

SANTA FE BRIDGE
Spanning the South Fork of Salt River at County Road 24
Santa Fe Vicinity
Monroe County
Missouri

HAER No. MO-68

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1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain Regional Office
National Park Service
U.S. Department of the Interior
P.O. Box 25287
Denver , Colorado 80225

Historic American Engineering Record

HAER No. MO-68

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Santa Fe Bridge

- Location:** Spanning the South Fork of the Salt River on Monroe County Road 24, 0.3 mile south of Santa Fe; NW $\frac{1}{4}$, NE $\frac{1}{4}$, Section 20, Township 53 North, Range 8 West; South Fork Township, Monroe County, Missouri.
- USGS Quadrangle:** Santa Fe, Missouri (7.5 Minute Series)
- Date of Construction:** September - December 1888 (moved 1931-32)
- Designer:** St. Louis Bridge and Iron Company, St. Louis MO
- Builder:** St. Louis Bridge and Iron Company, St. Louis MO
- Fabricator:** St. Louis Bridge and Iron Company, St. Louis MO
- Present Owner:** Monroe County, Missouri
- Present Use:** roadway bridge (scheduled for replacement in 1992)
- Significance:** Designed, fabricated and erected by the St. Louis Bridge and Iron Company in 1888, the through truss on the Santa Fe Bridge originally spanned the South Fork of the Salt River one mile south of the small town of Florida. The South Florida Bridge carried heavy vehicular traffic as a regionally important crossing until its replacement in the late 1920s. In 1931-32 one of its three spans was moved and re-erected at this site just south of Santa Fe, where it has since functioned in place with minimal alterations. This Pratt through truss displays typical wrought iron configuration and pin-connected detailing for its period of construction. It is technologically significant as the last remaining example in Monroe County from what was once a large collection of 19th century wrought iron spans.
- Report Assembled by:** Clayton B. Fraser
Fraserdesign
Loveland Colorado

November 1991

The Historic American Engineering Record (HAER) documentation for the Santa Fe Bridge was conducted by Fraserdesign of Loveland, Colorado, under contract with Monroe County, Missouri. The county has proposed the replacement of the structure (Project No. BRO-069(6)) in 1992, and this recordation is intended to mitigate in part the impact on the bridge by this action. Field recording of the Santa Fe Bridge and preparation of this report were undertaken in November 1991. The research for this project has involved three primary archival sources: the Monroe County Clerk's Office in Paris, Missouri, the Little Dixie Regional Library (Paris, Missouri, Branch) and the Missouri Highway and Transportation Department in Jefferson City, Missouri.

Monroe County was partitioned from Ralls County in 1831. Later that year Paris, the county seat, was platted, as was Florida, the commercial center of Jefferson Township.¹ As these and other settlements - Granville (1832), Jonesburg (1836), Clinton (1836), Santa Fe (1837) - developed along the Salt River, an impromptu network of roads and trails formed to link them, following the typical pattern of settlement and transportation.² Organized road and bridge building was the responsibility of the county government, administered by a county court. To bridge the myriad of streams, runs, gullies, ravines and washes that crisscrossed the region, the court ordered short-span timber stringer structures built in the 1830s and 1840s. Though inexpensive to erect, most of these spans tended to be structurally suspect and required frequent maintenance to prevent their collapse. Moreover, they were limited to short-span crossings.

It was the Salt River, with its various forks and branches, that formed the most serious impediment to overland travel. Lacking sufficient revenues in its formative years, Monroe County waited until the 1850s to undertake any large-scale bridge construction on the Salt. The county court contracted with Payson, Illinois, contractor Joseph C. Elliott to erect a series of timber Burr arch-trusses with wood coverings, beginning with a 120-foot span over the North Fork of the Salt River at Stoutsville in 1856-57. Elliott also built bridges across the Middle Fork of the Salt at Paris (1857), across the Elk Fork on the Paris-Mexico Road (1858-59), and across the South Fork at Santa Fe (1859).³ In 1876 the county court contracted with Henry Sebastian and William Vliet of Kansas City to build four combination trusses over the Salt River.⁴ In 1879, Sebastian, who by this time had split with Vliet to form H.W. Sebastian and Company in St. Louis, erected two combination spans across the Long Branch of the Salt.⁵ Sebastian designed and built all of Monroe County's major spans in the 1870s and 1880s. He even acted as *de facto* bridge commissioner as he inspected and reported on the condition of county bridges.

