Potawatomi Park's Enduring Monument

by

James L. Cooper

"A new iron bridge has been completed this week.... This makes the 4th structure of the kind in Jasper county.... They will be enduring monuments to the enterprise and sound judgment of the commissioners under whose administration they were built."

– editor, "Local Matters," *The Rensselaer Union*, 26 September 1872.

The author wishes to acknowledge with great appreciation the very special help of Edward Windhorst, sometime resident of Rensselaer, who introduced me to the bowstring in its abandoned state, participated in early local records reading, and provided important bridge measurements. Ed also took numerous photographs of the bridge from the Gangloff-Sayler farm to the park, a number of which have been used in this report.

22 May 2013

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Structural Form: Bowstring

"Bowstring" is the name used for a tied and trussed arch. The top chord or "bow" is arched and the bottom chord or "string" keeps the upper arched chord from flattening by tethering its ends. Members between the two chords help to carry the roadway and to resist the effects of moving loads over the superstructure.

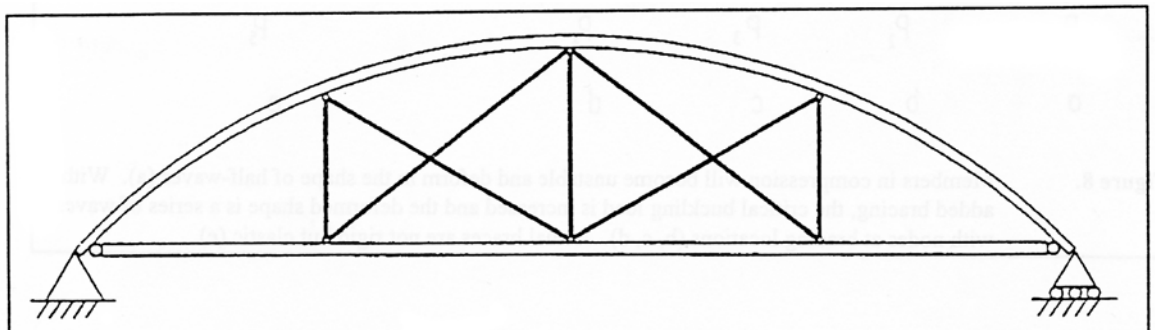

Figure 6. A TYPICAL BOWSTRING BRIDGE. The top chord is continuous and able to resist bending moments. All other members can carry only tension. The dead load causes some pretension in the lower chord, the verticals, and the diagonals.

– Dr. Dario Gasparini, "Structural Study of Iron Bowstring Bridges," Historic American Engineering Record, IA-90.

Bowstring arch bridges of cast and wrought iron were constructed in America in large numbers from the mid-1850s through the 1880s. Only six bowstring bridges – including that now located in Potawatomi Park in Rensselaer – remain in some kind of service in Indiana.[1]

Structural Style of Bowstrings

There were a good many styles of iron bowstrings designed, fabricated, and erected in the United States during the mid-19th century. The Hoosier extant bowstrings represent six different styles. The Potawatomi Park bridge is the only one built to the W. B. Rezner patents of 1867 and 1872 focused on an arched upper chord composed of two near semi-circular wrought-iron sections riveted together and tethered to the lower chord through cast iron foot blocks.[2] Indeed, there are fewer than a half-dozen Rezner-style bowstrings remaining in the whole nation.

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[1]There are also two dismantled bowstring structures, each of which will need significant repairs before being available for re-erection.

[2]The patent drawings and photos of the park bridge are excerpted on the next page. The full patent texts and drawings can be found in an appendix.

Glass, Schneider & Rezner,
Bridge.

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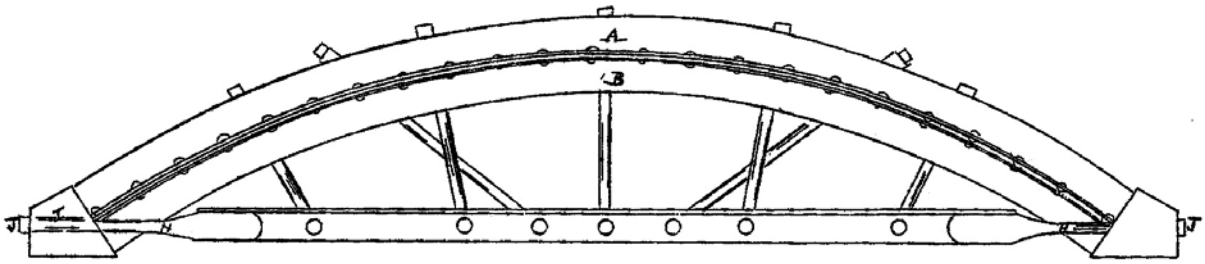
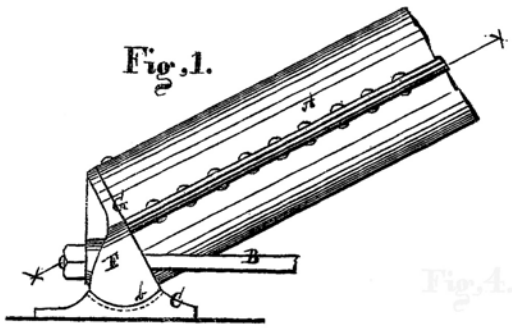
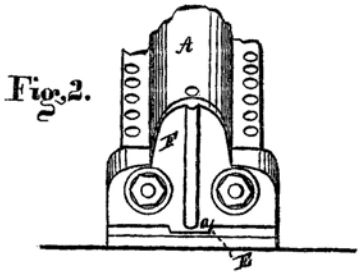
Fig. 1.



