CLEAR FORK OF THE BRAZOS SUSPENSION BRIDGE
(Woodson Bridge)
Texas Historic Bridges Recording Project
Spanning Clear Fork of the Brazos River
at County Route 179
Albany Vicinity
Shackelford County
Texas

HAER No. TX-64

BLACK AND WHITE PHOTOGRAPHY

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
1849 C St., NW
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HISTORIC AMERICAN ENGINEERING RECORD

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Location:	Spanning the Clear Fork of the Brazos River at County Route 179, Albany vicinity, Shackelford County, Texas. UTM: 14/484340/3642410 USGS: Fort Griffin, Texas, quadrangle (1981).
Date of Construction:	1896.
Designer:	Flinn-Moyer Company, Weatherford, Texas.
Builder:	Flinn-Moyer Company, Weatherford, Texas.
Present Owner:	Shackelford County.
Present Use:	Pedestrian bridge.
Significance:	The Clear Fork of the Brazos Suspension bridge is one of seven surviving suspension bridges in Texas that predate 1940. As one of three examples of the work by William Flinn of Weatherford, Texas, it preserves information about the deck and stiffening truss of a similar, but altered, Flinn-Moyer bridge at San Saba, Texas. The Clear Fork bridge was modified in 1926 by the Austin Bridge Company of Dallas, Texas.
Historian:	Dr. Mark M. Brown, with appendices compiled by J. Philip Gruen, August 1996. Revised 1997.
Project Information:	This document was prepared as a part of the Texas Historic Bridges Recording Project performed during the summer of 1996 by the Historic American Engineering Record (HAER). The project was sponsored by the Texas Department of Transportation (TxDOT).

I. Description

The Clear Fork of the Brazos Suspension Bridge has an approximate overall length of 312 feet, a 140'-0" clear span, and a clear roadway of 13'-8 3/4". It is oriented on an east-west axis. This catenary-type suspension bridge has been altered or repaired at least once. Major changes include encasement of the original towers in concrete, replacement of the center span's deck, and the addition of new cables. The description that follows addresses the remaining original features before describing the repairs (see Figures 1 through 7).[1]

A. Original Features

The east abutment is roughly coursed stone, while the western abutment appears to be earth fill. The piers, whose overall dimensions are about 19'-0" x 4'-0", are mortared coursed rusticated masonry with carefully worked corners. The pier heights vary and are unknown. Resting on the piers are towers about 17'-0" high, constructed of three wrought-iron pipes tied together by tension rods within pipe struts (see measured drawings for the Beveridge Bridge, HAER No. TX-46). There are two castings at the top of each tower. One secures the ends of the pipes, while the other is the cable saddle (see Figure 2).

The original parallel-strand main cables currently average about seven inches in circumference. Individual wire strands are about one-eighth of an inch in diameter, probably No. 9 gauge, galvanized steel or wrought iron.[2] Photographs taken at the time the bridge was accepted from the contractor show inclined stay cables extending from the tower to the deck (see HAER photograph TX-64-16).[3] With one notable exception, most of the cable anchorages disappear directly into the ground. At the southwest anchorage, there is a 3"-diameter wrought-iron pipe (snugly lined, or reinforced, with a smaller pipe inside it) placed roughly parallel to the

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[1] Most dimensions are taken from bridge inspection reports prepared by Bobby Nichols, TxDOT engineering technician, in the 1980s; Austin Bridge Company, Contract No. 894, Dallas, Texas, August 26, 1926 (courtesy of David Vance, Director of Communications, Austin Industries); and the author's field inspection, July 23, 1996. Special thanks to Tommie Brown, TxDOT Shackelford Maintenance Office, for arranging access to the cable saddles on the towers.

[2] Donald Sayenga, Historian, Wire Association International, personal conversation, August 5, 1996. No. 9 gauge is generally 0.148" diameter. See Donald Sayenga, "The Wire Gauge," *Proceedings of the 61st Annual Convention, Atlanta, Georgia, November 1991, and 1991 Regional Meeting Charleston, South Carolina, April 1991, of The Wire Association International, Inc.*, pp. 249-253.

[3] Inclined stay cables also occur on an unidentified catenary suspension bridge, attributable to Flinn-Moyer, shown in HAER photograph TX-64-20.

ground, around which many strands of wire have been looped. These looped wires, which are separate from the bridge cable wires, disappear into the ground, where they must be anchored in some manner. It appears that the wires of the main cable at this anchorage are wrapped under the pipe and around the looped wires. Rods with turnbuckles suspend the deck from the cables.

The approach spans are among the most important features of the Clear Fork bridge. They can tell us about the pre-alteration center span deck as well as the deck at the contemporary Beveridge Bridge. There are six approach spans on the east and three spans on the west, each averaging about 20'-0" long. The first spans on either side are, however, 15'-0" long. The bents supporting the deck beams of the approach spans consist of four 4 1/2"-diameter wrought-iron pipes. Each of bent's vertical pipes has two 1 15/16"-diameter pipes branching off at angles to further brace the deck beam (see Figure 3).[4]

The deck beams are 19'-0"-long, 3 1/2"-diameter wrought-iron pipes. Lower lateral cross-bracing (3/4" rods with turnbuckles), vertical beam supports, and other components to be mentioned shortly, were all tied to the deck beams by two special castings that rest about one foot from each end of the pipe beams. In the case of the beams supported by the vertical bents, the verticals keep the castings in place. Halfway between the spans, however, are similar, but not identical, deck beams. In these instances, the castings are kept in place from the tension of the cross-bracing by small pins which have been driven into holes in the deck-beam pipes. Additional support to resist the bending moment of the deck beam is provided in the form of a truss system consisting of a 1"-diameter tension rod and two castings acting in compression (see Figure 4).[5]

Given that wooden decks are less permanent and often replaced, it is less certain how closely the current 3" x 12" stringers supporting 3" x 8" planking with 3" x 8" wood curbs follow the original.

The entire deck system is stiffened by a 63"-high (center-to-center) Howe truss fabricated from wrought-iron pipe diagonals, castings, and tension verticals. Diagonal compression members leaning toward mid-span are 2 3/8"-diameter pipes, while those leaning away from mid-span are 1 15/16" diameter. Top and bottom chords are 2 7/8"-diameter pipes. Knee braces, the same size as the smaller diagonal members supporting the truss, connect the top chord with the ends of the deck beam pipes. Wooden boards, attached to the castings at the intersection of the diagonals, provided a wheel hub guard (see Figure 5).

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[4] Knee braces also occur on the bridge depicted in HAER photograph TX-64-20.

[5] These deck beam trusses are common among several bridges shown in photographs in the collections of William Flinn's descendants (see, for examples, HAER photographs TX-64-17 and TX-64-20).

B. 1926 Modifications by Austin Bridge Company

The most striking modification made by the Austin Bridge Company was to the tripod towers. The company's engineers encased the towers in obelisks of concrete. Two 3/4" square rods were added to convert the triangular base to a rectangle. The entire framework of pipes and square rods was hooped in wire before the concrete was poured.