Before 1882 the county had built only timber or combination structures. That August, however, the court contracted for its first all-iron span when it ordered a 100-foot Pratt truss from Sebastian to cross the Middle Fork of the Salt River south of Holliday.⁶ Just after this span was completed in April 1883, the judges bought a second iron truss for a crossing of the North Fork a mile north of Florida. Erected by Sebastian later that year, the bridge at Hickman's Mill consisted of a single 152-foot Whipple truss.⁷ By 1884 the county had built 32 bridges of various sizes, for an aggregate cost of over \$51,000. Of these, only the North Florida and Holliday bridges were comprised entirely of iron. The rest were timber structures, either simple stringer spans or combination trusses that used iron fittings and/or tension members.⁸

With an overall length of some 400 feet, the bridge over the South Fork just south of Florida was one of the most important and by far the longest crossing in Monroe County. Located next to the Goss and Vandeventer Mill, the structure consisted of three "National" combination trusses, built in the 1850s for approximately \$5,000. The spans lacked a wood sheathing to cover their structural members and had by this time begun to decay perilously. In October 1884 the county court ordered road and bridge commissioner William H. Combs to visit the deteriorating structure to "examine the condition of the bridge... and condemn and close the same if he deems it unsafe for public use and travel."⁹ Combs reported back to the court a month later; evidently the bridge was kept in service with relatively minor structural repairs.¹⁰ The South Florida Bridge carried wagon traffic for another three years until February 1888, when a sizeable contingent of area residents petitioned the county court for a new iron span at this location. "They labor under great inconvenience for want of same," wrote the county clerk. In response, the judges directed Combs to visit the site and estimate the cost of an all-iron bridge.¹¹

It was not until summer that the court acted further toward construction of the bridge at Florida. That August, H.W. Sebastian, who had recently incorporated his firm as the St. Louis Bridge and Iron Company, presented plans and specifications for a new bridge at the site.¹² Sebastian had delineated a wrought iron structure made up of two 134-foot and one 136-foot Pratt through trusses, supported by stone masonry piers and abutments.¹³ Extending 404 feet between the abutments, the proposed structure was only slightly longer than the timber bridge it would replace, but its iron composition would make it far more durable.

The trusses featured standard, pin-connected configuration and detailing, straight from St. Louis B&I's current roster of designs.¹⁴ (*See Appendix for the full text of the specifications.*) With a nominal height of 22 feet and roadway width of 14 feet, the trusses were divided into seven equal panels. They were comprised of rolled wrought iron members, built up and machine-riveted in the St. Louis B&I shops. The inclined endposts and upper

chords consisted of two back-to-back channels, covered by a continuous iron plate on top and joined by batten plates beneath. The verticals were similarly configured, with two channels laced together by iron straps. (Two square eyebars with shovel ends form the verticals at the hips.) The lower chords and diagonals were each made up of two rectangular bars with punched eyes; the counters consisted of round eyerods with slotted turnbuckles. St. Louis Bridge and Iron typically used rolled I-beams for floor beams on its 12-foot-wide trusses; on its heavily trafficked 14-foot-wide spans - such as the South Florida Bridge - the firm employed tapered, "fishtail" plate girders, U-bolted to the pins below the lower chords. The struts were comprised of four angles joined by double lacing, with deeper, knee-braced lattice struts at the portals. The upper lateral braces were round bars with threaded ends; the lower, round eyebars with unslotted turnbuckles. Timber stringers supported a timber deck, and 2x10 boards formed the hub rails.

