

WEST UNION BRIDGE  
Spanning Sugar Creek, CR 525W  
West Union  
Parke County  
Indiana

HAER IN-105  
*IN-105*

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
U.S. Department of the Interior  
1849 C Street NW  
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

WEST UNION BRIDGE

HAER No. IN-105

LOCATION: County Road 525W, spanning Sugar Creek, West Union, Reserve Township, Parke County, Indiana  
UTM: 16.471232E.4411699N, Montezuma, IN Quad.

STRUCTURAL TYPE: Wooden covered bridge, Burr arch-truss

DATE OF CONSTRUCTION: 1876

DESIGNER/  
BUILDER: Joseph J. Daniels (1826-1916), Rockville, IN

PRESENT OWNER: Parke County Parks and Recreation Department, Rockville, IN

PREVIOUS USE: Vehicular and pedestrian bridge

PRESENT USE: Pedestrian bridge, bypassed in 1964

SIGNIFICANCE: Local bridge builder J.J. Daniels built the West Union Bridge in 1876 to replace a washed out bridge. Daniels built nearly sixty covered bridges in Indiana between 1855 and ca. 1900. The bridge is 315' long, making it the longest in the county. The West Union Bridge is an excellent example of the Burr arch-truss and the accomplishments and ingenuity of Daniels.

HISTORIAN: Researched and written by Sarah Maria Rose Dangelas, 2002

PROJECT INFORMATION: The National Covered Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is part of the Historic American Buildings Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

## Chronology

- 1826 May 26, Joseph John Daniels is born in Marietta, Ohio to Sophia Warren and Stephen Daniels.
- 1851 March 9, Daniels marries Clarissa Blessing (they have five children, three live to adulthood).
- 1861 April to December, Daniels builds Star Mills/Harrison Bridge.
- 1866 Star Mills/Harrison Bridge is heavily damaged in a flood; by December, Daniels has rebuilt it.
- 1875 A severe storm washes out Harrison Bridge.
- 1876 September, Daniels completes the replacement for Harrison Bridge, now called West Union Bridge.
- 1913 West Union Bridge's abutments and approaches are damaged in the March flood. They are repaired at a cost of \$7,000.<sup>1</sup>
- 1916 August 1, Daniels dies in Rockville, IN, at age 90.
- 1936 Daniels' son Patrick Daniels donates a number of his drawings and writings to the Indiana Historical Society.
- 1957 First annual Parke County Covered Bridge Festival, a ten day event.
- 1964 West Union Bridge is closed to vehicular traffic and bypassed with a concrete bridge.
- 1976 West Union Bridge's structural beams are repaired.<sup>2</sup>
- 1977 West Union Bridge gets a new metal roof.<sup>3</sup>
- 1978 West Union Bridge is listed on the National Register of Historic Places along with thirty-four other covered bridges as part of the "Parke County Covered Bridge Thematic Resource."

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<sup>1</sup> Juliet Snowden, *(52 1/2) Covered Bridges of Parke County*, 2<sup>nd</sup> ed. (original 1969) (1981), 20.

<sup>2</sup> Charles Felkner (preparer), "Parke County Covered Bridge Thematic Resource," (Washington, DC: National Register of Historic Places, 1978), 7-3.

<sup>3</sup> Felkner, "Parke County Covered Bridge," 3.

### Introduction and Significance

In 1876, Joseph J. Daniels built the West Union Covered Bridge to replace his earlier Harrison Bridge, which had washed out in a flood. J. J. Daniels was a prolific bridge-builder from Rockville, the county seat of Parke County. He built nearly sixty covered bridges in Indiana between 1855 and ca. 1900.<sup>4</sup>

The West Union Covered Bridge is an excellent example of the strength of the Burr arch-truss and the accomplishments and ingenuity of Daniels. The bridge spans Sugar Creek, a tributary of the Wabash River, north of the center of West Union, in Reserve Township, Parke County, Indiana. At 315', it is the longest bridge in the county. The county bypassed the wooden bridge in 1964 with a concrete span.

### Description

The West Union Covered Bridge is a 315', two-span bridge (see Appendix B, Illustration 1). Each span, from abutment to pier essentially behaves as its own bridge, connected to the other only by a metal tension rod connecting the two end posts over the pier, about 2' below the top chord on either side. Each span is composed of a double Burr arch and a sixteen-panel multiple king-post truss (see Appendix B, Illustration 2).<sup>5</sup> The multiple kingpost design centers around strong, vertical posts (in tension), set at 9 1/2' intervals that are connected to an upper and lower chord that run the length of the truss. Diagonal braces (in compression), connect the posts to each other from bottom to top toward the center of the truss (see Appendix B, Illustrations 2 and 9).

The top chord is made of a single string of timber segments that are simply set end-to-end across the bridge. The lower chords each are composed of two parallel chords. Where the various segments of the individual lower chord members are joined, a "double headed hook" shear block secures the union (see Appendix B, Illustration 3).<sup>6</sup> Match marks are still visible on the ends of the chord segments, indicating the pre-fabrication or pre-arranging and matching of the members (see Appendix B, Illustration 4).