The Austin Bridge Company added an entirely new cable to the bridge. The company constructed new cable anchors and added a bundle of No. 9 gauge galvanized wires about eight inches in circumference. The original and new wire bundles were banded together between the saddles. Based on a comparison with the turnbuckles of the lower lateral bracing preserved on the approach spans, the current hangers are almost certainly replacements.

The entire center-span deck was also replaced by the Austin Bridge Company. Standard 10" I-beams with 3/4" lateral cross-bracing rods support the wooden deck (Figure 6). A railing made of angles and channels, with little apparent stiffening capacity, replaced the Howe pipe truss (Figure 7). Rather, the deck was stiffened with the substitution of two 12" x 3" steel channels for the outermost wooden deck stringers. Two 18"-wide embossed steel plate runners were installed to reduce deck maintenance costs.

The Austin Bridge Company also reinforced the approach spans. The pipe bents were strengthened with two 10" I-beam posts and two 8" channels placed parallel to the original deck beam pipe.

II. History

In the 1890s, the basin drained by the Clear Fork of the Brazos River, particularly northern Shackelford and southern Throckmorton counties, was largely cattle and sheep country. The ranchers of the region were not far removed from the settlement era, its conflicts with the indigenous tribes, and the virtual eradication of the buffalo. In 1893 Frederick Jackson Turner declared that the American frontier was closed — that a critical era in American history was over.[6]

"Judge" J. A. Matthews, one of the legendary figures in the region's heroic past, was intimately involved with the construction of the Clear Fork Suspension Bridge. Matthews's wife, Sallie Reynolds Matthews, chronicled the family history in the 1936 book *Interwoven*. In 1885, Matthews established the 45,000 acre "Lambshead" ranch in the Clear Fork of the Brazos valley. The isolation of the region was also shrouded in the language of the pioneering experience. Whether or not supplies were actually brought to the valley by wagon train from

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[6] Shackelford County Historical Survey Committee, *Shackelford County: 1874-1974* (Shackelford County Historical Survey Committee, 1974), pp. 7-8.

Weatherford, Parker County, 100 miles and three counties to the east, as one account has put it, the people involved saw their lives in this way.[7]

In 1881 or 1882 (sources vary), some of the isolation was broken. Residents of Albany, Shackelford County's seat, raised $50,000 as an "incentive" for the Texas Central Railroad to enter town. Albany was to remain the railhead until 1900, when the railroad was extended to Stamford, Jones County. With the coming of the railroad, Albany became the depot that Clear Fork ranchers used to ship their livestock to market.[8]

Getting to Albany from Throckmorton and Young Counties was another matter. In 1885, Shackelford County had a truss bridge built across the Clear Fork at Fort Griffin.[9] The Matthews family used a more direct route across the Clear Fork of the Brazos in the course of ranch business in Young County and the eastern section of Throckmorton County. This was a low-water ford across the ledge of a small falls, currently about two or three feet high. The low-water crossing is still maintained. However, during high water, an often unpredictable condition in Texas, the Clear Fork presented a serious obstacle.

In February 1896, about two years after J. A. Matthews was elected judge, i.e. senior officer, of the Shackelford County Commissioners' Court, the county acted on

> the several petitions of Citizens of Shackelford Co. & Western part of Young Co. & South Eastern part of Throckmorton Co. for the building [of] a Bridge across the Clear Fork of the Brazos River at or near the Matthews Ranch in Shackelford Co. Texas[10]

and ordered that the bridge "be built at or near the place known as the falls near J. A. Matthews house on his Ranch."[11] The next day the commissioners set the necessary procedures in motion

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[7] Bess Stephenson, "Woman Pioneer of Interwoven Families Clipped Wild Buffalo to Stuff Mattresses," *Fort Worth Star-Telegram*, May 17, 1936; "60th Wedding Anniversary Observed by Ranch Couple," *Fort Worth Star-Telegram*, December 26, 1936.

[8] *Shackelford County: 1874-1974*, p. 8; Charles P. Zlatkovich, *Texas Railroads: A Record of Construction and Abandonment* (Austin, Texas: Bureau of Business Research, University of Texas at Austin and Texas State Historical Association, 1981), pp. 88-89.

[9] See U.S. Department of the Interior, Historic American Engineering Record (HAER) No. TX-63, "Fort Griffin Iron Truss Bridge," 1996, Prints and Photographs Division, Library of Congress, Washington, D.C.

[10] Shackelford County, *Commissioners' Court Minutes* (hereinafter cited as SCCC *Minutes*), vol. 3 (Shackelford County Courthouse, Albany, Texas), p. 476 (February 11, 1896).

[11] Ibid., p. 476 (February 11, 1896).

for the establishment of a first-class road to connect the new bridge with the existing roads.[12] On the last day of February 1896, the court awarded a $4370.00 contract for

> a Truss Suspension Combination Bridge. Extreme length of Bridge 300 feet; length of span 140 ft; width of roadway 14 ft; height of floor above low water 40 ft; height of stiffening truss 5 ft; length of approaches right bank 116 ft. [unintelligible] left bank 44 feet; roadway joist 2 x 12; roadway floor 2-1/2 x 8; style of towers Tubular triangle as per Plan, and Specifications annexed; Style of piers Stone Masonry as per plan and specifications annexed[13]

to the Flinn-Moyer Bridge Company of Weatherford, Texas.[14] The commissioners also appointed Judge Matthews to superintend the construction of the bridge.

In selecting the Flinn-Moyer Bridge Company over "the several propositions of [unnamed] Bridge Builders," the commissioners were awarding the contract to a familiar firm. Not only had William Flinn been an active bridge builder in north-central Texas for many years, but the same day the court awarded the contract for the Clear Fork Suspension Bridge, they first accepted two bridges recently completed by Flinn-Moyer. These no longer extant "Howe Truss tubular Iron Bridges," had main spans of 80'-0" and 70'-0" and were constructed at separate locations across Deep Creek in the southeast part of Shackelford County.[15]

The Clear Fork Suspension Bridge was accepted by the commissioners on May 20, 1896. Two photographs were almost certainly taken that day; one has been reproduced as HAER

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[12] Ibid., pp. 447-48 (February 12, 1896).

[13] Ibid., pp. 487-89 (February 29, 1896); quotation, p. 488.

[14] The details of the contract as reported here, particularly with respect to the description of the towers and the spelling of the builder's name are in contrast to a previously published account. See T. Lindsay Baker, *Building the Lone Star: An Illustrated Guide to Historic Sites* (College Station: Texas A&M University Press, 1986), pp. 34-36. In what is either a printer's typographical error or a case of misinterpreting the ambiguous script in the SCCC *Minutes*, Baker reports the company name as "Fluice-Moyer". The reverse *Index to the Shackelford Commissioners' Court Minutes*, vol. 1, section F, however, is in an unambiguous hand. For more on Flinn-Moyer and William Flinn bridge work see J. Philip Gruen in HAER No. TX-46, "Beveridge Bridge," 1996, and this author in HAER No. TX-36, "Bluff Dale Suspension Bridge," 1996.

