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Mead Avenue Bridge, 1871, 1911
Spanning French Creek on Mead Avenue
Meadville
Crawford County
Pennsylvania

HAER PA-19

Meadville,
17.569760.4609690

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PHOTOGRAPHS

Historic American Engineering Record
Heritage Conservation and Recreation Service
Department of the Interior
Washington, D.C. 20243

ADDENDUM TO
MEAD AVENUE BRIDGE
Pennsylvania Historic Bridges Recording Project - II
Spanning French Creek at Mead Ave.
Meadville
Crawford County
Pennsylvania

HAER No. PA-19

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Jet Lowe, photographer, summer 1999.

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HISTORIC AMERICAN ENGINEERING RECORD

ADDENDUM TO
MEAD AVENUE BRIDGE

HAER No. PA-19

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This report supplements photographs previously transmitted to the Library of Congress.

Location: Spanning French Creek at Mead Ave., Meadville, Crawford County, Pennsylvania.

USGS Quadrangle: Meadville, Pennsylvania (7.5-minute series, 1973).

UTM Coordinates: 17/569770/4609690

Dates of Construction: 1871-72 and 1912.

Designer: Unknown.

Fabricator / Builder: Penn Bridge Works, 1871-72; Rodgers Brothers Co. (Albion, Pennsylvania), 1912.

Present Owner: Crawford County.

Present Use: Vehicular bridge.

Significance: Mead Avenue, formerly Dock Street, bears the unusual distinction of having two bridges on the same site at one time. Grafted to the original double-intersection Whipple truss built by Penn Bridge Works, external Baltimore trusses help this 1872 structure carry modern traffic loads. This compromise, born of economizing impulse and public turmoil, has allowed the bridge a longer life than might otherwise have been possible.

Historian: Ben A. Shackelford, August 1998.

Project Description: The Pennsylvania Historic Bridges Recording Project II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and

State Historic Preservation Officer. The fieldwork, measured drawings, historical reports and photographs were prepared under the direction of Eric DeLony, Chief of HAER.

Bridging French Creek

Several bridges have spanned French Creek directly west of Meadville. In 1814, a prominent local citizen funded construction of a covered bridge over the French Creek.¹ The covered bridge, built by a Dr. Kennedy, stood where Mercer Street now crosses French Creek into Meadville, and was the first bridge to serve the blossoming town.

In 1828 a second covered bridge was built upstream from Kennedy's bridge.² The Dock Street Bridge served the northern section of Meadville, linking its industrial and commercial heart with residential sections on the west bank. Just north of Dock Street, on the eastern side of French Creek, stood the Meadville roundhouse and maintenance shops of the Erie Railroad. Immediately south of Dock Street, the light manufacturing and industrial area of Meadville along the French Creek feeder canal helped, as did railroads, build the diverse if modest economy of Meadville.

By the second half of the nineteenth century, Meadville had grown into a bustling center of commerce. Canals and later, to a larger extent, railroads moved in to take advantage of traditional crossroads running through Meadville since pre-colonial times. Railways spread in all directions: north to Erie, west through Conneaut Lake, southward through Franklin, and east toward Oil City. In addition to Erie Railroad maintenance shops, Meadville was also a commercial town. The seat of prestigious Allegheny College and Crawford County government, Meadville fulfilled the role of a well-rounded urban hub within the surrounding rugged natural wealth of northwestern Pennsylvania.³

Following floods in 1869, Crawford County scrambled to rebuild many bridges lost when French Creek and its branches swelled beyond their banks, carrying numerous structures downstream. County commissioners' minutes depict an extremely busy year with bridge replacements in at least nine places throughout French Creek valley.⁴ The county commissioners were thus not strangers to the need to find a suitable replacement structure for the bridge at the end of Dock Street in Meadville. The covered bridge, although spared by the raging waters of 1869, had been sufficiently dilapidated by the floods and years of use to warrant replacement

¹ John Earle Reynolds, *In French Creek Valley* (Meadville, Pa.: Meadville Tribune Press, 1938), 96.

² Reynolds, *In French Creek Valley*, 114.

³ Helene Smith and George Swetnam, *A Guidebook to Western Pennsylvania* (Pittsburgh: Univ. of Pittsburgh Press, 1991), 149-50.