The judges listened as Sebastian explained his design, and then they immediately awarded a contract to fabricate and erect the trusses for \$7,000.00, apparently without competitive bidding. (See Figure 1 for a copy of the contract.) Almost as an afterthought, they awarded the substructural contract to Sebastian a month later for \$825.¹⁴ A St. Louis B&I crew began excavating for the limestone abutments and piers soon after the award of this second contract, completing the masonry work late in the fall. The men then erected the two iron trusses using standard timber pile falseworks. By year's end the bridge was complete. During this time, Thomas Combs, who had served as the county road and bridge commissioner since 1874, was replaced by John T. Grigsby. Grigsby was nothing if not thorough. Using the bridge company's plans and specifications, he pored over the newly completed structure and reported his observations to the court in January 1889:

The iron work agrees with the specifications accept [sic] in the following instances. Hip covers do not lap on batter post [endpost] and the state [stay] plates on batter post. And six rollers instead of seven and movable ends of south span is an abutment instead of a pier. No yoke on ends of the top lateral struts but fastened to top and bottom flanges of top cord [chord]. Portal braceing [sic] two bolts instead of four per foot. Flooring second panel of north end objected to. Said panel was put in by St. Louis Bridge and Iron Co. with the understanding that Goss and Vandeventer who furnished the lumber would replace it if it was objected to. The mason work seems to be satisfactory.¹⁵

The judges ordered St. Louis Bridge and Iron to replace the defective wood decking but otherwise accepted the bridge as built, paying the company the balance due at that time. They continued in their unswerving loyalty to H.W. Sebastian through the 1890s, as the county contracted with St. Louis B&I exclusively for its metal spans until the turn of the century.¹⁶ Around 1900, when Sebastian turned over control of the company to J.T. Garrett, the county stopped dealing with St. Louis B&I and began contracting with other bridge builders, including the Canton Bridge Company (Canton OH), Midland Bridge Company (Kansas City MO), Pan-American Bridge Company (New Castle IN) and the Decatur Bridge Company (Decatur IL).¹⁷

CONTRACT.

Articles of Agreement, Made this Seventh day of August A. D. One Thousand Eight Hundred and Eighty eight.
Between ST. LOUIS BRIDGE & IRON CO., of St. Louis, Missouri, party of the first part,
and Monroe County, Road and Bridge
Commissioners
of Monroe County State of Missouri, Party
of the second part.

WITNESSETH: That the said party of the first part, for the consideration hereinafter mentioned, agrees to furnish all material, and to build and construct for the said party of the second part, a weightless iron bridge across South Fork of
South River

and have the same completed on or before the first day of November, 1888.

Said bridge to be completed in accordance with the plan and specification herewith attached, which are hereby made a part of this contract.

Said party of the second part hereby agrees to pay the said party of the first part for constructing said bridge, the sum of Seven thousand 7,000 DOLLARS,

in manner following, to-wit: One-half when the same is delivered to the nearest Railroad station, to-wit: \$3,500.00 Two thousand when work is completed and accepted \$2,000.00 Five hundred 500.00 on the first 1889 2,000.00 Three thousand remains to be paid in installments at the rate of 6% per annum until paid in full on the first 1889.

and for the performance of all and every article and agreement above mentioned, the said parties do hereby bind themselves each to the other, firmly by these presents.

IT IS FURTHER AGREED, by and between the parties hereto, that should the weather or condition of the said stream be such as to preclude the erection of the said bridge within the time above specified, or should the same be delayed by the failure of the Railroads to transport any portion of the same within such time, or from any other cause or causes beyond the control of the said party of the first part, then the time for the fulfillment of this contract shall be extended for a period not less than that caused by such delay.

IN WITNESS WHEREOF, The said parties of the first and second parts have hereunto affixed their hands and seals.

But it is agreed and understood that this contract shall not be binding on the part of the party of the first part, unless the same be countersigned by one of its authorized Agents, but no Agent shall have authority to collect anything due or becoming due on this contract without written authority for same given by the general Manager.

Signed this Seventh day of August 1888



St. Louis Bridge & Iron Co.
per Wm. H. Bartholomew, President
Wm. L. Corbett, Bridge Commissioner

Executed on the part of the party of the second part in the presence of

Figure 1. Contract between Monroe County and St. Louis Bridge and Iron Company for South Florida Bridge. Original copy located at Monroe County Courthouse, Paris, Missouri.