Figures 1 & 2 below from Rezner's 1872 patent.





Jasper County's Contracting for Iron Bowstrings

As the *Rensselaer Union*'s editor noted in September 1872, the Jasper county commissioners had just erected their fourth metal-truss bridge – all were iron bowstrings. They did not contract for another metal bridge for more than a decade, by which time the popularity of bowstring design and construction had passed its zenith. On the whole, the county relied throughout the period on timber beam and low-truss bridges for its crossings.

The First Bowstring

In March 1869, the commissioners determined that the old Bedford Bridge over the Iroquois River just east of Rensselaer needed to be replaced with an 80-100 foot structure. In April of that year the board adopted John Lefler's plans for a five-span timber pile, or beam, bridge to be erected on sandstone abutments and piers.[3]

For the June 1869 letting, however, the commissioners were attracted to a proposal for an iron bowstring and contracted for its construction. For $2,200 the Wrought Iron Bridge Company of Canton, Ohio, offered to erect a single 100-foot span on "Hammond's Patent double T beam arch" across the Iroquois River. The county would provide the stone abutments.[4] While the iron superstructure was far more expensive than Lefler's timber beams would have been, the commissioners did save the cost of three stone piers. Construction was satisfactorily completed and the bridge accepted by early January 1870.[5]

The Second and Third Bowstrings

In April 1871, the Jasper county commissioners sought proposals for two more iron superstructures on "solid stone abutments." Both sites were on the Rensselaer and Remington Road – one at 60-feet over Big Slough at Alfred Hoover's and the other at 50-feet over Carpenter Creek at "Lipprant's crossing" about half a mile north of Remington, each to be 12- or 14-feet wide.

William Rezner apparently came to Rensselaer in June to present the commissioners with the Ohio Wrought Iron Bridge Company of Cleveland's proposal. Theirs was the lowest and subsequently the successful bid for these bridge superstructures. William Hartshorn of Grant

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[3]Jasper County, "Commissioners Evidence of Destroyed Records," I: 15, 163, 170-171.

[4]David Hammond, Canton, Ohio, U.S. Patent #56,043 (3 July 1866); reissue #3,433 (11 May 1869).

[5]Jasper County, "Commissioners Evidence of Destroyed Records," I: 198-199, 206, 263-264, 269, 276, 278-279, 362.

county won the contract for the two sets of stone abutments. The commissioners accepted both sets of abutments by late August, and Hartshorn received $2,309 for his stone work. In early

September, the commissioners also accepted the two superstructures and paid the Ohio Wrought Iron Bridge Company $1,636.47 for the spans.[6] The exact lengths of these two bowstrings remains approximate. The commissioners had advertised for a 50-foot span over Carpenter Creek and a 60-foot span over Big Slough, but the *Union* reported "the contract price for these bridges is $900 each" – a figure inconsistent with spans of unequal length.[7] Unfortunately, the Auditor did not record the Ohio Bridge Company contracts in the "Commissioners Record."