⁴ Crawford County, Pennsylvania, Commissioners' Minutes 1862-1870, Crawford County Historical Society, Meadville, Pa.

beginning with removal of the old bridge in the summer of 1871. As the *Meadville Daily Republican* reported:

If any one will take the trouble to examine this old nuisance, which is now to be replaced by a substantial iron bridge, they will wonder what could have held the rotten old thing up so long. Many of the sleepers that are now being taken down crumble to pieces of their own weight.... It is gratifying to know that the dangerous old tunnel is now among the things that were. And it surely will afford the citizens of the west side relief to know that they will soon be able to cross a neat and durable bridge, without expecting to meet at every post a cocked revolver, backed by some burly ruffian, or being in mortal terror, expecting to go through some trap door to the stream below. The commissioners will receive the thanks of many thousands who arrive and leave the city by that thoroughfare.⁵

The local paper's editor asserted that a new bridge was an important step in the continued health and prosperity of Meadville.

Despite such bubbling panegyric in the local newspaper, other comments echoed widespread notions of public pride. Meadville, sister city to Titusville, seat of the oil boom, was separated by hills from the filth, bustle, and profit of the oil fields and refineries, and cultivated a more genteel image. As a commercial center, the region around French Creek benefitted somewhat from the prosperity of oil and lumber, but light manufacturing, education, and government mainly comprised the basis of the Meadville economy. The maintenance shops of the Erie Railroad and the Spirella works, fabricators of ladies' supportive undergarments, constituted the larger manufacturing entities in town, while numerous machine shops, foundries, tanneries, and wood processing mills also occupied the industrial district. To round out an image of balance and propriety, the city hosted Crawford County government offices and county judicial chambers and Allegheny College. Meadville was, in contrast to the booming oil region of east Crawford County, a well-rounded, modest metropolis. Clearly such a place deserved no less than a safe, modern bridge.

The journalistic diatribe also revealed an unusual argument for the bridge's replacement. The assertion that public safety was at risk because of a structure's dilapidated condition seems reasonable. Fairy tales and folklore have long presented the bridge as a setting of potential danger and violence.⁶ However, the assertion that brigands would be exposed and thus ineffective on a bridge composed of open truss work seems a novel argument in favor of iron truss bridges. This assertion imbues the relatively recent technology of iron truss bridges with

⁵ "Dock St. Bridge," *Meadville Daily Republican*, 20 Jul. 1871.

⁶ The idea of danger on a bridge seems a recurrent theme in Western thought. Examples of the vulnerability of individuals on a narrow passage with limited chance of escape abound in literature, for example, *Three Billy Goats' Gruff*, *The Iliad*, *Dante's Inferno*, etc. It is informative and interesting to find this theme echoed in a journalistic medium near the end of the nineteenth century.

yet another dimension of improvement over preceding forms. Beyond being portable, inexpensive, and quick to assemble, iron bridges offered patrons an increased degree of safety from robbery and attack.

Prevailing interest in civic improvements resonated throughout reports in the 1871 *Meadville Daily Republican*. A new market complex, under construction during the summer and fall, revealed local interest in both civic improvement and commerce.⁷ In late fall, civic authorities began discussion of an avenue project, a means of developing a more aesthetically sophisticated and hygienic downtown area.⁸ Civic improvement and beautification were apparently issues dear to the people of Meadville as well. To fund the market house, the bridge, and other civic improvements, the citizens passed referenda allowing the local government to operate at a deficit.⁹

Construction

Following the removal of the original Dock Street covered bridge, construction of the iron bridge began in November 1871. Construction during a wet fall in northwest Pennsylvania presented difficulties. An article dated 17 November, reported that "A portion of the Dock Street bridge fell into the river yesterday, occasioned by the high water breaking loose a pontoon, which swung around and knocked out a part of the temporary trestle work." Fortunately for the citizens of Meadville and the Penn Bridge Company, this setback caused only minor damage. In addition to being flexible in application, iron truss bridges were crafted of durable components, pieces well suited to the frequently unpredictable nature of bridge erection. Further, the article gave the impression that the fallen pieces would be fished out of French Creek and construction resumed in short order, commenting, "The iron is nearly all on the ground and a few weeks more will give the people of the western townships what has long been needed, a safe, substantial bridge."¹⁰

As it turns out, several more than "a few weeks" were required to complete the bridge. Possibly because of damage and delays resulting from the collapse of the falsework, or because of the brutal cold that struck early that winter, the bridge would not be completed until early 1872.¹¹

⁷ "Local and Miscellaneous," *Meadville Daily Republican*, 2 Oct. 1871; "Market House Finally Open," *Meadville Daily Republican*, 31 Oct. 1871.

