (Chouteau was a descendent of the Chouteau family of St. Louis who began the western division of the American Fur Company). Although this fur trading post is "significant as the place where the first permanent, non-native settlement began in the area," unfortunately, it was washed out five years later in a flood. Subsequently in 1826, Chouteau re-established his post at a location near the south end of the ASE Bridge. It was this settlement that "became the nucleus of the present city" of Kansas City, Missouri.

Although the Francois Chouteau Bridge by name and location is commonly linked to the early history of Kansas City, its most important association is with the railroad for which it was built. In 1885, board members of the Chicago, Milwaukee, and St. Paul Railroad approved the extension of their line from Ottumwa, Iowa to Kansas City. To complete that connection, the board also approved the construction of a bridge at Kansas City over the Missouri River. The entry of the Milwaukee Road, as the railroad was called, into Missouri occurred "during its great expansive years under the presidency of Alexander Mitchell who headed the railroad from 1866 until his death in 1887." This Missouri connection was to be Milwaukee Road's first and only line in that state.

In order to provide funds for the new line, the Chicago, Milwaukee and St. Paul Railroad resolved to issue income bonds totaling $5,000,000. The sale of these bonds, in addition to the existing Chicago and Pacific Western Division bonds, made the Missouri connection a reality.

In March 1886 after the right-of-way for this new line was obtained and funding was procured, a contract with Herman Clark and Company, New York to extend the railroad was approved. Concurrent with this transaction, contracts were also let with the Keystone Bridge Works, Pittsburgh, for the bridge's superstructure and with SooySmith Company of New York for the construction of the bridge
piers. Charles Louis Strobel, consulting engineer and agent for the Keystone Bridge Works' Chicago office was chosen as designer for the bridge.

While grading of the railroad line commenced in the spring of 1886, the actual construction of the Milwaukee Road bridge did not occur until the fall of that year as a site for the location of the structure had not yet been selected. While several locations were considered as possible sites, the town of Randolph, Missouri was finally chosen and a permanent contract was made with the Belt Railroad of Kansas City to secure the right-of-way.

Like so many of the bridges built as connections for rail lines, the Milwaukee Road bridge over the Missouri at Kansas City (apparently, there was no official name) attracted little attention from professional publications. With the exception of six original drawings, there appears to be scant primary information available on the actual design of the bridge. In discussing those facts we are, for the most part, limited to a general account of the construction of the bridge written by Ralph Cooper. In a two-part article written for The Milwaukee Railroader, Cooper states:

A crew of well over 100 men, with horses, wagons and other equipment, went to work transporting earth from the distant south bluffs to be built over one mile of right-of-way. The fill began with a height of 50 feet rising up in the flat bottom land at the end of the south approach... Crews started the piers and main spans from the south side of the river, working with barges and cable lines.

Cooper further writes:

The bridge was a mixture of wrought iron, popularly used for years, and the new milled steel just coming into use at the time. The pier footings were carried 79 feet, 10 inches below the surface of the ground at the south end in order to reach Pleasanton shale formation and a sufficiently dense rock to carry the load.

Work on the Milwaukee Road bridge continued for six months past the contracted July 1887 deadline. Finally, on December 5, 1887, the Chicago, Milwaukee and St. Paul Railway opened their new Chicago to Kansas City line. Prior to the railroad's official opening as a trial run, the first train to cross the new tracks was locomotive No. 189 which included two passenger cars and a baggage car. Aboard the train were officials of the CM&St. P and several members of the Armour family.

Although the Milwaukee Road bridge was modified for vehicular traffic in the early 1950's in general, it appears as it was originally constructed. As per Strobel's design, the original overall length of the bridge measured approximately 2,980 feet from approach to approach. The superstructure features three main Whipple Truss spans that stretch over the Missouri River: the far south span measures 403 feet, 5 inches; the center span measures
404 feet, two inches; while the north span measures 403 feet 5 inches. Each truss features sixteen panels with steel top chords, iron verticals and combination steel and iron tension members. Iron bent approach spans at the south measured approximately 1,545 feet while short approach spans are located at the north end. Original iron bent and newer approach spans now stretch approximately 1,222 feet at the south end. The roadway of the bridge is supported by floor beams framing into the truss at the lower panel points and stringers spanning the twenty-five feet between floor beams. The river span trusses are spaced twenty-three feet center to center. There is fifty feet of vertical clearance from extreme high water to low steel. The piers, set in cement mortar bedding, feature limestone blocks above the water line and granite blocks below the water line. The original deck that featured a single main line track with safety rails has been removed. With the design of the Milwaukee Road bridge, Strobel introduced the "Z-Iron column." These columns can be found at the trestle-bents where Strobel found that "important advantages could be secured for this part of the structure by adopting for the compression members a new form of cross-section consisting of four Z-irons joined by lattice bars in the middle plane." Strobel performed tests on these Z-irons, which were manufactured by Brown, Bonnel & Co. of Youngstown, in Keystone's hydraulic testing machine in Pittsburgh.