The vertical posts are mortised into the top chord. They are then sandwiched between and bolted to the arches.<sup>7</sup> The lower chords are notched around the posts. Diagonal braces are notched into the posts at both ends between the chords (see Appendix B, Illustration 5). The

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<sup>4</sup> Eugene R. Bock, "The Covered Bridge and Indiana," *Indiana History Bulletin* 37, no. 5 (1960): 11.

<sup>5</sup> There is an empty shelter panel at the ends of the truss.

<sup>6</sup> John M. Vlach, "Daniels and Britton, Master Bridge Builders," *Indiana Covered Bridge Society Newsletter* 9, no. 4 (1972): 3. This typical nineteenth-century joinery feature was consistently used by Daniels, and is alternately called a fishplate.

<sup>7</sup> Daniels wrote that in his Burr arch-trusses, he removed the falsework "so the frame is supporting itself, then the arches shall be wrought on, and adjusted to their places." Joseph J. Daniels, "Specifications No. 1 [for bridge over Vermillion River near Hanging Rock, 1898]," *Papers and Drawings of J. J. Daniels, ca. 1861-1898*, in Indiana Historical Society Library, Manuscript Collection, Indianapolis.

arches are doubled, with two sets of concentric arches on each truss side (see Appendix B, Illustration 2). The arch timbers are 5 1/2 x 10". The arch timber segments join at every other post, meeting end-to-end and secured with a double bolt assembly through the corresponding post (see Appendix B, Illustration 6). The segments of the upper arch are never spliced at the same post as are the segments of the lower arch. The arches are incrementally pushed away from the posts by wooden spacers to make the required distance to sandwich the lower chord. Near the center of the span, wooden blocks reinforce the space between the inner and outer arches.

An iron tie rod connects the top chords above each post (see Appendix B, Illustration 5).<sup>8</sup> There are, then, sixteen overhead panels across each span of the bridge (mirroring the truss panels). Timber cross braces form X's (one resting inside the other) in the panels between the ties. Cast iron shoes are secured to the top chord to receive the upper lateral cross braces and the tie rods.<sup>9</sup> The roof rafters sit on the upper chord and support longitudinal stringers. The roof is of plywood, covered with shingles.

Board and batten siding, painted barn red, covers the bridge (see Appendix B, Illustration 1). There is a 10' overhang at the north entrance and a 17' overhang at the south. There is a small window slit running the length of the sheathing beneath the eaves. Daniels wrote of this feature that it was "to admit light."<sup>10</sup> It also helps allow wind to pass through the structure, relieving some of the transverse stress.<sup>11</sup> There are two windows in each span on the west side. These have sills and awnings, supported by three two-by-fours. The trim is painted white. On the east side, a single, small window breaks each span.

The portal faces are of vertical planks, painted white. Each portal has four signs attached. In the tympanum, "1876 / J.J. DANIELS / WEST UNION / CROSS THIS BRIDGE AT A WALK" is painted in black. The vertical clearance is 14'-6" and the opening is 16' wide. The road deck is made of longitudinal planks nailed to a layer of lateral planks. A guardrail runs the length of each side, but runs behind, rather than in front of, the arches.

The decking sits on longitudinal stringers that rest on floor beams, which in turn are supported by the lower chords. Iron rods tie the lower chords. Between the tie rods, timber cross braces fit into iron shoes in the same manner as the upper lateral braces.

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<sup>8</sup> According to covered bridge historian Joseph Conwill, "It appears that [Daniels] is attempting to mimic the function of continuous trusswork in having the live-load deflection of one span partly relieved by the dead load of the other; if so, a sophisticated feature."

<sup>9</sup> This feature eliminated some of the complicated timber joinery. George Gould, Indiana Covered Bridges thru the Years (Indianapolis: Indiana Covered Bridge Society, 1977), 16.

<sup>10</sup> "Specifications No. 1 [for bridge over Vermillion River near Hanging Rock, 1898]."

<sup>11</sup> Wayne M. Weber, Covered Bridges in Indiana (Midland, MI: Northwood Institute, 1977), 32-33.

The timber bridge rests on hewn stone abutments and one pier.<sup>12</sup> The upstream side of the pier is angled to form a point that helps to break up ice and debris flowing downstream (see Appendix B, Illustration 7). The concrete approach walls were built in 1914 after a flood damaged the existing walls (see Appendix B, Illustration 1). The south approach has the date “1914” and the names of the county officials at that time stamped into it.