The Fourth Bowstring

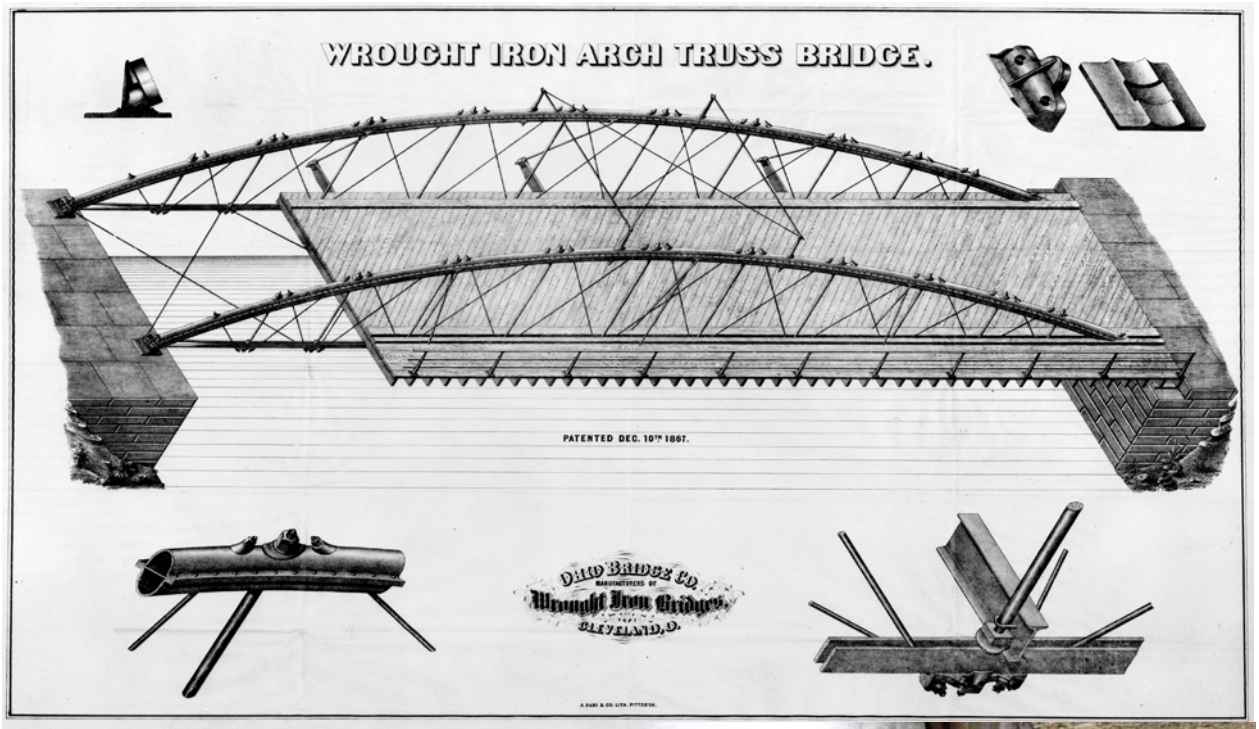
In April 1872, the commissioners sought proposals "for building abutments and iron bridge across the Iroquois River, where the Rensselaer and Winamac Road crosses the same at or near the residence of John Groom" (S16-21/T29N/R6W). At the June letting, the board rejected as too high all the proposals they had received for the stone abutments. New proposals filed on the spot led to a stonework contract with Grant county's Hartshorn, Crampton and Company. The superstructure contract went to the "Ohio Bridge Company of Cleveland, Ohio," at $19.70 per lineal foot.[8]

[6]Jasper County, "Commissioners Record," 4: 37, 53, 57-58, 61, 67, 69, 77, 84, 86-89, 127.

[7]"Proceedings in Commissioners Court," *The Rensselaer Union*, 15 June 1871, p3 c5.

[8]Jasper County, "Commissioners Record," 4: 180, 195-196, 209-210.

Work on the "Groom Bridge" proceeded quickly. The county received the stone abutments in August, paying Hartshorn, Crampton & Co. $935 and to others for excavation and timbers for sub-base for an additional $69.12. William Rezner notified the commissioners in early September that the fabricated iron members for the bridge had arrived by train in Francesville. Rezner was present in late September when the commissioners accepted the completed superstructure and authorized payment of $1,674.50 for "85-foot span linear measure @ $19.70 per foot."[9]



[9]Jasper County, "Commissioners Record," 4: 211-212, 216, 226-227, 229.

The End of the Beginning

In September 1875, the commissioners ordered the county auditor to advertize an October letting for "two stone abutments and a 50-foot span, 14-foot driveway Iron Bridge [known as Rawles Bridge] over Carpenter's Creek about one-half mile south of Remington." Six days later, the board rescinded its order for the Rawles Iron Bridge letting. In mid-October, the commissioners named Frederic Hoover as the board's agent to let a contract to repair "the old 'Rawles Bridge' south of Remington or to build a new bridge at this site on same plan as the Thomas and Bullis [timber pile] Bridges." In December, Decoursey and Thompson received $432 "for building Rawles Bridge across Carpenter's Creek."[10] This appears to have closed the chapter on Jasper County's contracting for iron bowstring bridges.