⁸ "Avenue Project," *Meadville Daily Republican*, 16 Nov. 1871.

⁹ *Meadville Daily Republican*, "Market House Finally Opened."

¹⁰ "Dock Street Bridge," *Meadville Daily Republican*, 17 Nov. 1871.

¹¹ On 21 December the thermometer at the office of the *Daily Republican* plunged to eighteen degrees below zero. See "Local News," *Meadville Daily Republican*, 29 Dec. 1871.

Though the first span was in place by 27 November, the bridge was not passable until 29 December and not fully painted and considered complete until 18 January 1872.¹² Of the new structure the *Daily Republican* reported, "It is one of the handsomest as well as best bridges in the country. It reflects credit on the builders, and will be a lasting monument to the foresight of the County Commissioners." The newspaper article exuded pride in place and progress. It reflects, even in hyperbole, the sense of civic achievement that helped drive projects such as the new Dock Street iron bridge to completion.

Construction of Wooden Supports

The Northwestern Pennsylvania Trolley Company introduced an excursion railroad to the nearby Conneaut Lake resort in 1907, which crossed the Mead Avenue Bridge. Shortly thereafter, the bridge was condemned as unsafe until further supports were installed. Tracks laid across the spans carried trolley loads of holiday-bound citizens and a few "package cars" (presumably light freight) westward to take advantage of the amusement parks and fine bathing at the water's edge. To permit passenger-loaded trains to cross over a truss designed for wagon traffic, wooden supports were built under the bridge at the midpoint of each span. Unfortunately, the buttressed spans would not safely carry the increased loads of light rail freight. In addition, the temporary piers had to be removed each winter before the ice came in, only to be replaced following the heavy rains of spring.¹³ With these measures, seasonal traffic at least could be spared the transfer across the bridge.

In 1911, the Northwestern Pennsylvania Trolley Company again reinforced the Mead Avenue Bridge with significant buttressing. The nuisance of installing and removing these supplemental supports, and subsequent revenue loss due to manual transfer of freight across the bridge during winter, led the company to agree to split the cost of building a new bridge with the Crawford County commissioners.¹⁴ On 10 June 1911, the commissioners ventured to Toledo, Ohio, to inspect concrete bridges in use there in order to discern if a concrete bridge would be suitable for replacement of the iron bridge carrying Mead Avenue over French Creek.¹⁵ County Civil Engineer W. T. Dutton returned with two other members of the bridge committee, all three

¹² "Local and Miscellaneous," *Meadville Daily Republican*, 27 Nov. 1871.

¹³ "To Use The Mead Avenue Bridge," *The Meadville Tribune-Republican*, 8 May 1911; Bronson B. Luty, *The Lake As It Was: An Informal History of Conneaut Lake* (Meadville, Pa.: Crawford County Historical Society, 1994), 58.

¹⁴ "Commissioners Favor Concrete Bridge on Mead Avenue and Are Waiting on Traction Company," *Meadville Tribune-Republican*, 14 Jun. 1911; "Traction Company and Commissioners Getting Together on the Mead Avenue Bridge Proposition," *Meadville Tribune-Republican*, 21 Jun. 1911; "Commissioners and Traction Company Agree on Concrete Bridge," *Meadville Tribune-Republican*, 23 Jun. 1911.

¹⁵ "County Commissioners Visit Toledo to Inspect Bridges and Secure Needed Information," *Meadville Tribune-Republican*, 10 Jun. 1911.

convinced that the new and versatile material of reinforced concrete offered the most modern, economical, and aesthetically pleasing possibility for the new Mead Avenue Bridge.¹⁶

Among the many attractions offered by reinforced concrete, initial cost estimates fell below that of a new steel truss. A concrete bridge would cost around \$21,500, whereas steel bridge prices ranged between \$25,000 and \$35,000.¹⁷ Furthermore, reinforced concrete, it was thought, would last at least 100 years and, unlike a steel truss, would require no maintenance. In light of these factors, the commissioners decided that a new three-span reinforced concrete arch bridge made the best economic sense. Sold on the prospects of putting a new concrete bridge across French Creek, the commissioners submitted a proposal for solicitation of bids to the traction company, which was to share the financial burden of construction. The Northwestern Pennsylvania Trolley Company approved the construction estimates, perceiving the benefits associated with multiple concrete arches.¹⁸ Plans were made to solicit bids immediately so that the bridge might be finished to accept trolley traffic that winter.