At the abutments, the arches bear on cast iron plates that were built into the stone. Daniels included these plates to “give a solid bracing and prevent the timber from taking moisture from the rock” and rotting (see Appendix B, Illustration 8).<sup>13</sup> This element prolonged the life of the arch ends, one of the most vulnerable spots in a timber bridge. Daniels also built iron eyehooks into the abutment face to anchor a “stay rod” coming down from the bottom chords (see Appendix B, Illustration 8). This feature was meant to secure the superstructure of the bridge to the abutments in an attempt to prevent the truss from being washed downstream in a flood.<sup>14</sup>

### **Covered Bridges in Indiana**

In the early nineteenth century, several important patent designs had proved the strength and resourcefulness of covered wooden trusses. Timber bridges quickly became more popular than stone bridges since they were less expensive to construct, called for materials that were easy to come by, could span greater widths, and required skills that local builders and carpenters already had. Roofs and siding covered these bridges to protect the wooden truss members and joints from the elements, thereby considerably increasing their life spans. The height of the covered wooden bridge era was the 1870s.

Between 1820 and 1922, at least 600 covered wooden bridges were built in Indiana. A handful of bridge-building companies and individuals were responsible for most of the covered bridges in the state. J. J. Daniels and J. A. Britton were each prolific builders in and around Parke County, west of Indianapolis. On the other side of the capital, three generations of the Kennedy family reigned in this industry. Daniels, Britton, and the Kennedys built at least 158 bridges in Indiana.<sup>15</sup> Ohioan Robert W. Smith and his Smith Bridge Company worked out of Toledo, but built several bridges in neighboring Indiana.

In 1930, state highway engineers and covered bridge enthusiast Robert B. Yule organized the Covered Timber Bridge Committee under the auspices of the Indiana Historical Society. At that time, the committee members gathered statistics, took documentary photographs,

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<sup>12</sup> Since West Union Bridge is the third bridge on this site, the abutments, in part or whole, may date to one of the previous bridges of 1861 or 1866.

<sup>13</sup> “Specifications No. 1 [for bridge over Vermillion River near Hanging Rock, 1898].”

<sup>14</sup> Daniels’ Harrison Bridge, which was on the same site, was washed away in a flood earlier that year.

<sup>15</sup> Indiana History Bulletin 69, no. 1 (March 1998): 1.

collected news clippings, and corresponded with bridge builders' families and local historians to create an archive on the covered bridges in the state. The result of this project is "The Covered Bridge Collection" in the Indiana Historical Society Library, divided into two sets of folders, one for photographs and the other for documents.<sup>16</sup> The effort has left an important archive of Indiana's bridges at mid-century, especially since many of these bridges have disappeared.

Although various organizations around the state have been active in preserving the bridges, most of them have been lost to replacement metal spans, floods, arson, and/or neglect. In 1998 there were only ninety-three covered wooden bridges left in the state.<sup>17</sup> In 2002, "Indiana's Historic Bridges" (including concrete, metal, and wooden spans) made the National Trust for Historic Preservation's "Eleven Most Endangered Structures" list.

### **History of the Bridge Site**

Parke County, Indiana organized in 1821 as an agricultural community. The land along the Wabash River, which is now known as Reserve Township, was originally organized as a reservation for Native Americans.

One of the largest rivers in the county is Sugar Creek, which empties into the Wabash River. The creek cuts through the top of the county, and likewise through the top of Reserve Township, from east to west. In 1874, the "Map of Reserve Township" noted "Reserve is one of the best townships in Parke county, being well adapted to farming, and at the same time is accessible by rail to markets."<sup>18</sup> The Indiana State Highway, laid out ca. 1825, crossed Sugar Creek at the future location of West Union Bridge. Certainly there was a fording, if not a proper bridge, set up at the site at this time.

### **Construction of the Bridge**

The West Union Bridge that stands today is the third one built on this location by J. J. Daniels. The story of the bridges is somewhat complicated. For my research at the county courthouse and other archives, the author received invaluable assistance from Juliet Snowden, a local historian who dedicated countless amounts of time and energy to compiling the histories of Parke County's covered bridges from primary sources. She is also a preservation advocate and helped start the county's annual covered bridge festival.

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<sup>16</sup> There is no finding aid for these files, as they are uncatalogued, but the folders are readily available when requested as "The Covered Bridge Collection" and subsequently by county. Unfortunately the files were not kept up-to-date and primarily contain clippings, etc., only from late 1930s to the early 1950s. The bulk of the photographs examined were taken ca. 1940, and are small format. Some negatives and postcards are present as well.

<sup>17</sup> Indiana History Bulletin 69, no. 1 (March 1998): 1. The author believes the tally in 2002 to be ninety.

<sup>18</sup> "Map of Reserve Township," (1874).