Why did the county decide not to build more "enduring monuments"? Cost was surely one motive. If the county had proceeded with its originally expressed intent to rebuild the Rawles Bridge with stone abutments and a 50-foot iron span, the cost – assuming a cost equivalence with the 50-foot bridge over Carpenter's Creek just north of Remington – would have been approximately $1,150 for the stonework and $900 for the bowstring for a total of $2,050 as compared with the $432 paid for the new timber pile structure.

A second motive concerned recycling county revenues within Jasper County. The county appears to have lacked an adequate supply of stone masons. The Bedford Bridge abutments, whose construction was let to county residents, proved so insufficient that the north abutment had to be repaired within five years. By 1883, the Bedford Bridge abutments as a whole were in such bad shape that the county declared an "urgent" need for "repair" and contracted "for the erection of wooden bents for support of the iron bridge."[11] The stonework for the other three bowstrings was subsequently contracted out to masons from Grant County. The iron superstructures all came from Ohio. On the other hand, the timber pile and combination (timber with iron rods) bridges for which Jasper County regularly contracted could be designed "by practical engineers" at hand and constructed by local carpenter builders.

The cost comparison suggested above omits several significant countervailing factors. First, timber pile bridges required frequent repair and typically decayed within 15 years. Second, a 50-foot timber pile structure would consist of at least 3 timber beam spans seated on timber piles in the stream, not a single iron bowstring atop stone abutments at the stream banks. The timber structure would be far more subject to collecting drift and to washout from flooding than the iron one, thus possibly limiting its life until replacement to even less than 15 years. Thus initial costs are not the only relevant ones.

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[10]Jasper County, "Commissioners Record," 5: 22, 33, 46, 52.

[11]Jasper County, "Commissioners Record," 4: 326, 328, 342; 7: 208-209, 219.

Third, the Ohio Bridge Company of Cleveland, upon whom the Jasper County commissioners had depended for their lower-cost bowstrings, had been merged into the somewhat more expensive Wrought Iron Bridge Company of Canton somewhere between mid-1872 and 1874.[12] The closest cost comparison we have between these two companies is between the Bedford Bridge by Wrought Iron for $22 per linear foot and the Groom Bridge by Ohio Bridge at $19.70 per linear foot.

The commissioners did not again consider metal-truss bridge construction through the 1870s into the 1880s. In September 1879, for example, Charles Hopkins agreed to examine and tighten the bolts and then sand and paint the county's four metal bridges. Hopkins enumerated the bridges as Bedford, Hoover, Carpenter Creek at Remington, and Groom – all of Jasper County's potentially enduring monuments.[13]

[12]Victor C. Darnell, *Directory of American Bridge-Building Companies, 1840-1900* (Washington, D.C., 1984), 50. Darnell cites 1874 as the ending date for Ohio Bridge. David Simmons of the Ohio Historical Society reported in an email message that Robert Newberry of Wisconsin Department of Highways documented a January 1872 Ohio Bridge Company of Cleveland contract that had become a Wrought Iron Bridge Company of Canton project by July 1872.

[13]Jasper County, "Commissioners Record," 6: 91.

A Home Away from Home:
The Gangloff-Sayler Farmstead

Of the four iron bowstrings, only the one relocated to cross the Iroquois River at the Gangloff-Sayler farmstead survives.

Grandma's Bridge

Anna Marlin

While paddling down the river
South towards Rensselaer,
We came upon a narrow bridge
Antiqued by clime and years.

Hidden back in bushes and trees,
Seen best from the water,
Sits the old iron bridge
Now worn and tottered.

In days gone by, horse drawn carriages
Crossed the bridge fast and free.
Now the rusty old bridge
Is crossed only by foot...very carefully.

We look in silent wonder,
As it sits there hidden well.
If it could talk of olden days,
Oh, the tales that it could tell.

I bet it would tell about Grannie
Who had to ford the river to farm her land
Because the fields were split apart
By the Iroquois' soft bed of sand.

And then they dredged the river,
Making it very deep.
Grannie couldn't get across;
The banks were very steep.

She used the neighbor's land to cross
Until they had a spat.
She wouldn't use their field again.
It's just as plain as that.

So Grannie went into the house,
Huffed, and put on her hat.
"I'll get me a bridge of my own."
And she did just that.

She went about her way and bought a bridge,
The one that crossed old Hoover Slough,
And had it placed across her land,
Just as good as new.

And there at the Iroquois it still stands
Across its banks so sandy.
For Grandma got her way that day,
She got her bridge, By Grannie!