On the very day the concrete bridge proposal was introduced to the trolley company, a county commissioner named Benner was en route to Cleveland to see the world's longest concrete arch span.¹⁹ Concern about mid-creek piers obstructing the flow of ice and causing winter floods gained form and followers. Besides matters of engineering feasibility, safety and cost, boosters cited the civic prestige to be garnered from a single arch constructed of modern reinforced concrete.

Nonetheless, the bridge remained unbuilt because competing interests could never quite agree on what the bridge should be. The commissioners, viewing the bridge as a public work which had to be funded from never-too-full government coffers, wanted to take advantage of the trolley company's largesse. A similarly pragmatic, though more self-interested, view was held by the trolley company. Representing capitalists working to develop a small interurban line in a state already heavily served by railroads, they wanted an inexpensive, permanent, and reasonably priced solution to winter transport problems. Further, they wanted the solution in place for that winter's business. At the other end of the spectrum, the Meadville Chamber of Commerce, and the citizens it represented, couched its arguments in terms of safety, although actually concerned with aesthetics. City leaders wanted a civic symbol in keeping within the community's status and position. Ultimately the three sides, with differing perspectives about funding, need, and place, though discussing the same bridge, talked past each other.

¹⁶ "Traction Company and Commissioners Getting Together on the Mead Avenue Bridge Proposition," *Meadville Tribune-Republican*, 21 Jun. 1911.

¹⁷ "Traction Company and Commissioners Getting Together"; "Some Interesting Data About County Bridges that Span French Creek, Millers to Cochranon," *Meadville Tribune-Republican*, 7 Jul. 1911.

¹⁸ "Meadville Business Interests Will Contest Proposition for Short-Span Bridge in Mead Ave." *Meadville Tribune-Republican*, 24 Jun. 1911.

¹⁹ *Meadville Tribune-Republican*, "Commissioners Favor Concrete Bridge."

Early in the debate, the *Meadville Tribune-Republican* reported on a formal agreement which was reached on Thursday between the County Commissioners and the Northwestern Pennsylvania Railroad Company, it was announced at the Commissioners's office as practically assured that the new bridge to be erected in Mead Avenue across French Creek will be a concrete structure, though it is possible that a petition signed by representative business men of the City may result in changing the plan of the bridge to a single span structure.²⁰

The cost of construction would be divided among the traction company, the Northwestern Pennsylvania Railroad Company, and Crawford County, and would begin in a few weeks. Clearly the commissioners wanted a quick, cheap bridge. Likely, they wanted to take advantage of the trolley company's generous cost-sharing offer, get the issue behind them, and move on to matters elsewhere in the county. The trolley company seemed anxious to end the expense of yearly installation of temporary supports and lost revenue from seasonal use of the existing bridge. Despite these considerations, prominent citizens, indeed much of the business community of Meadville, was interested in building a single-span structure of impressive modern design and presence.

When the petition failed to produce the desired results, battle lines sharpened. On 24 June 1911, after the county commissioners and the trolley company had agreed to solicit bids for a three-span concrete bridge, a committee of prominent citizens representing the Meadville Chamber of Commerce pushed for a single-span bridge before the county commissioners, amid rumors they would secure a court injunction halting letting of bids until a single span could be decided upon.²¹ Even the Erie Railroad Company supported the growing lobby in favor of a single-span arch. Newspapers reported how the growing group of interested boosters were frustrated by the unwillingness of the county commissioners to spend the "few thousand extra dollars" for a single-span bridge in the county seat. If the expense could not be justified for the prestige of the structure, then surely a single span was warranted as a safeguard against flooding.