In Indiana at this time, the county commissioners let bridge contracts. A similar three member Board of Commissioners still governs the county. In the nineteenth century, the life of a bridge often began many months before its construction. A petition might be circulated and presented to the commissioners who would then agree to apportion county monies to the cause and subsequently order specifications from a local builder, an engineer, or a county employee. A call for bids would appear in the local and often the Indianapolis newspaper at least twice.<sup>19</sup> The call would ask for proposals for bridges that followed the specifications available in the auditors office. At the arranged date, the commissioners would convene a special meeting to open the bids and let the contract. Contractors and builders were sometimes present at these meetings.<sup>20</sup>

### **Bridges Preceding the West Union Bridge**

The first known bridge at this site began with a petition for two bridges across Sugar Creek, one at Star Mills (future West Union Bridge site) and another at Rockport Mills (Jackson Bridge).<sup>21</sup> The bridges were paid for by subscription in January 1861. Subscription was a common practice for erecting county bridges in the early and mid-nineteenth century in which interested residents would contribute what they could to the price of the bridge (in this case between \$1 and \$50).<sup>22</sup> The subscribers needed to raise \$8,000 for each of the bridges. They were only able to raise \$2,747 for Star Mills Bridge. Eight local men agreed to make up the difference, and the commissioners agreed to let the contract.<sup>23</sup> The contractors' bids for the two bridges were opened on March 6. The commissioners awarded both contracts to William D. Daniels, "as per plans and specifications submitted by J.J. Daniels his agent."<sup>24</sup> J.J. Daniels completed the Star Mills Bridge in December 1861. According to local lore, Daniels, a staunch Republican, christened this bridge "Harrison Bridge" in homage to Gen. William Henry Harrison. At the same time, he named his recently completed bridge at Rockport

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<sup>19</sup> This process was described in a personal communication with James Cooper, June 2002.

<sup>20</sup> For more on calling for proposals, determining specifications, and awarding contracts, see Wayne M. Weber, Covered Bridges in Indiana (Midland, MI: Northwood Institute, 1977), 11-13.

<sup>21</sup> According to Juliet Snowden, Daniels attended a commissioners' meeting in 1859, "seeking a contract to build 'bridges over Sugar Creek,'" but this was not verified. See Snowden, (52 1/2) Covered Bridges of Parke County, 20. Jackson Bridge is still in use (2002), see HAER No. IN-48.

<sup>22</sup> This may have been a loan to the county, rather than a gift. After construction, travelers would have to pay a toll to use the bridge until it paid for itself.

<sup>23</sup> Parke County Commissioners' Records, Vol. 5 (Rockville, IN: Parke County Courthouse, 1861), 210-216.

<sup>24</sup> Parke County Commissioners' Records, Vol. 5, 240. William D. Daniels was probably Joseph's brother, but this is unconfirmed.

Mills, Jackson Bridge, for the former president.<sup>25</sup> On Christmas Day, his contractor William Daniels went to the commissioners:

Wm. D. Daniels contractor (by J.J. Daniels agent) [was present to ask the] board to receive the Bridge over Sugar Creek at the Star Mills said bridge being completed. Whereupon (the board having examined said bridge on Tuesday Dec 24<sup>th</sup> 1861 and found the same finished in good and substantial manner and according to contract) it is therefore ordered that the said bridge at Star Mills be and the same is hereby received and that the said W. D. Daniels is hereby released from any further responsibility of the same.

Ordered that W.D. Daniels be allowed the sum of four thousand three hundred and thirteen and 98/100 dollars in full payment of balance due him on bridge contract in payments as follows to wit. [the payments are scheduled, the last being October 15, 1863] Also two hundred dollars in cash for difference in quality of shingles put on bridges as stipulated in contract.<sup>26</sup>

This bridge was damaged considerably in the spring of 1866, after which Joseph J. Daniels was contracted to “rebuild Harrison Bridge...at its former site.”<sup>27</sup> His bid for \$5,725 was accepted on the condition that he finish the bridge by January 1, 1867.<sup>28</sup> He did so, for on December 7, 1866, the County Auditor was instructed to pay Daniels for the work. This bridge was not destined to last long either. In a flood in 1875, according to one eyewitness, it “washed off its foundation, turned horizontal, dropped out of sight, and like truth crushed to earth” and disappeared.<sup>29</sup>

### **Contract Letting for the 1876 Bridge<sup>30</sup>**

On October 20, 1875, the commissioners contracted with Enos Kuhn and J.P. Hunt to tear down Star Mills Bridge for \$200.<sup>31</sup> In December, the commissioners paid J.J. Daniels \$100

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<sup>25</sup> See Juliet Snowden, *(52 1/2) Covered Bridges of Parke County*, 2<sup>nd</sup> ed. (original 1969) (1981), 20.

<sup>26</sup> *Parke County Commissioners' Records*, Vol. 5 (Rockville, IN: Parke County Courthouse, 1861), 293.

<sup>27</sup> Snowden reports that \$268.66 was paid to remove the bridge from the creek, see Snowden, *(52 1/2) Covered Bridges of Parke County*, 20. *Parke County Commissioners' Records*, Vol. 6 (Rockville, IN: Parke County Courthouse, 1866), 253.

<sup>28</sup> The price on this contract is more in line with major repairs or rebuilding with original materials. A completely new bridge would certainly cost a couple of thousand dollars more, as did the 1875 bridge.

<sup>29</sup> Kaye Aydelotte, in Parke County Historical Society, *Parke County, Indiana: History and Families, 1821-1989* (Paducah, KY: Turner Pub. Co., 1989), 71.