[15] Quotations from SCCC *Minutes,* vol. 3, p. 487 (February 29, 1896), and p. 466 (November 20, 1895). Timothy L. Flinn of Strawn, Texas, great-grandson of William Flinn, has a model of a Howe truss bridge which almost certainly represents the type of bridge Flinn-Moyer constructed across Deep Creek. See HAER photographs TX-64-12 through TX-64-15.

photograph TX-64-16; another, showing dignitaries standing at one end of the bridge, is in the Robert E. Nail Archives at the Old Jail Art Center in Albany, Texas. This conclusion is supported by inscriptions in the margins of the second photograph: "(May) 1896" and the name of one of the Matthews family. Both images have similar style numbers in their lower left corners, suggesting that a series of photographs were taken on the occasion. Finally, it is difficult to imagine another reason for so many formally dressed dignitaries would be at an otherwise remote site. Clifton Caldwell, current owner of the land surrounding the bridge, has suggested that the figure on the extreme left is Judge Matthews. Comparison with photographs in the collections of the descendants of William Flinn suggest that the figure on the right with the white hat and tie is William Flinn. As part of his responsibilities as superintendent of construction, Matthews approved a 10'-0" extension of "the approach or abutment" of the bridge and the company was paid an additional $73 or $75.[16]

The history of the Clear Fork of the Brazos Suspension Bridge remained uneventful until the fall of 1926. By September the bridge had apparently fallen into such disrepair that the Commissioners' Court invoked an "urgent necessity and calamity" clause of Texas law to avoid advertising for competitive bids. The contract to repair "the Suspension bridge across the Clear Fork, on the Albany-Woodson Road," alternately styled the "Woodson Bridge," was awarded to Austin Bridge Company, Dallas, Texas, for $4,500.00. Repairs, described in more detail above, included replacing the center span deck, augmenting the main cables, reinforcing the approach spans, and reinforcing the towers with concrete. The steel runners were added to the contract for an additional $700.00.[17]

III. William Flinn

William Flinn of Weatherford, Parker County, Texas, was a partner in both the Flinn-Moyer Bridge Company and the Runyon Bridge Company. Evidence from recently uncovered family archives and from patent research suggests that Flinn was primarily a contractor. The level of his involvement in the design of the bridges is unclear.

William Flinn was born in Iowa Point, Kansas, and arrived in Weatherford, Texas, in the early 1880s. No information has come to light about Flinn's professional engineering training or how he became involved in bridge building. In late December 1884 he purchased property for a

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[16] SCCC *Minutes*, vol. 3, p. 517 (May 20, 1896); quotation, p. 517; Clifton Caldwell, personal conversation, July 23, 1996.

[17] SCCC *Minutes,* vol. 6, p. 347 (September 13, 1926), p. 353 (November 8, 1926). The Austin Bridge Company, the largest Texas bridge company during this period, did an extensive repair business. For examples of their repairs see HAER No. TX-46, "Beveridge Bridge," 1996 (a repair of a another Flinn-Moyer suspension bridge), HAER No. TX-66, "Oriana Bridge," 1996, and HAER No. TX-31, "Kelley Crossing Bridge," 1996.

house in Weatherford, and married Alice Elizabeth Thompson in May of the following year. Flinn died without a will on June 16, 1904. On his death, Flinn left an estate worth approximately $12,000, a wife and five children, an uncompleted contract, and a long-overlooked legacy of bridge building. Family tradition indicates that he died of complications from a tooth infection while working on a bridge contract in Palo Pinto County. Alice Flinn may have married A. A. Moyer shortly after her husband's death. Flinn's descendants believe that Moyer joined his business partner in death shortly after the wedding and Moyer's brother(s) may have taken control of the business. Flinn's eldest son reportedly sued for control or compensation when he reached legal age.[18]

Information about Flinn's business activities can be gleaned from county records, newspaper clippings, directories, and family memorabilia. Nevertheless, the precise nature of his business relationships is unclear. No charters or articles of incorporation are on file with the Secretary of State in Austin, nor do any small business records survive (if, indeed, they ever existed) among the Parker County records from this period. The contracts associated with the 1890 Bluff Dale Suspension Bridge, show that the Runyon Bridge Company was based in Weatherford in 1890-1891.[19] On the other hand, Runyon's patent No. 446,209, filed in 1890, lists Runyon's residence as Pilot Point, Denton County, Texas. An undated business card, found in William Flinn's house by a subsequent owner, and now in a family collection, confirms that at one point Runyon Bridge Company was based in Pilot Point.[20] It may be that Flinn-Moyer was a successor firm to Runyon Bridge Company, since Flinn-Moyer's contracts seem to date from the mid-1890s until Flinn's death. In assessing this possibility, due consideration must be given to the fact that the two extant Flinn-Moyer bridges show no evidence of the Runyon patents.

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[18] Mrs. Paul Martin Flinn, "Paul Martin Flinn," in Parker County Historical Commission, *History of Parker County* (Dallas: Taylor Publishing Company, 1980), pp. 282-83; Parker County, *Deed Book*, vol. 15 (Parker County Courthouse Annex, Weatherford, Texas), pp. 354-55 (December 2, 1884); Parker County, *Probate Minutes*, vol. 8 (Parker County Courthouse Annex, Weatherford, Texas), pp. 581-83 (June 16, 1904); Dr. Timothy L. Flinn, to author, June 24, 1996. No additional information of any certainty concerning A. A. Moyer has come to light, but see note 23.

[19] The Bluff Dale Suspension Bridge was built by E. E. Runyon and William Flinn, doing business as Runyon Bridge Company.

[20] Edwin Elijah Runyon, "Suspension Bridge," U.S. Patent No. 446,209, August 23, 1890. Earlier patents show Runyon residing in Mountain Spring, Cooke County, Texas. See Runyon, "Bent for Suspension Bridge," U.S. Patent No. 410,201, September 3, 1889. A photocopy of William Flinn's business card is in the Collection of Dr. Timothy L. Flinn, Strawn, Texas. Dr. Flinn also has a sign advertising the business.

Further complicating our understanding of Flinn's business dealings is evidence that he also did bridge business under his own name at the same time he was associated with Runyon and with Flinn-Moyer.[21] Finally, Flinn placed a quarter-page advertisement in the 1890-1891 *Texas State Gazetteer and Business Directory,* which makes no reference to Runyon Bridge or any other company.[22] Interestingly, the advertisement makes it clear that Flinn was seeking other types of construction projects, including buildings, wind mills, cisterns, and tanks, all during the construction of the Bluff Dale Suspension Bridge.

The Howe truss bridge model in the possession of Flinn's heirs is made of sheet metal rolled to look like pipe, and blocks of metal cut to function as castings. Flinn did not hold any patents and since the Howe truss pattern was in the public domain, the model might have been constructed for sales purposes.[23] The striking affinities between the approach spans at Clear Fork and the model suggest that the model represents the "Howe Truss tubular Iron" bridges that Flinn-Moyer built across Deep Creek for the Shackelford County Commissioners' Court in 1895-1896. Both the Clear Fork bridge and the model use rod instead of wire for the tension member. Similarly, the pipe extends beyond the casting and provides support for the diagonal truss brace. The use of pipe and the particular shape of the castings needed for the truss connections is also common to both.