Among frequent and generous allusions to the aesthetic and progressive connotations of a single-span structure, safety was a frequently cited concern. The leading citizens of Meadville were interested in keeping French Creek free from the ice gorges and floods "caused" by mid-creek bridge piers. Even when the county commissioners moved toward appeasement by suggesting one pier instead of two, concerned citizens protested that a concrete bridge with even one pier would "be a constant menace" to the area around it.²² Little mention was made of the

²⁰ "Commissioners and Traction Company Agree on a Concrete Bridge, Each Bearing Half the Cost," *Meadville Tribune-Republican*, 23 Jun. 1911.

²¹ *Meadville Tribune-Republican*, "Meadville Business Interests Will Contest Proposition."

²² *Meadville Tribune-Republican*, "Meadville Business Interests Will Contest Proposition."

performance of the existing stone pier supporting the trusses of the 1872 iron bridge, and less still was said about the actual frequency of ice flow build-up at that location. Instead, citizens noted that Meadville contributed one-sixth of the county budget but cost the county little in the past quarter-century. The Chamber of Commerce demanded nothing less than a single span of at least 200 feet. Arguments for a single span's greater safety, however unfounded, justified the Meadville citizens' desire for the prestige of an impressive, single-span reinforced concrete bridge.

In the turmoil, the issue was broken down, at least in the newspaper, as a conflict between the Chamber of Commerce and the county commissioners. The interest of the Northwestern Pennsylvania Trolley Company was lost in the fracas. In retrospect, consideration of the single-span bridge the boosters were arguing for, especially regarding the Erie Railroad's input, versus those private interests who were willing to fund half of the bridge, is warranted. A single-span arch, 200'-0" long and shallow enough to be used on Mead Avenue, would have been prohibitively expensive. An arch strong enough to support an excursion train of trolley cars, yet shallow enough to vault over French Creek from an approach beginning only 14'-0" above water and ending 200'-0" opposite onto a hillside, would be as much a reinforced concrete beam as an arch. Building a span of sufficient elevation to take advantage of the load-distributing qualities of a true arch form would require massive approaches. Undoubtedly a single span would cost more than the original multiple-span proposal.

Second, the trolley company was in a small way competing with the Erie Railroad. The package freight car attached to the excursion trolleys carried light freight westward to Conneaut Lake and stops along the way. The Erie Railroad's support of a single-span bridge, the design of which for trolley loads would have been difficult, was likely an effort to curtail local competition.²³

Finally, the county commissioners were likely unwilling to dismiss the generosity of the traction company in favor of the prideful pleas of the Chamber of Commerce. The bridge over French Creek had been condemned four years previously only because the traction company had begun use of the span. The Northwestern Pennsylvania Trolley Company had been unable to contribute to an improved structure before 1911, and the commissioners seemed unwilling to let the offer pass.

The pragmatic stubbornness of the County Commissioners, the interests of the traction company, and the local boosterism sent the issue to court. Following testimony from the Crawford County civil engineer and Erie Railroad bridge engineers, each of whom outlined the disastrous flooding that would result from piers in the waterway of French Creek, the Chamber of Commerce seemed confident that its arguments would sway the county commissioners.²⁴

²³ "Erie Railroad Company Pledges Co-operation with Meadville To Secure Single Span Bridge," *Meadville Tribune-Republican*, 26 Jun. 1911.

²⁴ "Mead Avenue Bridge Question Still Wide Open and Likely to Go Into Court for Settlement," *Meadville Tribune-Republican*, 1 Jul. 1911; "Commissioners Close Contract," *Meadville Tribune-Republican*, 7 Jul. 1911.

They felt that when the flooding matter had been brought to light, especially with the Erie Railroad's demonstration of interest in this hazard, the issue would quickly be resolved with a single span.

To counter the opinions related on behalf of the Chamber of Commerce, the defense called upon the engineer whose two-pier bid had been accepted, the renowned Daniel B. Luten. Refuting the assertions of the county and railroad engineers, Luten confessed that he stood to gain 10 percent of the funds spent for any bridge using his patents, giving him a clear interest in the successful adoption of his plans. With his years of experience as a bridge builder, he was certain that two piers across French Creek posed no flood danger. Confident and assured, Luten convinced the court that his plans were sound.²⁵ Judge Prather, the man deciding the issue, ruled that without demonstrable safety concerns, the City Chamber of Commerce could not legally demand continuance of a court injunction to forestall construction.²⁶ The idea of a multiple-span concrete arch could go forward.