Between the 1890s and the 1920s, Monroe County avoided building major new structures at several of its river crossings by maintaining and repairing the existing wooden bridges, especially the five covered bridges built by Joseph Elliott.¹⁸ One of these gable-roofed structures was located just south of Santa Fe, in South Fork Township. The bridge carried an extension of Jefferson Street south of the small town over the South Fork of the Salt River. Completed by Elliott late in 1859, the Santa Fe Bridge consisted of a single 100-foot Burr arch-truss span, which rested on a natural limestone outcropping on its north end and a stone pier on the south.¹⁹

Through occasional repairs, the county managed to keep the Santa Fe Bridge open until it was destroyed by flooding on June 19, 1926. For some reason, the court was slow in replacing the wrecked structure, however. The judges ordered the steel truss at the London Ford crossing east of town moved to the site in July 1930, but this was never done.²⁰ Finally, in October 1931 the court ordered the 136-foot span from the South Florida Bridge, which had since been replaced by the state highway department, moved and re-erected at Santa Fe.²¹ The county built a new concrete pier and abutment on the bridge's south end (using the original stone ledge abutment on the north end), moved a riveted lattice pony truss to serve as the south approach, and then moved and re-assembled the iron truss at the site. John Grigsby, who as Monroe County road and bridge commissioner had overseen the construction of the original South Florida Bridge in 1888, also supervised the truss' move and assembly at Santa Fe in 1931. The structure has carried intermittent traffic since its completion in 1932, with only minor maintenance-related alterations.

Like virtually all of Missouri's counties, Monroe County followed a definite progression in its bridge construction in the 19th century, responding to evolving transportation needs and to technological development in the bridge building industry. The first simple spans, built as the county was undergoing its initial settlement, were rudimentary timber structures: cheap and easy to build but lacking in durability and limited in span length. With greater revenues from increased settlement, the county could undertake more ambitious timber trusses in the 1850s and 1860s. Iron was used for tension members in the combination spans erected during the 1870s and early 1880s. These in turn were superseded in the 1880s by all-iron spans, made readily available by mass-production techniques. Although the county court barely noticed the transition from iron to steel in the 1890s - and, indeed, continued to refer to new bridges as iron that were undoubtedly made of steel - this evolution marked a watershed that would continue into the 20th century for bridge fabricators and the rolling mills that supplied them. Of the dozens of substantial wagon bridges built in the 19th century by Monroe County, only two, the Santa Fe Bridge and the Union Covered Bridge, have survived demolition and flooding. The Santa Fe Bridge is significant as the only remaining example in the county of early wrought iron truss construction. The span may be salvaged once again and moved to a new location, but presently its future is clouded.

Endnotes

¹As the birthplace of Samuel Clemens, Florida was one of the better known among Monroe County's settlements. An 1884 county history described the town and the mills which spawned its settlement: "Florida is situated upon a high point of land between the Middle and North Forks of Salt River, near their junction, in the eastern part of Monroe County... The two mills, which formed the first starting points of the town, were built about the same time, in 1827. The mill upon the South fork was erected by Peter Stice, a jolly Dutchman; that on the North fork by Richard Cave. Stice's mill was purchased by Hugh A. Hickman during the fall of 1830 and operated by him for nearly 40 consecutive years. Perhaps no mill in the State was ever run so long by the same individual, nor was ever a business more faithfully managed than was this loved calling by the old Captain, as he was familiarly called... He sold the mill in the spring of 1868 to Messrs. Clark and Gaitskill; they to M.B. Clark, and he to the Powers Bros... The Powers Bros. sold to Goss & Vandeventer (John C. Goss and John W. Vandeventer). The mill on the North fork was built by Richard Cave and sold by him to Dr. Meredith, a physician from one of the New England States. From Dr. Meredith it was purchased by Boyle Goodwin and operated by him with moderate success, and sold to A.M. Hickman about 1852... Florida was declared the head of navigation on Salt River, and was thought by those brave and ambitious pioneers to be a favorable point for the founding of a great commercial town. The town was accordingly laid off by Maj. Wm. N. Penn, Hugh A. Hickman and others, and although the bright dreams which swelled the hearts of these noble pioneers were not realized, Florida has always held the rank of a respectable and enterprising village." *History of Monroe and Shelby Counties, Missouri* (St. Louis: National Historical Company, 1884), pages 152-154.