Through the years, there have been several alterations made to the bridge (see chronology), but the most significant change occurred in 1951-1953 when the Milwaukee Road structure was sold to the City of Kansas City and converted to two-lane highway use. This shift was the result of the effects of a joint operation created by the Rock Island Line and the Milwaukee Road. In connection with this transaction, a new drawbridge across the Missouri River was constructed and the old Milwaukee Road bridge was abandoned.

As a result of the conversion, the original deck of the bridge was removed and replaced with an open grating and concrete deck. New side rails were also constructed. In addition to these modifications, the name of the bridge was changed to The Francois Chouteau Bridge, in commemoration of the first family of Kansas City, Missouri. On September 17, 1953, the Francois Chouteau Bridge officially opened.

CURRENT AND FUTURE BRIDGE EXPECTATIONS

This report has been prepared in conjunction with the Feasibility Study and Design Concept Report for the replacement of the Francois Chouteau Bridge over the Missouri River. The study, dated May, 1991, entailed an investigation of the suitability for continued service of the existing structure, the options available for rehabilitation of the existing structure, and alternatives for bridge replacement. Topographic surveys and traffic studies for the area were carried out as a part of the feasibility study.

The investigation revealed that the bridge has deteriorated gradually over its history to the point where commercial trucks may
no longer safely use it. The structure, which is part of a system of bridges which span the Missouri River, is unable to carry its share of traffic due to its narrow roadway and deteriorated structural condition.

The configuration of the truss structure does not lend itself to a feasible increase in lane widths which might allow its continued use to serve the City's transportation needs. Possible preservation of representative spans as a historic exhibit with incorporation into Riverfront Park was also investigated. The results of all studies are documented in the referenced Feasibility Study and Design Concept Report and its Appendix.

After careful consideration of all aspects of the feasibility study, the decision was reached that the existing bridge should be completely removed and a new structure built to replace it. Therefore this report has been prepared to provide documentation for the original structure in accordance with the requirements of the Historic American Engineering Record (HAER). The firms of Boyd, Brown, Stude & Camben, Chartered and Architectural and Art Historical Research compiled the historical data, photographs, and drawings in the following report under the direction of Harrington and Cortelyou, Inc., the prime engineering firm for the project.

**BIOGRAPHICAL MATERIAL**

Charles Louis Strobel

Charles Louis Strobel, son of Karl and Ida L. Strobel, was born on October 6, 1852 in Cincinnati, Ohio. At the age of 17, after attending public schools in Cincinnati, Strobel traveled to Stuttgart, Germany and enrolled in the Royal Institute of Technology in civil engineering. Upon graduation in 1873, Strobel returned to the United States and was hired by the Cincinnati Southern Railway as a draftsman. His success with the firm was immediate as he was appointed assistant engineer in charge of "theoretical work and designs" in 1874.

During his tenure at the Cincinnati Southern which lasted until 1878, Strobel "analyzed the competitive designs" for bridges and viaducts for the railroad line which was then in the process of construction. The magnitude of Strobel's work was vast as he was directly responsible for the design of 300 miles of new iron superstructures including The Ohio River Bridge at Cincinnati and the High Bridge over the Kentucky River.

The bridge over the Ohio River featured the longest span of the truss or girder type at the time. The High Bridge (1876-1877), designed by Louis Frederic Gustav Bouscaren and C. Shaler Smith, was the first cantilever bridge in America. It was with this structure that Strobel "introduced... probably for the first time in this country, the calculation of stresses based upon definite locomotive wheel loads followed by uniform train loads." In addition, Strobel researched and computed the "bearing and shear values of rivets and the bending, as well as shear and bearing values, of pins." With these analyses, Charles Strobel's reputation as an innovative engineer became well known.