<sup>30</sup> According to Snowden, Star Mills Bridge and Harrison Bridge are one in the same. The name changes back and forth in the commissioners' records cannot be explained. Perhaps it is merely the name that changes according to the political persuasion of the commissioners or court recorders at the time. In 1875-1876, the Indiana gubernatorial race was on. The local “Harrison”—Benjamin—lost to the democratic candidate.

<sup>31</sup> *Parke County Commissioners' Records*, Vol. 8 (Rockville, IN: Parke County Courthouse, 1875), 274.

for his plans and specifications for a new bridge. At the same meeting, they “Ordered that a Bridge be built across Sugar Creek at the Old ‘Star Mills’ Seat. Said Bridge to be of wood and of the Burr plan.”<sup>32</sup> On January 27, 1876, the commissioners reviewed the proposals and awarded the contract once again to J.J. Daniels.<sup>33</sup> Daniels’ bid was for \$8,900.<sup>34</sup>

The existence of alternate names for the Star Mills, Harrison, and West Union Bridges deserves further research. It is possible that the West Union Bridge was built in a slightly different location than the earlier bridges. Perhaps it was nearer the mill (or the mill ruins), but intended to replace the older, damaged bridge. The various contract prices in 1861, 1866, and 1876 would support that West Union Bridge was a new bridge altogether. Furthermore, after the loss of two bridges in less than fifteen years, the county officials and Daniels might have realized a better siting might help prolong the life of the third bridge.

On September 7, 1876, the commissioners “Ordered that the Bridge erected by J.J. Daniels across Sugar Creek at the ‘Old Star Mills’ seat be and the same is hereby accepted by the Board of Commissioners and that the Auditor draw his warrant on the County treasurer for the sum of Nine Thousand Five hundred Dollars,” less the amounts already issued to Daniels on this contract.<sup>35</sup> Daniels had gone over the contract price for West Union Bridge. The additional cost was warranted, as the bridge has now stood over 125 years.

### **Joseph J. Daniels<sup>36</sup>**

Joseph J. Daniels is probably the most well-known and respected of Indiana’s covered bridge builders. He was born in 1826 in Ohio. His father Stephen made a career of building railroad bridges in Ohio. Notably, Stephen Daniels was an agent for Col. Stephen Long, who designed and patented the Long truss in 1830. The younger Daniels worked with his father, receiving informal training as a carpenter.<sup>37</sup> From 1855 until 1861, J.J. Daniels was General Superintendent of the Evansville and Crawfordsville Railroad.

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<sup>32</sup> Parke County Commissioners’ Records, Vol. 8, 292.

<sup>33</sup> Daniels’ plans and specifications did not automatically gain him the contract for building the bridge. It would not have been out of the ordinary for the contract to go to someone else; the two were separate matters.

<sup>34</sup> Parke County Commissioners’ Records, Vol. 8, 307.

<sup>35</sup> Parke County Commissioners’ Records, Vol. 8, 407.

<sup>36</sup> The following biography comes from several sources including Wayne McClellan Weber, The Covered Bridges of Parke County, Indiana (Indianapolis: Indiana Covered Bridge Society, 1980). There is also a college term paper in the Rockville Public Library’s local history section: Dann Chamberlin, “Joseph J. Daniels and His Indiana Covered Bridges” (Naperville, IL: North Central College, 1958). This contained a well-researched biography of Daniels based on county records, Daniels’ correspondence, and family records.

<sup>37</sup> In other respects, Daniels is “said to be a self-educated man,” Wayne M. Weber, Covered Bridges in Indiana (Midland, MI: Northwood Institute, 1977), 38. His obituary recalls him as both “self made” and “self taught,” “Joseph J. Daniels” obituary, 1916, clipping in “Indexed Scrap Album” in the collection of the Rockville Public Library, Indiana.

His work there must have been impressive, as he received (probably solicited) many letters of recommendation, now archived in the Indiana Historical Society in Indianapolis.<sup>38</sup> These letters, from the supervisors of bridges he completed, testify to Daniels' skill as a bridge builder. For the most part, the letters are filled with superlatives regarding Daniels' skills, comportment, competence, etc. One, from a civil engineer, can serve as an example: "with his skill as an architect, and gentlemanly deportment I am highly gratified and recommend his services to all such as may need them."<sup>39</sup> Perhaps Daniels requested these letters when he left the railroad company in 1861 to settle in Rockville in Parke County. That year, Daniels earned the contract to build Jackson Bridge and Star Mills Bridge (discussed above).<sup>40</sup> He went on to build nearly sixty bridges in Indiana and several others in Ohio and Kentucky, living up to his esteemed reputation.

Daniels often experimented with new techniques as the years brought newer materials. Historians often credit Daniels' success to this adaptability and to his sophisticated craftsmanship.<sup>41</sup> His use of iron has been called "progressive."<sup>42</sup> Furthermore, his incorporation of iron ties rods and cast iron "shoes" in his trusses allowed his wooden bridges to successfully compete with iron bridges for contracts. His versatility as an architect and his able structures no doubt contributed to his lasting popularity with the commissioners.