Concrete bridge advocates did not enjoy victory for long. An article on the front page of the next day's newspaper questioned the very idea of a concrete bridge. A concrete bridge in Jamestown, New York, was cracking. The article further commented, "This bridge was erected over the Chautauqua Lake outlet and has piers in the stream. Erie railroad men who have seen it say it is very much like the bridge that it is proposed to build in Mead Avenue, and that it was used only a very short time before it had to be closed."²⁷

Once defeated on the concrete bridge idea, the civic boosters sought to delay construction, possibly until county commissioner elections early the following year. Business interests believed that if a new bridge were to be built economically, then it should be of steel. They concluded that the county engineer, one Professor Dutton, could provide plans for a steel bridge for \$50 or \$100, rather than 10 percent of construction cost as required by Luten. Better to spend less money and have it stay "at home" than line the pockets of an expert from outside, they argued. The gathering of Meadville business men further criticized the decision of the county commissioners regarding the structure's economy. They pointed out that a two-pier steel bridge would cost the least and provide greater vertical stream clearance.²⁸ Moreover, Meadville suffered more from flooding from the city-owned mill race than from French Creek, as proved by the flood of 15 September 1911. French Creek, rather than inundating the town, remained well

²⁵ "Engineer Luten a Good Witness Though Admitting a Personal Interest in Concrete Bridge," *Meadville Tribune-Republican*, 13 Jul. 1911. Luten also failed to mention that his estimate had been for bridge work above water and his patented design required extensive reinforcement beneath the water. No doubt the \$21,300 estimate he gave was indeed much lower than the actual cost.

²⁶ "Mead Ave. Decision In Full," *Meadville Tribune-Republican*, 25 Jul. 1911.

²⁷ "Jamestown's Trouble With Concrete Bridge," *Meadville Tribune-Republican*, 26 Jul. 1911.

²⁸ "Business Men Discuss Mead Ave. Bridge Matter and Bring Out Two Quite Interesting Facts," *Meadville Tribune-Republican*, 28 Jul. 1911.

below flood stage while the smaller mill race running through town caused an estimated \$50,000 in damage.²⁹ Fears of flooding from French Creek as a result of bridge piers were therefore unjustified.

Eager to save money, county commissioners finally adopted an option proposed by John Dick, the president of the committee of city business men. "So far as economy is concerned," Dick reported, "I have been informed that the present bridge, for the expenditure of a few thousand dollars, could be strengthened so that it would carry the load of the Traction Company." Commissioners adopted his suggestion for an easy way to rebuild a bridge, save money, use only one pier, and complete construction by winter, even with the delays caused by court trials.³⁰

Enlivened by the prospect of improving the current structure at a cost amounting to less than 10 percent of the cost of a new structure, the commissioners and the traction company began work immediately. Bids for the reinforcement work were accepted on 8 December, reported to the public the next day, and the contract signed by 20 December.³¹ The Rodgers Brothers Company of Albion, Pennsylvania, secured a contract to fabricate and attach two reinforcing trusses for \$2350 and complete other repairs to the bridge on a cost-plus basis. The entire job was worth an estimated \$3000 and was to be finished by 26 January 1912.³² Expenses were to be split by the Northwest Pennsylvania Trolley Company and Crawford County.

Rodgers Brothers began work on the additional trusses on 15 January and completed the work within the week. Seemingly in shock from the speed with which hopes for a new, single-span concrete bridge were obliterated, a small column in the *Meadville Tribune-Republican* noted that "the letting this contract was on of the last acts of the old Board of County Commissioners and it was with surprise that the general public heard of the act."³³ Meant to last but ten years more in its strengthened form, the Mead Avenue bridge remains today as it was finished in the winter of 1912.

Description

Two double-intersection Whipple through trusses fabricated in 1872 inside two Baltimore through trusses dating from 1912 carry Mead Avenue across French Creek. A central pier of unfinished cut ashlar masonry stands halfway, supporting the spans in the center of the stream.

²⁹ "Meadville Not Alone In Flood," and "Citizens Get Into Action On Freshet Problem and This Time Are Determined to do Business," *Meadville Tribune-Republican*, 16 Sep. 1911.

³⁰ "Letters From The People: The Meadville Side of the Mead Avenue Bridge Matter," *Meadville Tribune-Republican*, 10 Aug. 1911.

³¹ "Bridge Contract Signed," *Meadville Tribune-Republican*, 20 Dec. 1911.