There are also interesting differences between the Clear Fork bridge and the model. The hub guard at Clear Fork is timber, whereas on the model it is pipe.[24] Details differ between the connections of the lower lateral bracing and the deck beam castings. Most importantly, the

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[21] Flinn was awarded at least one bridge contract in Parker County in the years 1885, 1889, 1890, 1893, 1896, 1897, 1900, 1901, 1902, and 1903. See Parker County bridge file, Environmental Affairs Division, Texas Department of Transportation, Austin, Texas.

[22] See R. L. Polk, *Texas State Gazetteer and Business Directory*, vol. 3 (St. Louis: R. L. Polk and Co., 1890-91), p. 1037.

[23] A certain Abraham Moyer "residing at Kosoma in the Choctaw Nation, Indian Territory [now Oklahoma?]" was issued a patent for a low-water bridge deck. It is not known whether the name is a coincidence or Flinn's partner, A.A. Moyer. See Abraham Moyer, "Bridge," U.S. Patent No. 625,051, May 16, 1899.

[24] The hub guard at Bluff Dale, which might have been part of a 1899 repair by Flinn-Moyer, is also pipe. The Beveridge Bridge originally had a timber hub guard. For a historic photograph of the Beveridge Bridge showing the timber hub guard, see San Saba Historical Commission, *San Saba County History* (San Saba: San Saba Historical Commission, 1983), p. 439. Images in the Flinn collections show hub guards of both materials: timber on the bridges in HAER photographs TX-64-17 and TX-64-20, and pipe in TX-64-18 and TX-64-19.

model design uses two sets of tension rods running the length of the bridge, coupled with short compression members, to reinforce the Howe truss.

The materials and design features of the bridges that Flinn helped construct permitted swift and economical construction in remote areas. The pipe for the towers, deck beams, and trusses; the wire for cables and bracing; and the small custom castings throughout the structures were relatively easy to transport. Much of the remaining material needed for the bridges could have been locally available. These included stone for the piers and possibly the timber for the decks and deck trussing. Larger structures would require larger amounts of harder-to-transport material, such as the riveted metal plate for tower piers shown in HAER photographs TX-64-22 through TX-64-24.

All of these carefully planned provisions came together in Flinn's "Camp & bridge building outfit," to quote from his estate inventory (see HAER photographs TX-64-25 through TX-64-27). A large tent, equipped with bunk beds and a portable kitchen, invokes semi-mythic images of America's western frontier. Another photograph shows workers, pipe inventory, cutting equipment, and bridge towers under construction in the center background (see HAER photograph TX-64-21). It is interesting to note that missing from the photograph is the heavier equipment and prefabricated inventory of the sort needed by competing truss bridge companies.[25]

Clear Fork is only one of three known surviving bridges built with the participation of William Flinn. Flinn was probably part of the long tradition of innovative empirical bridge builders — a tradition waning in the late nineteenth century with the rise of university-trained engineers. Judging by the number of bridges known through county contracts and through family photographs, Flinn was a prolific builder (see Appendix C).[26] According to the Weatherford *Daily Herald*, admittedly a source likely to be positively predisposed, Flinn was "reputed to be the most successful bridge builder in the state."[27]

IV. Conclusion

The Clear Fork of the Brazos Suspension Bridge is one of only seven suspension bridges in Texas surviving from before 1940. It is clear that Texas once had a much more extensive

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[25] Quotation from Parker County, *Probate Minutes,* vol. 8, p. 583 (June 16, 1904); "Parker County's Bridge Man," Weatherford *Daily Herald*, June 30, 1903. Francis Witherspoon, William Flinn's granddaughter, reported a story that William Flinn traveled about in his own railroad car; personal conversation, September 12, 1996.

[26] A preliminary tabulation suggests that between 1885 and 1903, more than twenty-five contracts were awarded to William Flinn or to the Flinn-Moyer Bridge Company by the Parker County Commissioners' Court; see Parker County bridge file.

[27] "Parker County's Bridge Man," Weatherford *Daily Herald*, June 30, 1903.

collection of small- and medium-span suspension bridges. J. Philip Gruen has argued that suspension bridges were widely in Texas used because they required less material and labor than fabricated metal trusses and consequently were relatively inexpensive. In addition, Gruen suggests that suspension bridges do not require the construction of mid-stream piers — a distinct advantage in locations with unstable soil conditions or the risk of flooding.[28]

Each of the remaining William Flinn bridges — Clear Fork, Bluff Dale, and Beveridge — have been altered to some degree. Together they are even more significant as a group because each reveals important information about its siblings. The Beveridge Bridge, for example, has been so heavily altered and rebuilt that only the tripod pipe-towers and the builder's plate are original fabric. But for the stone piers, the Beveridge and Clear Fork bridges were virtually identical. Consequently, it is possible to reconstruct the appearance of the deck at Beveridge using the approach spans at Clear Fork as a model. Beveridge, in turn, reveals the details of the original towers beneath the concrete at Clear Fork. Bluff Dale's retrofitted stiffening truss, while in poor condition, runs almost the entire length of the bridge and conveys a visual impression once made by the other two bridges. Of course, the difference between cable-stayed and catenary suspension systems means that the deck beam system at Bluff Dale is different.

The repairs and alterations made by the Austin Bridge Company are important. By replacing the center span and reinforcing the main cables, approach spans, and towers, the Austin Bridge Company made it possible for the remaining fabric of the bridge, and the information it contains, to endure as long as it has. Coming to the aid of county commissioners throughout Texas when they were faced with "urgent necessity and calamity" was an important part of the Austin Bridge Company's business.

Finally, the alteration of the Clear Fork towers are historically significant in their own right. That is, for whatever reason, structurally appropriate or not, the concreting of the piers gave the Clear Fork of the Brazos Suspension Bridge a monumentality not present at the contemporary Beveridge Bridge or at the more significant, in the history of civil engineering at least, Bluff Dale Suspension Bridge. It is the combination of the stone piers and the concrete obelisk towers that gives Clear Fork this monumentality and that makes it stand out visually in the otherwise vast and dwarfing landscape of north Texas.

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[28] For the suspension bridge tradition, see HAER No. TX-36, "Bluff Dale Suspension Bridge"; for reasons why they were popular, see HAER No. TX-46, "Beveridge Bridge". The collapsed truss seen beneath the suspension bridge in HAER photograph TX-64-18 shows quite literally the superiority of the suspension form.

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_____, HAER No. TX-63, "Fort Griffin Iron Truss Bridge," 1996.

_____, HAER No. TX-66, "Oriana Bridge," 1996.

Weatherford Daily Herald, December 4, 1902.

Weatherford Public Library Archives, Weatherford, Texas.

Witherspoon, Francis. Granddaughter of William Flinn, Strawn, Texas, personal conversation, September 12, 1996.

Zlatkovich, Charles P. *Texas Railroads: A Record of Construction and Abandonment*. Austin, Texas: Bureau of Business Research, University of Texas at Austin and Texas State Historical Association, 1981.

APPENDIX A: Suggestions For Further Research

This recording project has raised several issues that remain unanswered due to limitations of time and resources:

1. What was Flinn's educational background? How and where did he learn the bridge business? Appendix C represents but a preliminary answer to the question: how extensive was Flinn's business? Are there any records of the lawsuit that Flinn's children brought against Moyer's brothers? Do they reveal anything about the business or the bridges?