²*Ibid.*, pages 91-95; Walter Williams, ed., *A History of Northeast Missouri* (Chicago: Lewis Publishing Company, 1913), pages 464-481; *Standard Atlas of Monroe County, Missouri* (Chicago: George A. Ogles and Company, 1897).

³Elliott built one more covered bridge, across the North Fork of the Salt River on the Paris-Fayette Road in 1870-71. Known as the Union Bridge, this structure consisted of a single 126-foot span, supported by stone abutments. *History of Monroe and Shelby Counties, Missouri*, pages 276-277; Pauline Bryan and Annie Smithey, "Covered Bridges of Yesteryear in Monroe County, Missouri," typewritten manuscript, 1973, located at Little Dixie Regional Library, Paris, Missouri, Branch, n.p.; Monroe County Court Record: 8 April 1870 (Book M, page 15), 6 June 1870 (Book M, page 56), 9 June 1870 (Book M, page 67), 6 July 1870 (Book M, page 75), 4 October 1870 (Book M, page 124), 6-7 September 1871 (Book M, page 356-357), located at Monroe County Courthouse, Paris, Missouri.

⁴Monroe County Court Record: 9 August 1876 (Book N, page 549), 6 September 1876 (Book N, page 559), 1 January 1877 (Book N, page 595), 7 February 1877 (Book N, page 609), 6 March 1877 (Book N, page 623).

⁵Monroe County Court Record: 9 October 1878 (Book O, page 227), 8 November 1878 (Book O, page 236).

⁶Monroe County Court Record: 9 August 1882 (Book P, page 334), 4 April 1883 (Book P, page 455).

⁷Monroe County Court Record, 4 April 1883 (Book P, page 455), 4 September 1883 (Book P, page 523).

⁸As listed in 1884, the bridges in Monroe County were: "North fork, Salt River, three bridges - Elliott bridge [Burr arch-truss covered bridge built by Joseph C. Elliott], Paris and Hannibal road, 145 feet, \$5,000.00; Pratt truss double intersection, iron, 156 feet span, one mile north of Florida, \$7,000.00; Pratt truss combination, 140 feet span, at Clinton, \$1,500.00; Clear Creek, on Paris and Shelbina Road, wooden, \$150.00; Four bridges on Crooked Creek, 1 combination and 3 wood, \$1,500.00; Otter Creek, 5 wooden bridges, \$1,500.00; on Middle fork of Salt River, 5 bridges to wit: at Leesburg one Pratt truss combination, 110 feet span, \$1,000.00; at Porter's Ford 1 National truss, 100 feet span, condemned; 1 on Holliday and Grunville [Granville] road, Pratt truss, iron single intersection, 100 feet span, \$2,000.00; 1 at Paris, Elliott's bridge, 100 feet span, \$5,000.00; 1 a mile south of Florida, National truss, 3 spans, 400 feet, \$5,000.00; 7 bridges on Elk [North] fork of Salt River, viz.: 1 on Paris and Louisiana road, Pratt truss combination, 135 feet long, \$1,500.00; 1 on Paris and Mexico road, Elliott make, \$4,000.00; 1 on Paris and Columbia road, Pratt truss combination, 135 feet span, \$1,500.00; 1 on Paris and Middle Grove road, Elliott make, \$5,000.00; 1 on Madison & Sturgeon road, Pratt truss combination, 135 feet span, \$2,000.00; 1 wooden bridge on road from Madison to Middle Grove, \$200.00; 1 wooden bridge on road from Evansville to Middle Grove, \$200.00; On Long Branch of Salt River, 4 bridges, viz.: 1 on Paris and Santa Fe road, Pratt truss combination, 130 feet span, \$1,500.00; 1 on Paris and Mexico road, Pratt truss combination, 75 feet, \$800.00; 1 wooden bridge on Paris and Centralia road, \$200.00; 1 wooden bridge on Madison and Centralia road, \$200.00; 1 bridge on South fork of Salt river, Elliott make, 100 feet span, \$4,000.00; 1 bridge on Indian Creek, wooden, \$250.00; 1 wooden bridge on Mud Creek, \$200.00. Total, \$51,200.00." *History of Monroe and Shelby Counties, Missouri*, pages 276-277.