A collection of Daniels' original drawings and descriptions of bridge specifications is also in the library of the state historical society.<sup>43</sup> These drawings are primarily in pencil on rolled paper. A few are dated and signed. This collection provides us with both a glimpse of bridge building in Indiana at the end of the nineteenth century and insight into Daniels' methods.<sup>44</sup> For example, Daniels drafted not only trusses, but also pilings, grillage, abutments, and piers.

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<sup>38</sup> These are in Folder 2 of the manuscript collection "Wylie J. Daniels Papers, 1850-1940," (Indianapolis: Indiana Historical Society Library, 1850-1940). The letters range in date from 1847 to 1861.

<sup>39</sup> Signed "J.S. Williams, Civil Engineer, Aug 14, 1850." In the "Wylie J. Daniels Papers, 1850-1940."

<sup>40</sup> Daniels built his first bridge in 1851, in Union Township, Parke County (obit)

<sup>41</sup> John M. Vlach calls Daniels a craftsman "of the highest order," in "Daniels and Britton, Master Bridge Builders," Indiana Covered Bridge Society Newsletter 9, no. 4 (1972): 3.

<sup>42</sup> Wayne M. Weber, Covered Bridges in Indiana (Midland, MI: Northwood Institute, 1977), 38. Daniels was using metal at least as early as 1861, as evidenced in 1863 when the county asked him to "examine and tighten the bolts" on a few of the bridges he had built in 1861. Parke County Commissioners' Records, Vol. 5, 415.

<sup>43</sup> "Papers and Drawings of J. J. Daniels, ca. 1861-1899," manuscript collection, Indiana Historical Society Library, Indiana. This collection is neither accessioned nor catalogued, though there is an old finding aid in Box 11 of the "Covered Bridge Papers," which may be incomplete and/or incorrect. The drawings themselves are rolled and stored at the library, but not all are properly labeled. Many of the drawings and papers were transferred to microfilm in 1944 (Microfilm F178 Positive), though some of the papers on the film are not on the finding aid. Also on this film is Col. Stephen Long's entire book Description of Col. Long's Bridges (1836), and some of the letters in the collection of "Wylie J. Daniels Papers, 1850-1940."

<sup>44</sup> The author was unable to view all of the original drawings, but did view the entire microfilm reel. The brief descriptions of the unidentified bridges on the finding aid do not indicate that the West Union Bridge is represented in this collection. Although no documents illustrating the West Union Bridge in particular were found, several of the drawings used similar mechanics and specifications, including the double arch, the iron tie rods and shoes, etc.

There are also drawings for Howe trusses, though Daniels predominantly used the Burr arch-truss.

A few of the drawings and writings are particularly interesting in that they show Daniels working out bearing loads, dimensions, and stress. One drawing is for a composite metal and wood truss.<sup>45</sup> Another document is his “Strain Sheet for Burr Bridge.”<sup>46</sup> These illustrate Daniels’ interest in the engineering of his structures. Many of the early nineteenth century bridge builders were carpenters by trade and worked without intricate knowledge of engineering principles.<sup>47</sup> Instead, they transferred skills learned in house and barn building to truss frames. Daniels’ specifications, however, show that he was interested in analyzing stress for both wood and metal trusses.

Daniels lived in Rockville until his death at home at age 90 in 1916. He built his last bridge in 1904 at age 78.<sup>48</sup> In addition to the praise of both his character and his skill in the letters of the 1850s, Daniels’ obituaries remember him through “the wooden bridges of this county [which] stand as monuments of his skill as a draftsman and honesty in performance of public work.”<sup>49</sup>

### **Bridge Design<sup>50</sup>**

The West Union Covered Bridge employs a Burr arch-truss. Theodore Burr (1771-1822) patented his first bridge design in 1806 and a second on April 3, 1817.<sup>51</sup> The 1817 patent drawing shows a multiple kingpost truss resting on stone abutments, superimposed with an arch whose ends are anchored to the abutment faces (below the lower chords) (see Appendix B, Illustration 9). In Burr’s design, the posts are in tension while the diagonal braces are in compression. The diagonals meet the posts with little need for mortise and tenon.

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<sup>45</sup> This is the drawing labeled “(Unidentified) One span 168 feet C to C; Roadway 16 feet.” Joseph J. Daniels, “Papers and Drawings of J.J. Daniels, ca. 1861-1898 (manuscript collection),” Indiana Historical Society Library.

<sup>46</sup> Joseph J. Daniels, Papers and Drawings of J.J. Daniels, ca. 1861-1898 (manuscript collection).

<sup>47</sup> Robert S. Yule, The Covered Bridge in Indiana (Indianapolis: Indiana State Highway Commission, 1971); George E. Gould, “Indiana’s Covered Bridges Built by Inventive and Skillful Craftsmen,” Outdoor Indiana, February 1978, 5.