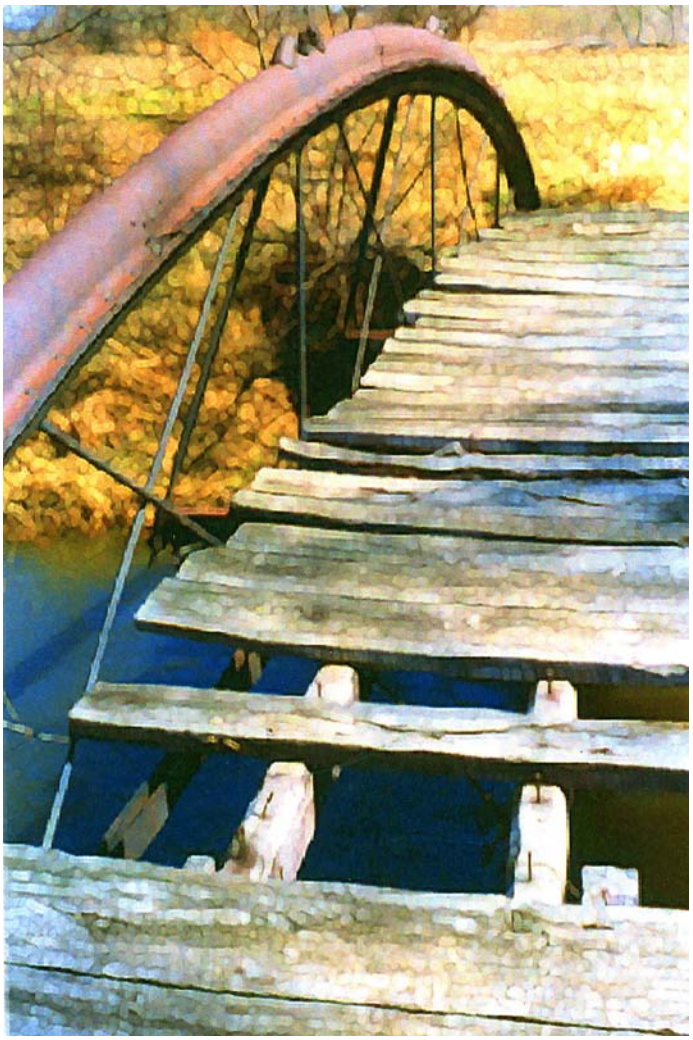
Grannie's poetry captures a lot that rings true with prose reporting, too. Neither the lay of the adjacent land nor old county maps provide evidence of a public highway approaching Grannie's bridge. At the same time, it is quite unlikely that a Jasper County farmer would have privately contracted for an approximately $900 dollar new Rezner bowstring to be seated on either $1,000 stone abutments or on $50 timber bents (which would have to be replaced every decade). Grannie's bridge was more likely a used county bowstring which was then seated on less-than-secure abutments that contributed to some wracking of the trusses over time.

In the photo below to right the lower chord or string and the round-rod diagonals are not taut as designed, and some of the external sway bracing has separated from its upper connection.[14]

There are other clues to relocation as well. The photo to the left below shows one 19th-century square nut and one 20th-century hexagonal nut at the bearing. Note, too, that the square nut shows signs of having been significantly scored, likely in forced loosening or tightening.

[14]See Dr. Gasparini's "Figure 6" and caption on page 2 of this report for the general design function of bowstring members.

There seem to be only two possible sources of a Jasper County Rezner bowstring in the range of the almost 50-foot superstructure removed from the Gangloff-Sayler farmstead to Potawatomi Park. Both candidates had been built on the Rensselaer-Remington Road by the same contractors in 1871. As we have noted earlier, the county commissioners specified a 50-foot superstructure for over Carpenter's Creek a little north of Remington and a 60-foot superstructure for over the Big Slough near Alfred Hoover's residence just south of Rensselaer. Grannie claims her bowstring came from "the old Hoover Slough." A difficulty here is that the Hoover bridge may well have been longer than the surviving bowstring. On the other hand, relocation of the Carpenter's Creek bridge – the quite-right length – to a little east of Rensselaer would have been more time-consuming and therefore somewhat more costly for Grannie.



– Connie Kingman, "Bowstring Truss Bridge" (1979)

The Indiana State Highway Commission sent a team to survey the bridges on the Rensselear-Remington Road in January 1928, including the two crossings discussed here.[15] The state had incorporated this section of Jasper County roadway with its structures into State Route #53. In neither case did the state surveyors find a bowstring in place or located within one or two miles up or down stream or ditch from the relevant state highway crossing.

Residents in the county had started legal proceedings in 1907 to dredge Big Slough into Howe Ditch. Existing bridges were routinely removed from the path of dredges, and the dredging itself typically widened – 51-feet on top with Howe Ditch – as it deepened waterways, making unlikely the return of a bridge superstructure to its original location after dredging. Some superstructures were moved upstream or ditch; others were replaced. If the Hoover bowstring had been 60-feet long as the county had originally specified, it could have been re-erected at its original location after dredging.