⁹Monroe County Court Record: 8 October 1884 (Book Q, page 78).

¹⁰Monroe County Court Record: 6 November 1884 (Book Q, page 85).

¹¹Monroe County Court Record: 8 February 1888 (Book Q, page 603).

¹²Monroe County Court Record: 7 August 1888 (Book R, page 58).

¹³For more descriptive and historical information about Pratt trusses, see T. Allen Comp and Donald Jackson, "Bridge Truss Types: A Guide to Dating and Identifying," (Nashville: American Association for State and Local History, 1977); and David Plowden, *Bridges: The Spans of North America* (New York: The Viking Press, 1974).

¹⁴The South Florida Bridge closely resembles two other extant Missouri trusses built during this time by St. Louis Bridge and Iron: the Morse Mill Bridge (1886-87) in Jefferson County and the Young's Ford Bridge (1884) in Vernon County.

¹⁵Monroe County Court Record: 4 September 1888 (Book R, page 77).

¹⁶Grigsby's report is reprinted in the Monroe County Court Record: 7 January 1889 (Book R, pages 127-128).

¹⁷During the 1890s, St. Louis Bridge and Iron built at least seven metal bridges in Monroe County: the Palmyra Ford Bridge over the Middle Fork (1893), the Lear Ford Bridge over the Elk Fork (1893), the Indian Creek Bridge west of Swinkey (1893), two other Indian Creek bridges (1893), a bridge across Long Branch (1893) and the Buck Creek Bridge near Stoutsville (1895). Monroe County Court Record: 7 September 1892 (Book S, page 76), 6 December 1892 (Book S, page 103), 8 August 1893 (Book S, page 182), 4 September 1893 (Book S, page 185), and 11 April 1895 (Book S, page 331).

¹⁸For a brief chronology of the St. Louis Bridge and Iron Company, see Victor C. Darnell, *A Directory of American Bridge-Building Companies: 1840-1900* (Washington, D.C.: Society for Industrial Archeology, 1984), pages 30-31.

¹⁹Monroe County has only been partly successful in saving its covered bridges. The Santa Fe Bridge washed away in a flood in 1926. The Stoutsville Bridge was razed in 1932 to make room for a steel replacement truss. The Paris Bridge was restored in 1952 but was destroyed six years later by flooding. The Mexico Bridge lasted until 1967, when it too was destroyed in a flood just before it was to be taken over by the state. Of the five, only the Union Bridge remains. After its floor partially collapsed beneath a truck in 1970, the structure was closed to traffic, restored and now serves as the centerpiece for a small state park. *Monroe County Appeal*, 18 May 1969, 23 April 1970; Pauline Bryan and Annie Smithey, "Covered Bridges of Yesteryear in Monroe County, Missouri," n.p.

²⁰*Ibid.*; Monroe County Court Record: 8 November 1859 (Book I, page 409), 7 December 1859 (Book I, page 434), 2 January 1860 (Book I, page 444), 2 July 1860 (Book I, pages 558-559).

²¹Monroe County Court Record: 9 July 1930 (Book X, page 606).

²²"It is ordered by the Court that they do give one span of the Old Bridge that formerly stood across the South Fork just south of Florida to be placed across the River at Santa Fe, where the Old Covered Bridge washed out." Monroe County Court Record, 5 October 1931 (Book Y, page 52).

Appendix

H. W. SEBASTIAN, President & Treas.

F. W. SCHULTE Vice Pres. & Secretary



BRIDGE ACROSS THE MERRIMAC RIVER AT PERTON MO.
3 SPANS-ONE 134'-0" ONE 136'-0" ONE 136'-0" ONE 136'-0"

Specifications for Bridge across South Fork near Florida

St. Louis Bridge and Iron Co.

[Original specifications located at Monroe County Courthouse, Paris, Missouri. The specifications refer to construction drawings, also produced by the bridge company. These drawings have not been located.]