2. Who was A. A. Moyer? No deeds or wills were found for him in Parker County. What did he bring to the business?

3. Was there any structural weakness in the pipe towers that prompted Austin Bridge's engineers to reinforce them with concrete, or was it a bias against an unfamiliar technology?

4. The prefabricated metal truss is a familiar concept. In an informal discussion, Donald Sayenga, Historian, Wire Association International, suggested that suspension bridges were also prefabricated. The idea, he argues, began with A. S. Hallidie's 1867 suspension bridge patent (U.S. Patent No. 66,327). Wire manufacturers assembled bridge kits as a way of selling more wire.[29] If Sayenga's theory is correct, how would a prefabricated suspension bridge be identified? Are any of Flinn's suspension bridges based on prefabricated kits? Who designed them and where were the castings manufactured?

5. Are there any surviving members of the Matthews and Reynolds families and do they have archival materials that might shed light on the circumstances around the construction and subsequent history of the bridge?

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[29] Donald Sayenga, Historian, Wire Association International, personal conversation, August 5, 1996.

APPENDIX B: Extant Suspension Bridges Built in Texas Before 1940

Compiled by J. Philip Gruen

Bridge	Location	Builder	Type	Span	Year
Waco	Spanning Brazos River at Bridge Street, Waco, McLennan County	Thomas M. Griffith	Catenary	475' clear span	1869; rebuilt 1914
Bluff Dale	Spanning Paluxy River at County Route 149, Bluff Dale, Erath County	Runyon Bridge Company, Weatherford, Texas	Cable-stayed	140' clear span	1891
Clear Fork of the Brazos	Spanning Clear Fork of the Brazos River at County Route 179, Shackelford County	Flinn-Moyer Company, Weatherford, Texas	Catenary	140' clear span	1896
Beveridge	Spanning San Saba River at County Route 112, San Saba County	Flinn-Moyer Company, Weatherford, Texas	Catenary	140' clear span	1896
	Spanning Choctaw Creek, Grayson County		Catenary		
Roma-San Pedro International Bridge	Spanning Rio Grande, between Roma, Starr County, and Ciudad Aleman, Mexico	George E. Cole, engineer	Catenary	700' overall	1928
Regency	Spanning Colorado River, between San Saba and Mills counties	Austin Bridge Company, Dallas, Texas	Catenary	340'	1939

Source:

County Bridge Files, Environmental Affairs Division, TxDOT, Austin, Texas.

APPENDIX C: Preliminary List of Bridges Built with Participation of William Flinn

Compiled by J. Philip Gruen

Bridge	Location	Spanning	Type	Span	Year
Bluff Dale	County Route 149, Bluff Dale, Erath County	Paluxy River	Cable-stayed	140'	1890
(a)	Stephenville-Meridian Public Road, Erath County	Bosque River			1890
(a)	Upper Granbury Public Road, Erath County	Bosque River			1890
(a)	Stephenville-Palo Pinto Road, Erath County	Bosque River			1890
Beveridge	County Route 112, San Saba, San Saba County	San Saba River	Catenary	140'	1896
Clear Fork of the Brazos River	County Route 179, Shackelford County	Clear Fork of the Brazos River	Catenary	140'	1896
(b)	Weatherford-Millsap Road, Parker County	Grindstone Creek		50'	1902
(e)	Bell County	Leon River			ca. 1903
	Bell County				ca. 1903
	Fisher County		Steel (truss?)		ca. 1903
	Fisher County		Steel (truss?)		ca. 1903
	Parker County				ca. 1903
	Parker County				ca. 1903
	Johnson County				ca. 1903
(b)	Garner vicinity, Parker County?	Dry Creek		50'	
(c)	Rock Bluff Crossing, Weatherford, Parker County	Brazos River	Iron		
Dark Valley (d)		Brazos River			
(d)	North Main Street, Weatherford, Parker County		Steel truss		

Bridge	Location	Spanning	Type	Span	Year
(e)	State Route 180, between Palo Pinto and Mineral Wells, Palo Pinto County	Brazos River?			

Sources:

(a) Erath County, Texas, *Commissioners' Court Minutes,* vol. E, p. 88 (March 7, 1890), p. 90 (March 27, 1890).

(b) *Weatherford Daily Herald,* December 4, 1902.

(c) Newspaper clipping, n.d. Vertical files, Weatherford Public Library Archives, Weatherford, Texas.

(d) Parker County Historical Commission, *History of Parker County* (Dallas: Taylor Publishing Company, 1980), pp. 282-83.

(e) Timothy L. Flinn Collection, Strawn, Texas.

APPENDIX D: Figures

Figure 1 Overall elevation, from Bobby Nichols, Bridge Inspection Report, n.d.