[15]Indiana State Highway Commission, "Bridge #202" survey book (1928), 38-79 (housed in the Records Division, INDOT, Indianapolis).

Instead, the county replaced the bowstring in 1916-1917 with a 70-foot long Warren pony-truss superstructure seated on concrete abutments.[16]

The Carpenter Creek bowstring (S19-24/T27N/R6-7W) had also been replaced by a 49-foot pinned Pratt pony-truss superstructure, in this case seated on the original bowstring's stone abutments. This would, indeed, confirm the county's recorded specifications for a 50-foot long bowstring there. Carpenter Creek had not been dredged, and structures located up and down stream by two miles were all Pratt or Warren pony-truss spans. The replacement superstructure over Carpenter's Creek carried rectangular built-up girder floor-beams, more typical of late 19th- than of 20th-century design, but the 18-foot wide roadway demarks the 20th century for Jasper County bridge design and construction.

We are left with a narrow range of uncertainty about the exact original location of the Potawatomi Park bowstring. But we can be quite sure of its Rezner-based design and its 1871 date of construction. Of the six in-service Hoosier bowstrings, this is the second oldest, the only one of Rezner-style design, and the single example of Ohio Bridge Company of Cleveland fabrication. In short, the Potawatomi Park bowstring is not only an "enduring monument," it is also a highly significant one.

[16]In July 1916, the Jasper County Council appropriated $3,800 for a new bridge over Howe Ditch (S7-12/T28N/R6-7W). Jasper County, "County Council Record," 1: 156. Furthermore, none of the bridges which the state found within two miles up or down Howe Ditch in 1928 from the "Hoover Slough Bridge" was a bowstring. Indiana State Highway Commission, "Bridge #202" survey book (1928), 43.

William Rezner Patents

United States Patent Office.

JOHN GLASS, GEORGE P. SCHNEIDER, AND WILLIAM B. REZNER, OF CLEVELAND, OHIO.

Letters Patent No. 71,868, *dated December* 10, 1867.

IMPROVED BRIDGE.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that we, J. GLASS, G. P. SCHNEIDER, and W. B. REZNER, of Cleveland, in the county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Bridges; and we do hereby declare the following to be a full and complete description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a side view of the arch.

Figure 2 is a longitudinal section.

Figure 3 is an end view.

Figure 4 is a transverse section in the direction of the line *x x*, fig. 2.

Figure 5 is a detached view.

Like letters of reference refer to like parts in the views.

Fig. 1 represents the arch of the bridge, which is constructed in three sections, A B C, fig. 4. Each of the sections A B consists of a series of iron plates, bent into a semi-oval or circular form, while they are in the process of being manufactured or rolled out in the mill. The special curve is given to each plate, to form the spring of the arch, by a set of rollers provided for that purpose, the degree of which being more or less, as the nature of the circumstance may require, for the span of the bridge. These plates are then riveted or bolted together, and when placed one upon the other, as shown in the transverse section, fig. 4, forms an oval tube, the longest axis of which being in a right line with the radii of the arch, however, may be varied from an oval more or less, as may be desired. These two sections A B are each provided with a flange, D, fig. 3, by which they are riveted or bolted together, as shown in fig. 1. The third section, C, referred to, consists of a diaphragm placed between the two sections A B, as seen in fig. 4, and which form the minor axis of the tube. The relative position of the diaphragm to the tubes is shown in fig. 2, in which it will be seen that it describes an arch in common with the tubes, and is secured between the flanges by means of the bolts or rivets by which the two sections are fastened together. The purpose of this diaphragm is to resist the lateral strain upon the tubes, and thereby prevent any possible vertical compression of them, thus giving additional strength to the structure. The chord G of the arch forms the stringers on which are placed the cross-beams for supporting the flooring of the bridge. These chords are connected to the ends of the arch by rods H, the ends of said rods being projected through the foot-blocks I, against which the ends of the arch abut, and are secured by nuts J. These foot-blocks are provided with a deep flange or boss K, fig. 5, which is made to project into the ends of the arch, so that the ends will rest upon the shoulders L, as shown in fig. 2. By this arrangement the blocks cannot get displaced, but afford a secure and permanent abutment for the ends of the arch. E are the main stays, by which the stringers and flooring of the bridge are sustained by the arch, and counterbalanced by the stays E.

The tubes of the arch as above described are curvilineal, but the plates may be bent so as to form an angle, making an angular tube of any variable degree of regularity, without changing the principle of a tubular arch for bridges, roofing, or other purpose to which it may be applied.

What we claim as our improvement, and desire to secure by Letters Patent, is—

1. The tubular flanged sections A B, as arranged in combination with the diaphragm C, for the purpose and in the manner substantially as set forth.