Number and Length of Spans	The Bridge shall consist of three spans. 2 spans 134 ft. each, one span 136 feet.
Roadway	Bridge shall have one roadway 14 feet in clear between trusses.
Trusses	The trusses shall be wrought iron throughout. The connections, style of arrangements, and size of truss members are shown on the accompanying drawing which is made part of these specifications.
Panels	Each truss shall be divided into seven panels.
Hight	The hight [sic] of each truss shall be 22 feet.
Top Chords	The top chords shall be made up of plates and channels of the sizes shown on drawing. The underside of each chord shall be stiffened by stay plates $4\frac{1}{2}$ " x $\frac{1}{4}$ ", five to each section. The first plate shall be one foot from pier, and all plates shall be fastened to channel flanges by four $\frac{5}{8}$ " rivets.

- Joints** The joints in top chords shall occur 5" from center of pins, as indicated on drawings with splice plates on outside of channels 6"x 3/8" x 17" long with eight 5/8" rivets in each.
- Hinged End** The first section shall be hinged at hip, with reinforce plates 6"x 3/8"x 16", ten rivets in each plate. These plates are also on outside of channels.
- Hip Covers** The hip shall be covered on top by a plate 12"x 1/4" with four rivets fastening it to top chords. The end lapping on batter post shall not be riveted.
- Cover Plates** The top covers at intermediate joints are 12"x 1/4" by 14" in length, eight rivets in each plate.
- Batter Post** Batter or end post are same in section as top chords, with seven stay plates on underside of same size and fastened in same manner as those on chords.
- Pin Bearing Ends** The hip ends shall be pin bearing, same as first section of top chords above described, with same sized reinforce plates on inside of channels.
- Pedestal Ends** The pedestal ends, shall be constructed as shown on drawing of Pedestals & Rollers, with bearing plate 18"x 1/2"x 18".
- Rollers** One end of each span shall rest on a set of expansion rollers as shown, seven rollers in each set.
- Bed Plates** Bed plates shall be of wrought iron constructed as shown 1/2" thick and 18" square. Rivets to be countersunk on under side of plate. The plates must be properly bedded in cement on masonry piers.
- Movable Ends** The movable ends of each span must rest on center piers.
- Bottom Chords & Main Diagonal** The bottom chords and main diagonals shall consist of eye bars, of the number and sizes shown on drawings, with diameters of heads increased 50% over main body of bar.
- Verticals** Vertical bars are round iron with eyes to go over top & bottom pins, the eyes to be in loop form. The loop shall be 2 1/2 times diameter of pins in length, measuring from center of pin to inside of loop.
- Counters** Counters are of size as marked on plans, with turnbuckle or sleeve nut adjustment, six feet from lower end with loops formed in same way as on verticals for pin ends.
- Top Laterals** Top laterals are from 1-1/8" to 7/8" diameter with skew eyes passing around pins between ends of lateral struts and web of inside channels of top chords, as shown. Each rod has turnbuckle or sleeve nut adjustment being enlarged to one fourth over main body of bar. The end laterals take hold of hip pins.