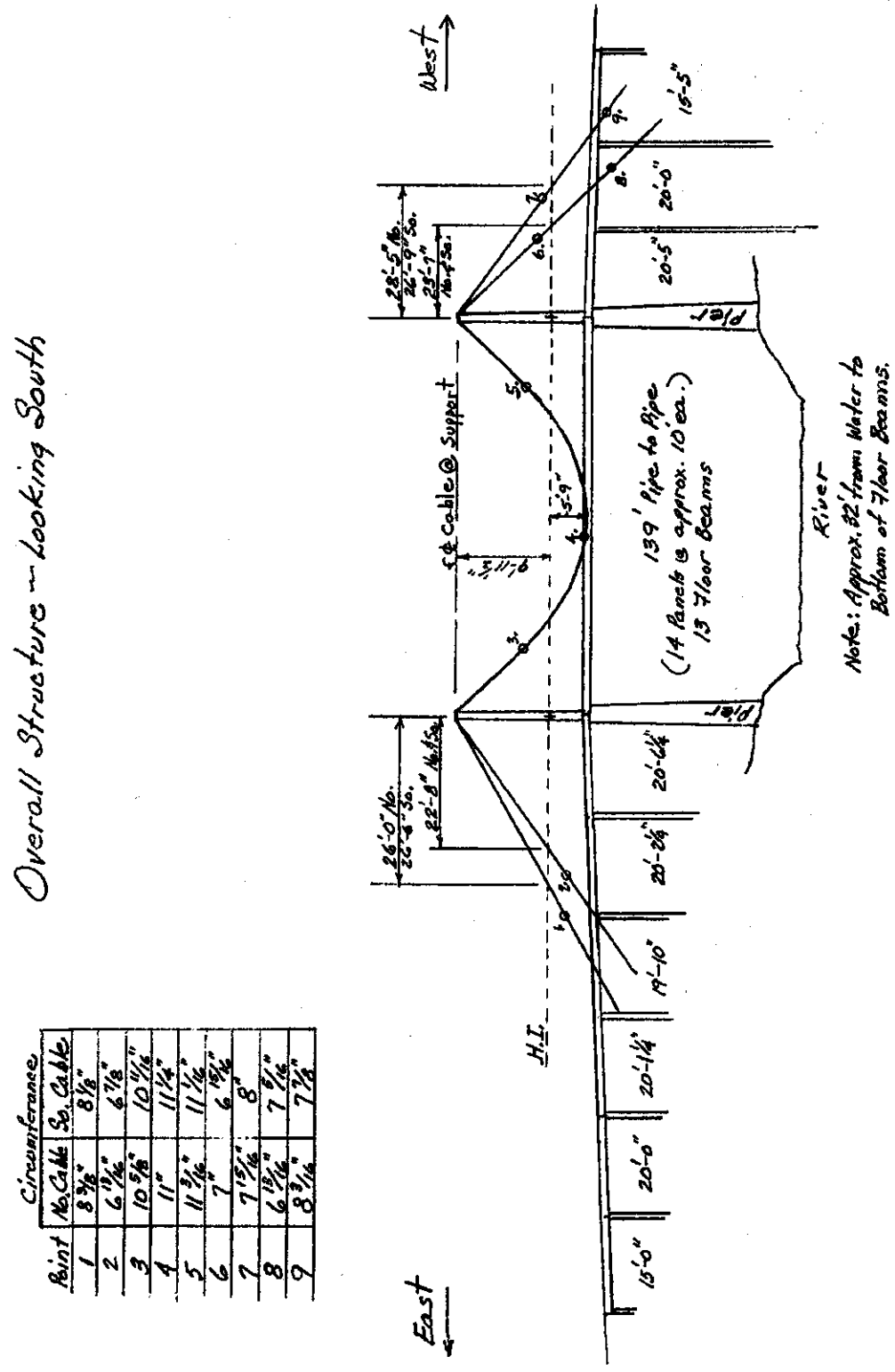

Figure 2 Detail of piers and towers, from Bobby Nichols, Bridge Inspection Report, n.d.

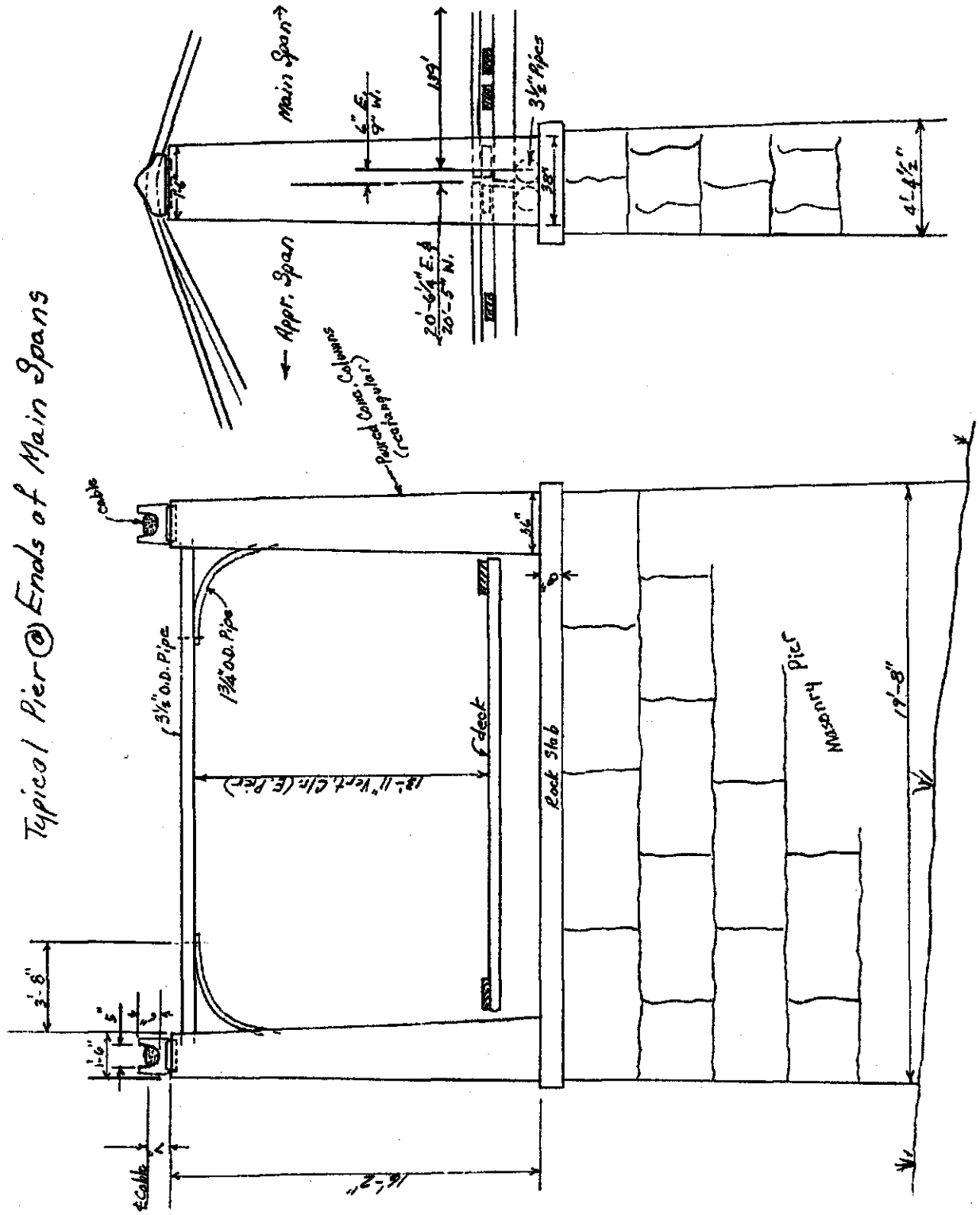

Figure 3 Section through approach span deck at bent, from Bobby Nichols, Bridge Inspection Report, n.d.