In 1878, Strobel left Cincinnati and during the course of the following seven years he was engaged as assistant to the president
and engineer of the Keystone Bridge Works in Pittsburgh, Pennsylvania. Then for the next eight years, from 1885-1893, Strobel was employed as consulting engineer and agent in Chicago for the Keystone Bridge Works in addition to consulting engineer to both Carnegie, Phipps and Company, Ltd. (1886-1893) and to the Chicago, Milwaukee and St. Paul Railway Company (1886-1890).

It was during this period, from 1878 to 1893, that Strobel was his most prolific. He designed many prominent bridges over the Missouri, Mississippi and Ohio Rivers in addition to the first "standard" sections for I-beams and channels for the Carnegie Phipps and Company, Ltd. He also introduced the rolling of Z-bars and Z-bar columns in connection with his design for the superstructure of the Chicago, Milwaukee and St. Paul Railway bridge over the Missouri River at Kansas City. Among many advantages of the Z-bar, Strobel found that the preparation of Z-iron was much less expensive than that of channel iron and much more efficient to use.

While in Chicago, Strobel also worked with Daniel H. Burnham and John Welborn Root in designing steel skeletons for the Rookery (1885-87), the Monadnock (1889-91), and with Dankman Adler and Louis Sullivan in designing the steel work for the Chicago Auditorium (1886-1890). According to written accounts of the times, Strobel "had much to do with the development of steel skeleton construction for Chicago's Sky Scrapers."

In 1893, Charles Strobel engaged in independent business as a contracting engineer which he incorporated into the Strobel Steel Company in 1905. Strobel's achievements during this phase in his career included his contribution to the development of the first Rolling Lift Bascule Bridge (1894), designed by William Scherzer. Strobel retired in 1926 from a distinguished career as "a truly great pioneer engineer." Although Strobel contributed many fundamental principles of construction to the world of engineering, perhaps his most important work was his book A Pocket Companion of Useful Information and Tables Appertaining to the Use of Wrought Iron for Engineers, Architects, and Builders. Prepared for Carnegie Brothers and Company, Ltd., publishers of the book in 1881, this source later became known as the Carnegie Handbook.

On April 4, 1936, Charles Louis Strobel died at his home in Chicago, where he was prominent in civic and social life.

The Keystone Bridge Works

The Keystone Bridge Works was "always a source of satisfaction to me", wrote Andrew Carnegie (1835-1919), the American industrialist and philanthropist. "The Keystone works have always been my pet..." A pioneer in the construction of long span railway bridges and one of the earliest companies to specialize in manufacturing iron railroad bridges, the Keystone Bridge Works was organized in 1865 in Pittsburgh, Pennsylvania by Andrew Carnegie. With a capital of $300,000, the soon-to-become steel baron's new company absorbed the bridge firm of Piper and Shiffler. Coincidentally, Carnegie had been "instrumental in establishing" Piper and
Shiffler in 1861 while working with the Pennsylvania Railroad Company.

According to his biography by Joseph Frazier Wall, Carnegie was impressed by J.L. Piper whom he became acquainted with in 1856. Piper, who had worked as a mechanic for the Pennsylvania line, was becoming dissatisfied with the vulnerability of wooden bridges and was often called upon to repair or completely reconstruct those structures that had been damaged by the effects of weather or fire. Because of his "objection to the futility of the whole process" of building bridges of wood, Piper became very interested in the notion of constructing bridges out of iron.

Along with the chief bridge engineer for the Pennsylvania line, J.H. Linville, Piper designed a small iron bridge for the railroad which was hailed as a triumph by their associates and supervisors. Carnegie, too, realized "the value of Piper's and Linville's ideas" and soon convinced Piper, Linville and Shiffler to establish a new firm "dedicated exclusively to the building of iron railroad bridges."

By the spring of 1865, Andrew Carnegie resigned from the Pennsylvania Railroad Company and by May 1, the Keystone Bridge Works was officially formed. From its inception, the newly reorganized bridge building company, under the management of Piper and Shiffler, was a success. The original company shops of Piper and Shiffler were subsequently expanded and remodeled by the Keystone Bridge Works, while several new buildings including machine-shops, riveting sheds, pattern-shops, smith-shops and bolt-cutting areas were constructed.

Even before his company officially merged, Carnegie saw the economic advantage of creating his own supply of structural beams and plates manufactured of iron. He acted swiftly and on October 14, 1864, Andrew Carnegie organized The Cyclops Iron Company along with Thomas Miller, Piper and Linville. Prior to this development, the Kloman and Phipps Company, partly owned by Andrew's brother Tom Carnegie, had been the main supplier of iron for Keystone. For Andrew "the appropriately named Cyclops would have its one eye fixed on Kloman and Phipps - not as a potential rival, but as a subsidiary."