- Top Lateral Struts** Top lateral struts are to be made of 4 1-3/4"x 1-3/4" angle bars, latticed double with 1 1/4"x 1/4" lattice bars with yokes at ends of 4 1/2"x 1/2" iron fastened with eight rivets to each yoke. Pin holes in these yokes must be drilled, with a play not to exceed 1/32".
- Knee Braces** One set of knee bracing is put in at each intermediate post, consisting of one piece 4"x 2" tee iron with a run of 6 feet.
- Portal Braces** Portal bracing consist of one top 4"x 2" T iron and two bottom 1-3/4"x 1-3/4" angle iron with lattice bars 1 1/2"x 1/4" between to extend down in center 24" and 48" down on the ends, lower ends to have a forged foot 6" long. These are bolted to post by 4 - 5/8" bolts in each foot. The top tee iron is also bolted to post by 4 - 5/8" dia. bolts.
- Bottom Laterals** Bottom laterals in panels one are 1 1/4" O, in panel two 1-1/8" O, panel three 1" O, center panel 7/8" O. All to have upsett [sic] thread on ends, said ends to pass through web of floorbeam and through bevel plates riveted to same, said plates to have an angle of 2nd degree to give the nut on rods a square and full bearing.
- Intermediate Post** Intermediate post shall consist of channels or each size as shown on plans, with tie plates at ends 6"x 1/4" and lattice 1 1/4"x 1/4" between, distance between lines of rivets in each post 5".
- Reinforce Plates** Reinforce plates on all posts 5/16" thick, six rivets in each plate.
- Floor Beams** Floor beams shall consist of 4 angles 3"x 2", 6 [pounds] per foot and web plate 1/4" thick, 10" deep at end and 22" deep at center, riveted with 5/8" dia. rivets, 3" to 4" pitch, beams to have stiffeners of 2"x 2" angle iron, two to each beam.
- Hangers** Hangers two to each beam shall be 1 1/4"x 1 1/4" iron looped over pin, with enlarged screw ends.
- Hanger Plates** Hanger plates shall consist of 6"x 5/8"x 9" long plates.
- Pins** Pins shall be of the sizes shown on drawing 1/16" inch being allowed for lathe work. That is the finished sizes shall not differ from those marked on drawing by more than 1/16 inch in diameter.
- Pin Nuts** All nuts on pins shall be at least 3/4" thick hexagonal in shape and of wrought iron.
- Pin Holes** Pin holes in all members shall not exceed diameter of pins by more than 1/32" and all eye bars must be true to length within 1/64".
- Rivets** Rivets in chords, batter posts, splice plates and pedestals shall be 5/8" diameter. Intermediate posts, portal braces, yokes on top lateral struts 1/2" diameter. The punched holes must not exceed diameter of rivet by more

than 1/16 inch. Rivets must be properly heated and well driven to completely fill the holes. All loose or imperfect rivets shall be cut out and replaced. Preference will be given to power riveting.

- Quality of Iron** Wrought iron shall be tough, ductile and fibrous, and when tested in long presses shall develop an ultimate strength of 50,000 [pounds] per square inch and an elastic limit of 20,000 [pounds] per square inch. An elongation before rupture of 12%, and a reduction of area at breaking section of 20%. Round rods shall be bent cold till the inner edges of the two halves are in contact, without sign of fracture. Flat bars shall be bent around a pin the diameter of which is the thickness of the bar, and when the sides are parallel no sign of fracture shall be visible. All iron shall be true to dimension called for, straight and free from cinders, blisters and imperfect edges.
- Workmanship** The workmanship shall be first class throughout, and anything which shall be noticed not strictly in accordance with good work, must be made right before the structure shall be accepted.
- Wood Work** The wood work throughout shall be oak, with the exception of subplank and post which can be of white pine if deemed desirable.
- Flooring** The flooring shall be 2 inches thick, with ends secured by strip 3"x 6". It shall be laid square across the bridge and will be spiked to joist by 4½" spikes. It can vary in width from 6 to 12 inches.
- Joist** Joist shall be 3"x 12", eight per panel as shown. The outside strings shall be in line and abut over center of floorbeams, with a splicing board 1"x 10"x 2" nailed on inside, as shown. The other strings shall pass over beam and be well spiked together at the cap. All shall be notched down on floor beam ½ inch.
- Hub Boards** The hub boards shall be 2"x 10" planed and painted two coats. Each board shall run a panel length and be bolted to batter and intermediate post of trusses and hub board post as shown. They shall be packed out in line at intermediate post, as shown in Section at Center [drawing].
- Railing Post** The hub board post shall be 4"x 6" notched 1" on to joist and hub boards and bolted to joist by two ½ inch bolts and to hub boards by one ½ inch bolt and spaced as shown in side elevation. These shall also be planed and painted same as hub boards.
- Painting** All iron work shall receive one coat of best mineral paint mixed with boiled linseed oil before being shipped from the works and another when erected. All inaccessible surface must be painted before being put together in course of construction at the shops.

All work must be done to the entire satisfaction of the Commissioner in charge, and to the County Court of Monroe County Mo.