<sup>48</sup> This was the Neet Bridge, a 126’ Burr arch truss over Little Raccoon Creek, south of Rockville. It still stands today, but is closed to vehicular traffic.

<sup>49</sup> “Joseph J. Daniels (obituary),” clipping pasted in “Biographies of Parke County,” a scrapbook in the Rockville Public Library August 1916. A second obituary also reveals the tremendous respect the people in Parke County had for Daniels. “Joseph J. Daniels (obituary),” clipping pasted in “indexed Scrap Book” in the Rockville Public Library, August 1916.

<sup>50</sup> West Union’s design is similar to that of Daniels’ Jackson Covered Bridge of 1861, see HAER No. IN-48. The West Union Bridge replaced Harrison Bridge, the sister bridge to Jackson Bridge.

<sup>51</sup> J. G. James, “The Evolution of Wooden Bridge Trusses to 1850 (Continued),” Journal of the Institute of Wood Science 9, no. 52 (1982): 169-193. The patents were lost in the US Patent Office fire of 1836.

Although Burr built dozens of bridges, he is remembered more for the practicable design he patented and promoted. No doubt, much of its success was due to its expediency. Burr wanted to reduce the need for complex carpentry/joinery. He “advocated merely butting suitably mitred ends to save much of the carpentry effort and expense.”<sup>52</sup> The design also allowed for variation at the connections, in the proportions, and with the materials. The design’s widespread repute and proven durability helped provincial carpenters successfully bid for and build economical, lasting bridges more or less in their own backyards. The Burr arch-truss became one of the most popular vernacular designs for wooden bridges in the United States, its product varying slightly from builder to builder. In some cases, as with J.J. Daniels, builders could master the Burr arch-truss to the degree that they could successfully earn a living almost entirely by constructing bridges in their regions. The Burr Truss was used extensively in Indiana.<sup>53</sup> Historians generally attribute this to it being the favorite design of the state’s most prominent bridge builders, J.J. Daniels, Emmett and Archibald Kennedy, and J.A. Britton.<sup>54</sup>

Nearly all of Daniels’ bridges have the Burr arch-truss. Daniels, however, adapted the design in several ways and altered it slightly for each bridge. Two of Daniels’ important metal additions, described above in “Description,” were the cast iron plates at the arch ends and the stay rods joining the wooden truss to the abutments (see Appendix B, Illustration 8). He also employed iron tie rods and metal shoes at upper lateral and flooring cross brace connections (see Appendix B, Illustration 5).

## I. Subsequent History of the Bridge

Parke County, Indiana has built a solid reputation for itself as “the Covered Bridge Capital of the World.”<sup>55</sup> With thirty-two extant covered wooden bridges, more than any other county in the United States, the title is warranted. Indiana covered bridge historian George E. Gould also attributes the plethora of covered bridges in this county to the “salesmanship of the builders” (as well as to the topography and the ample forests).<sup>56</sup> “The presence of Daniels and Britton in the county was a factor [in the large number of bridges] since both campaigned actively for jobs. The competition between the two after 1882 no doubt increased their

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<sup>52</sup> James, “The Evolution of Wooden Bridge Trusses to 1850 (Continued),” 171.

<sup>53</sup> George Gould, *Indiana Covered Bridges thru the Years* (Indianapolis: Indiana Covered Bridge Society, 1977). Gould calculates that about 63 percent of Indiana’s covered bridges were Burr arch-trusses.

<sup>54</sup> See Robert S. Yule, *The Covered Bridge in Indiana* (Indianapolis: Indiana State Highway Commission, 1971).

<sup>55</sup> <http://www.coveredbridges.com/>

<sup>56</sup> George E. Gould, “Indiana’s Covered Bridges Built by Inventive and Skillful Craftsmen,” *Outdoor Indiana*, February 1978, 5. Gould was also referencing the abilities of the prolific Kennedy Family in Rush County (see HAER IN-106).

promotional efforts.”<sup>57</sup> That so many of these bridges have survived to the twenty-first century is a testament to the workmanship of these two builders.

Juliet Snowden reports that many of the county’s bridges were repaired in the 1930s under WPA supervision. The bridges “desperately needed repairs at a time when there was very little local money to be spent on maintenance.”<sup>58</sup> Snowden credits the WPA project as helping to save the bridges for another generation. Again in the late 1950s, the bridges needed help. Enter the popularity of the Covered Bridge Festival, staged by local citizens interested in saving their inheritance of bridges. Since 1957, the county has played host for ten days each October to hundreds of thousands of covered bridge-seeking tourists during its annual “Covered Bridge Festival.” This festival has certainly aided the preservation effort.

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<sup>57</sup> Felkner, “Parke County Covered Bridge Thematic Resource,” 8-2.

<sup>58</sup> Juliet Snowden, *(52 ½) Covered Bridges of Parke County*, 3.