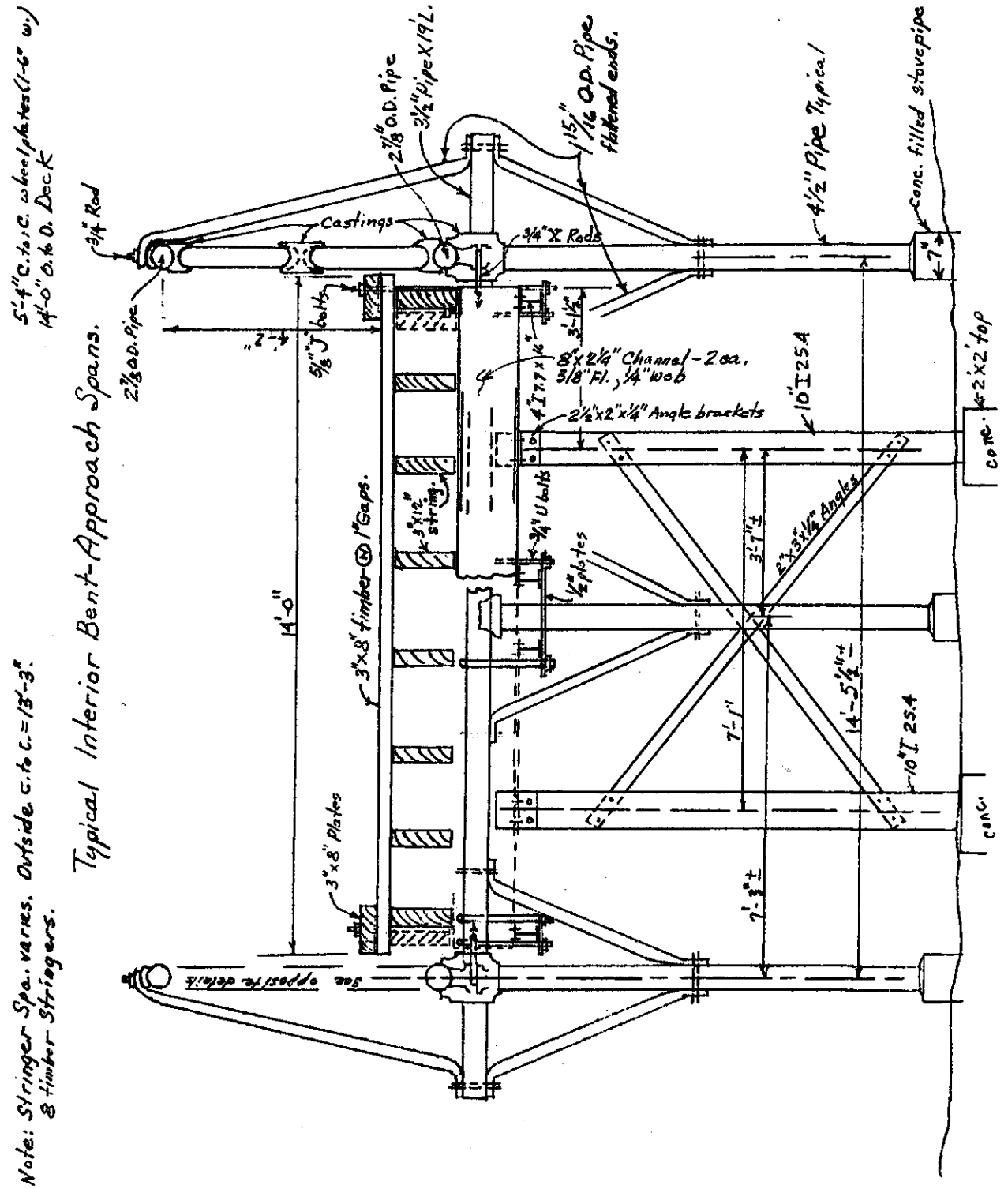

Figure 4 Section through approach span deck at mid-span, from Bobby Nichols, Bridge Inspection Report, n.d.

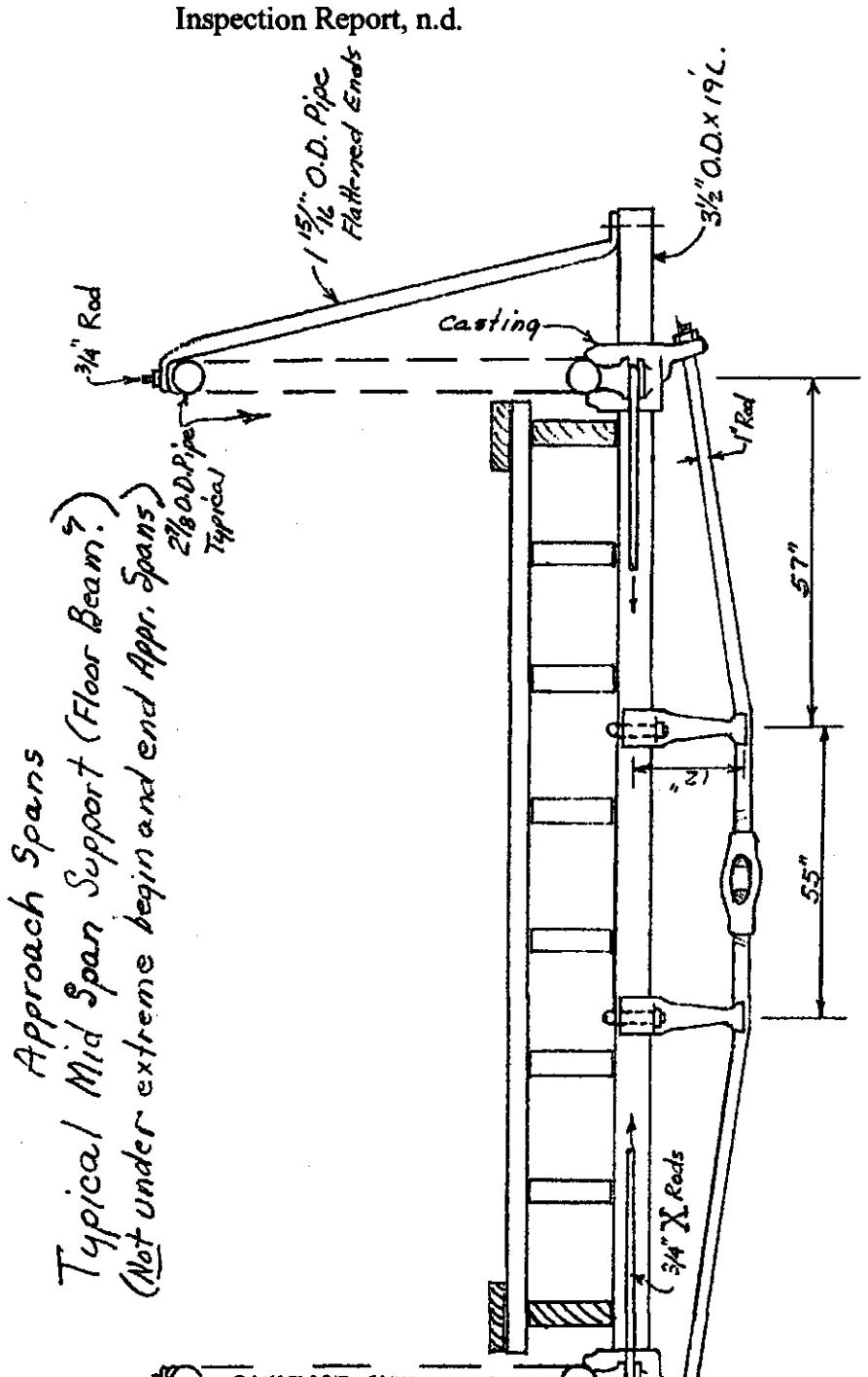

Figure 5 Detail elevation of approach span, from Bobby Nichols, Bridge Inspection Report, n.d.