2. The tubular arch, as constructed with sections A B C, in combination with the foot-block I, provided with a flange or boss, K, when arranged in the manner as and for the purpose set forth.

JOHN GLASS,
GEO. P. SCHNEIDER,
WM. B. REZNER.

Witnesses:
W. H. BURRIDGE,
J. HOLMES.

Glass, Schneider & Rezner,
Bridge.

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Fig. 1,

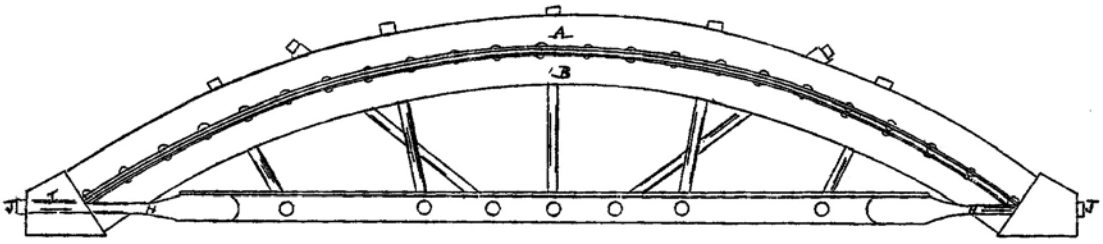


Fig. 2,

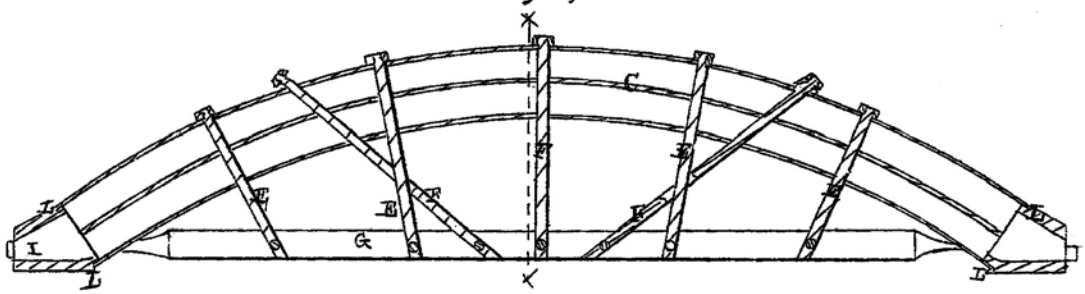


Fig. 3,

Fig. 4,

Fig. 5.

Witnesses;
J. Holmes
Frank S. Alden.

Inventors,
John Glass
William B. Rezner
Geo. P. Schneider

UNITED STATES PATENT OFFICE.

WILLIAM B. REZNER, OF CLEVELAND, OHIO.

IMPROVEMENT IN ARCH-BRIDGES.

Specification forming part of Letters Patent No. 128,509, dated July 2, 1872.

SPECIFICATION.

To all whom it may concern:

Be it known that I, WILLIAM B. REZNER, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Arch-Bridges; and I do hereby declare that the following is a full, clear, and complete description thereof, reference being had to the accompanying drawing making part of the same.

Figure 1 is a side view of a section of the arch of a bridge. Fig. 2 is an end view. Fig. 3 is a plan view. Fig. 4 is a detached section.

Like letters of reference refer to like parts in the several views.

The nature of this invention relates to a bridge of an arch character; and the object thereof is to provide said arch with a skew-back, against which the ends of the arch shall abut, and which skew-back, or the plane of the abutment face thereof, shall be at all times at a right angle or square to the projected line or curve of the arch resting thereon, thereby securing a ready adjustment of the two antagonizing surfaces, viz., the ends of the arch and the face of the skew-back, whereon is received the thrust of the arch against a firm opposing face at a proper angle to bring all its parts in equal compression.

Of the above said invention the following is a more full and complete description.

In Fig. 1, A represents one end of an arch of a bridge. Said arch is of a tubular character, and is constructed of iron, and of which B are the chords. The skew-back referred to consists in part of an iron plate, C, commensurate to the size of the arch. The under side of said plate is a flat surface in order that it may lie upon the abutment or stone-work of the bridge, whereas the upper side of the plate thickens toward the middle into two parallel ridges, forming a concave, D, between them, as shown in the detached view, Fig. 4. In the middle of said concave is formed a recess or groove, E, the purpose of which will presently be shown. The companion part of the skew-back consists of a triangular-shaped block or piece, F, Fig. 1, having a convex under surface of a curvature corresponding to the concave of the plate C, and in which it rests, as shown in said Fig. 1, longitudinally; and midway the under surface of the block is formed a boss or wide rib, *a*, Fig. 2, corresponding in size and character to fit closely in the groove E of the plate C; the purpose of which rib and groove is to prevent lateral displacement of the two sections comprising the skew-back. The plane of the face G of the block F, which is the skew-back proper, slants back at any required angle with the under side or convex surface *b* of the block, but which is, however, at all times at right angle to the axial or arch line *x x* of the arch; hence, the ends of the arch have a right angle abutment against the skew-back, and which back is retained in its relation to the arch by a boss or offset formed on the face G and projected into the end of the arch.