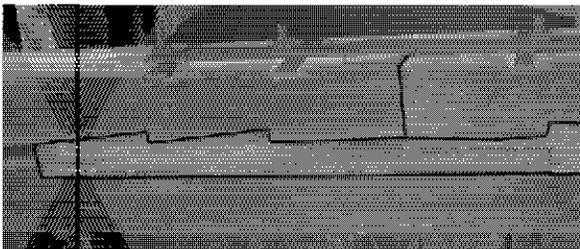
Appendix A, Illustrations



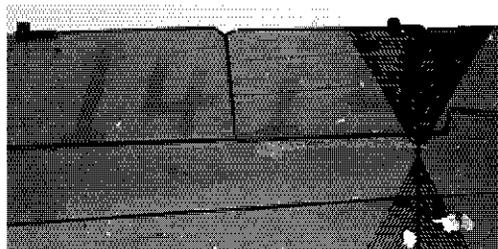
**Illustration 1.** West Union Bridge. Field photograph courtesy of author.



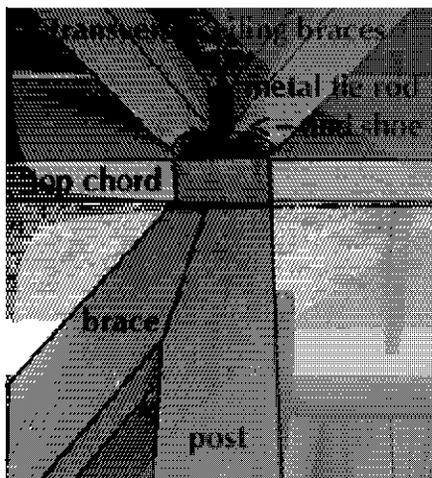
**Illustration 2.** Truss. Field photograph courtesy of author.



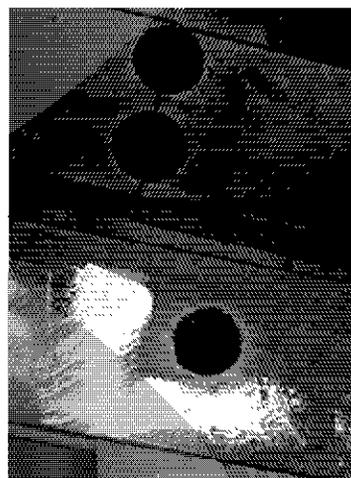
**Illustration 3.** Daniels' double headed hook. Field photograph courtesy of author.



**Illustration 4.** Match marks (looking down at the lower chord). Field photograph courtesy of author.



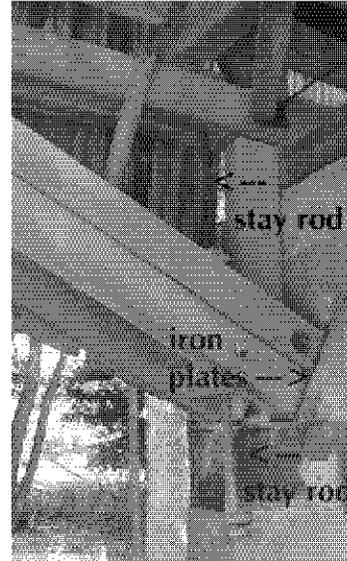
**Illustration 5.** Connections at the top chord. Field photograph courtesy of author.



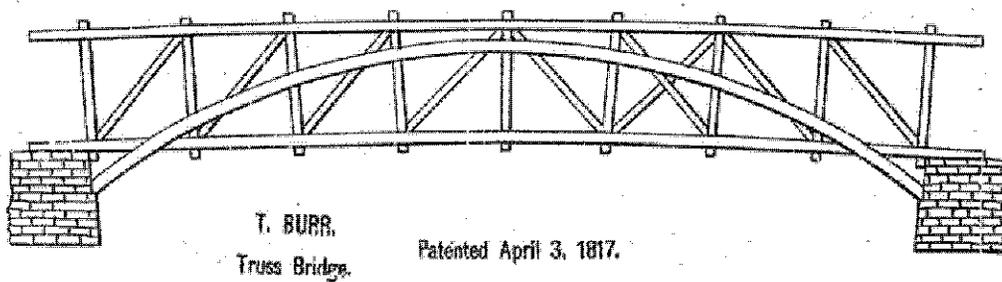
**Illustration 6.** Arch segments joined at post. Field photograph courtesy of author.



**Illustration 7.** Pier. Field photograph courtesy of author.



**Illustration 8.** Arches at the abutment. Field photograph courtesy of author.



**Illustration 9.** Reconstruction of Burr's 1817 patent drawing.<sup>59</sup>

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<sup>59</sup> Original was presumably lost in the U.S. Patent Office fire of 1836.

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ADDENDUM TO:  
WEST UNION BRIDGE  
National Covered Bridges Recording Project  
Spanning Sugar Creek, CR 525W  
West Union  
Parke County  
Indiana

HAER IN-105  
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