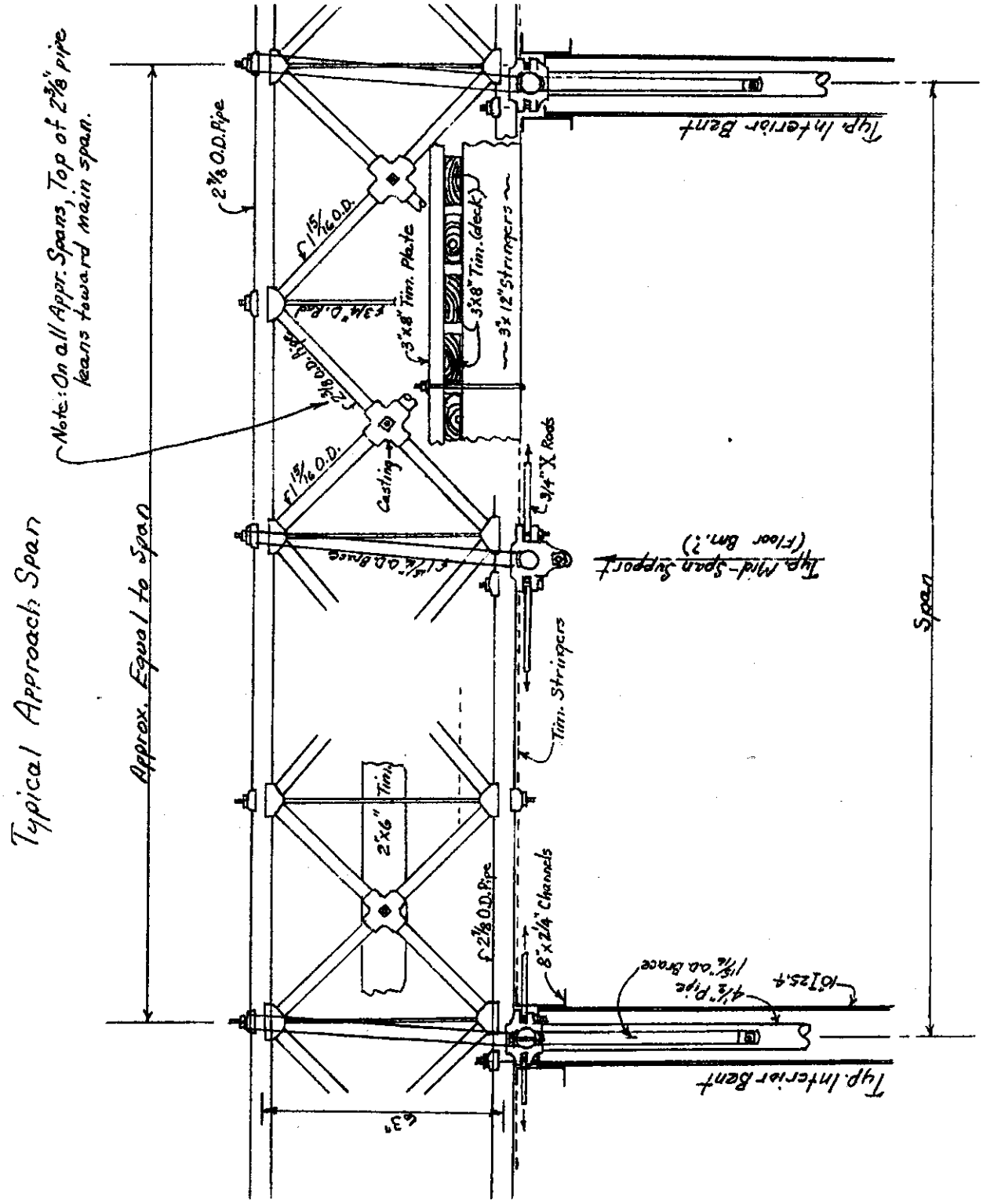

Figure 6 Section through main span deck, from Bobby Nichols, Bridge Inspection Report, n.d.

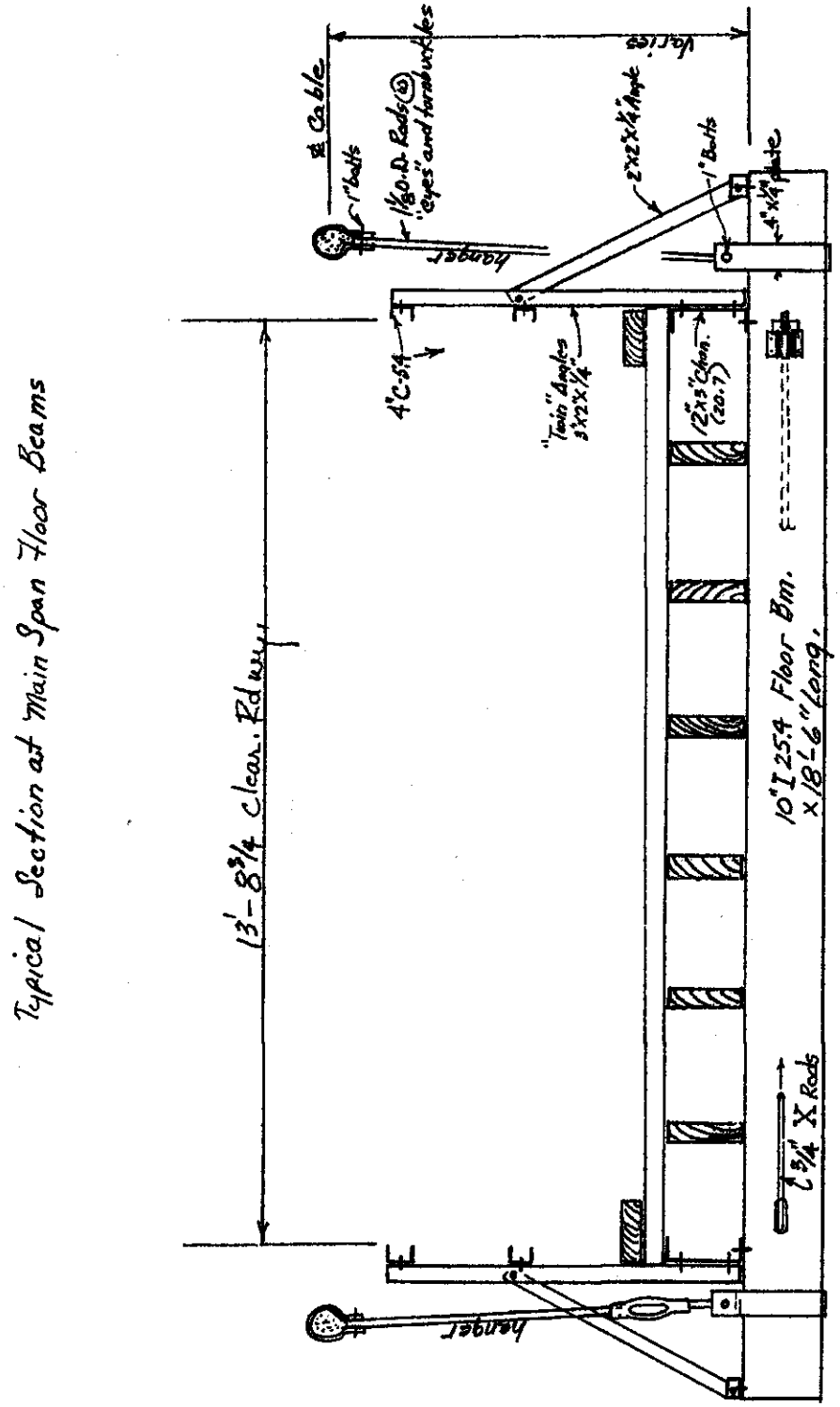

Figure 7 Detail elevation of main span, from Bobby Nichols, Bridge Inspection Report, n.d.