Once again as a result of his remarkable business savvy, Andrew created the Union Iron Mills from the merger of Cyclops and Kloman and Phipps in March of 1865. Thus, his source of iron for his Keystone Bridge Company was now complete. Located between the Allegheny Valley Railroad and the Allegheny River in Pittsburgh, the Union Iron Mills, like Keystone, was an immediate success. Among its many innovations, was the construction of the first "universal" mill in the United States. This type of mill, patented by Andrew Koman, was designed especially for "rolling heavy flat bars or plates up to thirty-six inches in width, with sound and true edges, avoiding the necessity of shearing." With this invention, it was almost certain that Keystone could meet the specifications of any bridge design.

Of the hundreds of bridges that were built by Keystone, undoubtedly the most important project for that company was the Eads Bridge (1868-1874) in St. Louis over the Mississippi River.
Designed by Capt. James Buchanan Eads, the bridge was one of Carnegie's "proudest achievements" even though the material for the bridge was mainly furnished by the Midvale Steel Works of Philadelphia. Eads had refused to use iron for the construction of the bridge and instead, insisted on the use of steel parts.

Other prominent superstructures built by Keystone include The Steubenville Bridge (1862-63), The Newport and Cincinnati Bridge (late 1880s-1891), The Brooklyn Bridge (1869-83), the Keokuk-Hamilton Bridge across the Mississippi (1868-1873?), the Schuylkill River Bridge at Fairmount, Philadelphia (1873), and the Connecticut River Bridge at Middletown, Connecticut (1870s). In addition, Keystone was responsible for the construction of several bridges throughout Mexico and South America.

It appears that because of the aforementioned incident with Eads, Carnegie's interests shifted from the manufacturing of iron to steel. In spite of the fact there was strong opposition from the stockholders of Union Mills, Carnegie formed Carnegie McCandless and Company on November 5, 1875. This company was later absorbed into the Edgar Thomson Steel Works and on July 1, 1892, The Carnegie Steel Company was established. The Keystone Bridge Works, too, became part of this operation.

In his last major business transaction before his death in 1919, Carnegie sold his steel manufacturing companies including the Carnegie Steel Company to U.S. Steel on February 26, 1901. Just prior to this transaction, in 1900, Keystone Bridge Works was consolidated into the American Bridge Company.

FOOTNOTES


2. Ibid.


5. The Organization and History of the Chicago, Milwaukee and St. Paul Railway Company. 49.

6. Ibid.

7. General William SooySmith (1830-1916), was widely known as the first bridge engineer to use pneumatic caissons. The Missouri River Bridge at Glasgow, Missouri, constructed by SooySmith, was the first bridge in America to feature all-steel spans.

8. Kansas City Times, October 6, 1886, 8.


11. Milwaukee Railroader, 10.

12. Ibid. Although Cooper is not a professional historian, his father was a conductor for the Milwaukee Road Kansas City Division throughout his lifetime. Cooper, now retired, is a recognized authority on the Kansas City line.


15. This information was gleaned from several drawings including Plan No. 558, August 21, 1886 and Project No. 835, dated May 21, 1951.


17. Kansas City Times, September 17, 1953, 3.


22. Ibid.

23. Ibid.

24. ASCE Transactions. (April, 1888), 104.


26. ASCE Transactions. (1937), 1494. It is important to note that Strobel filed several patents during his career. These
include Manufacture of Eye-Bars (1883); Bridge Truss or Girder (1884); Eye-Bars and Similar Articles (1885); Apparatus for Rolling Eye-Bars (1996); and A Movable Bridge (1898). These inventions were not mentioned in any of Strobel's biographies.

27. Strobel's work as an author of this handbook is not only documented in several biographies, but is corroborated by a search of the 1881 and 1890 editions through OCLC, Kansas City Public Library. It should be mentioned that an earlier edition of this handbook published by Carnegie Brothers and Company in 1876 and compiled by A.G. Haumann, C.E. has also been located.


29. Ibid, 227.

30. Ibid, 228.

31. Ibid, 229.

32. Ibid.

33. Ibid.


35. Andrew Carnegie. 249.

36. Ibid.


38. Andrew Carnegie. 275.

39. Ibid, 291. Some of these bridges have been replaced with more modern structures.

40. Ibid, 535-536.

41. Ibid, 792.

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