The special advantages of a skew-back constructed substantially as above described are, that the plane of the resisting surface or face G of the skew-back is always at right angle to or square with the projection of an arch of any desired curvature, which, as aforesaid, provides for an easy and ready adjustment of the two antagonizing surfaces, viz., that of the face G of the block F resisting the thrust of the arch against it, and which resistance is always in a right line to the thrust, though the curve of the arch may vary more or less. Therefore an adjustable but firmly-opposing face at a proper angle is presented to the arch in order to bring all its parts in equal compression upon the face G of the skew-back. This skew-back also adapts itself to any inequality that may exist in the masonry, and in the event of the settling of the stone-work it prevents undue strain being exerted upon the structure by said event. It also prevents the elastic motion that often exists in iron-bridge structures from being transmitted to the masonry of the abutments, and which motion produces that vertical vibratory movement upon the stone-work so frequent in solid shoe-blocks, thereby working loose the stones and thus damaging the masonry.

By the use of a skew-back constructed as above described, one pattern or skew-back can be applied to arches of different curvatures, as the face of the block will adjust itself to the line of the arch curve in consequence of the freedom of the block to turn in the concavity

of the plate; hence, as before said, the plane of the face of the block will at all times be square to or at right angle with the arch-line or line of pressure.

Claims.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The head or block F having a convex under surface, *b*, plate C provided with a corresponding concave, D, for the reception of the convex surface *b*, arranged to operate conjointly, in combination with an arch, A, substantially in the manner as and for the purpose set forth.

2. The rib *a* of the block F as arranged in relation to and in combination with the groove E of the plate C, substantially as and for the purpose specified.

WILLIAM B. REZNER.

Witnesses:
W. H. BURRIDGE,
G. E. FRYETT.

W. B. REZNER.

Improvement in Arch-Bridges.

No. 128,509. Patented July 2, 1872.

Fig. 1.

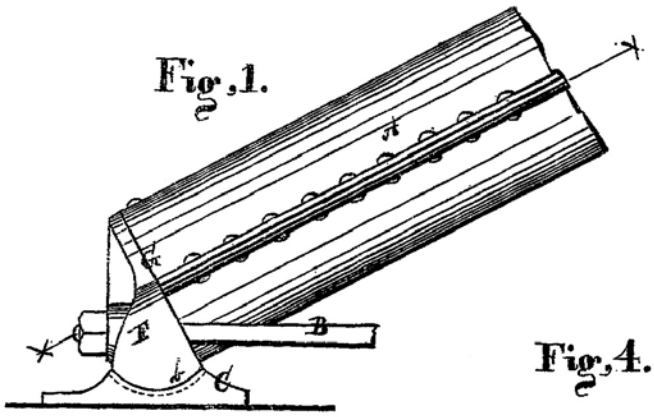


Fig. 4.

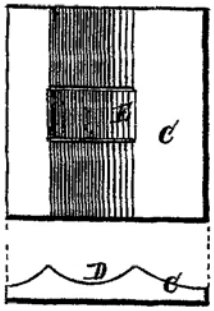


Fig. 2.

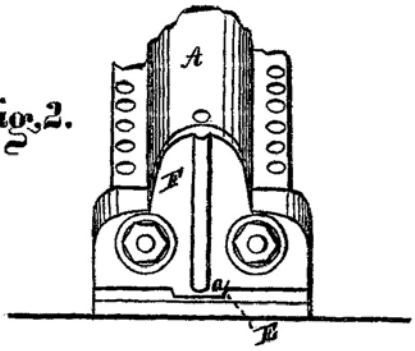
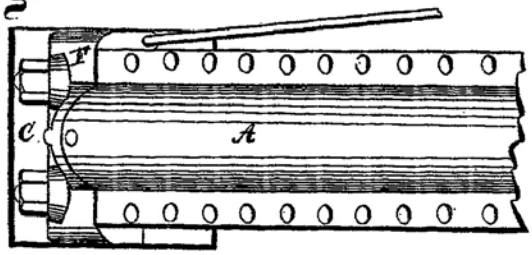


Fig. 3.



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