³² *Meadville Tribune-Republican*, "Bridge Contract Signed."

³³ "Strengthening of Mead Ave. Bridge," *Meadville Tribune-Republican*, 17 Jan. 1912.

Each of the 1872 trusses is composed of fourteen panels with vertical end posts. The end posts are riveted together from four elements approximately 3/8" thick, rolled into a section approximating a wide "W," with flanges projecting radially at 90 degrees. These columns are the same general shape and thickness in section as the other verticals, resembling an octagon with two riveted flanges radiating from the center of every other facet. Wrought iron for columns and other vertical elements on the bridge was rolled at the Union Iron Mills in Pittsburgh. The end posts are the largest of the octagonal vertical elements, which are similar in section throughout the structure. The column portion of the post is 9" in diameter with an overall flange width of 11-1/2". At its base, the column fits into a cast socket corresponding to its flanged octagonal sectional shape. Radiating downward from the cast finials atop each end post, two diagonals attach to the lower end of the next two vertical elements further along the truss. This double diagonal service of the end column sets up a system of overlapping diagonal members carried throughout the truss.

Inward from the end posts, intermediate vertical columns fabricated from the same "W"-shaped rolled elements carry compressive loads. These columns are key to the diagonal bracing of the double-intersection Whipple truss. For the intermediate columns, rivets hold spacers between the flanges, creating an element with slots running between the flanges for their entire length. These slotted hollow columns are riveted onto bosses cast onto receivers. These bosses are the same thickness as the slot spacers between the flanges forming each column. A vertical slot running the entire length of the element is thus formed by the integral spacers of the receiver and spacers riveted between flanges throughout the column.

On the underside of the casting that receives the slotted intermediate verticals, four cast saddle webs rest on connection pins. These pins, which run transversely under the casting, link the lower chord at each panel point. U-bolt hangers running over the pins trap these solid lower chord eye-bars, clamping them between the floor beams and the connecting pin. To accommodate greater tension loading, the bars of the lower chord increase in number and cross-sectional area toward mid-span.

Suspended under the pin connections, floor beams traverse the bridge at each panel. Inside each truss, six 12-1/4" by 6-1/2" I-section stringers rest atop fifteen 15-3/4" x 5-1/4" I-section floor beams. Originally the stringers were capped with wood planking that supported a wood block wearing surface.³⁴ Today, the floor decking consists of an open steel grid with channel-section curbs mounted on welded tabs approximately 3" inward from the truss system. Cantilevered on either side of the truss, two wooden sidewalks and hand rails also rest atop the floor beams. The sidewalks rest atop wooden 2" x 10" stringers. Panels between hand rail posts rising up from each floor beam are filled with decorative diagonal double lacing.

To sustain compressive loading, the upper chord is a box-section beam, fabricated from channels, plate, and lacing. Eight-inch channels with a 2-1/4" flange are arranged back-to-back and spaced apart by a 12"-wide strip of 1/4" plate riveted atop the box. Riveted diagonal lacing

³⁴ Field notes, Karl A. Miller Papers, Crawford County Historical Society, Meadville, Pa.

forms the underside of the box. At the same elevation but perpendicular to the top chord beams, transverse struts cross the structure from the top of each intermediate vertical. These struts are formed of four angles riveted back-to-back into an element that tapers to apogee over the centerline of the roadway.

At the portal end of each truss, the top chord fits into reciprocal sockets cast into a flared finial similarly socketed atop the end post. One-panel-long beams form the top chord fitting into cast junction blocks riveted atop each intermediate vertical. These junctions also hold the intermediate vertical members, diagonal panel stiffeners, upper chord lateral stiffening diagonals and upper chord spacing struts. Effective consolidation of such a variety of components requires that the thirteen junction castings have a rather elaborate form. To attach the intermediate verticals, bosses projecting downward are riveted between spaced flanges. Similar bosses, projecting horizontally toward the center of the roadway, hold the outer rivets of the transverse struts. Blocks protruding from the junction casting at the same elevation but perpendicular to the strut boss receive the box-section upper chord elements. Atop the casting, provisions are made to attach lateral bracing in the upper chord plane and the larger diagonals of the vertical trusses. Two bosses on the outer edge of the junction casting receive the lateral diagonal bracing rods, 3/4" diameter, whose threaded ends are retained by nuts. Nuts also hold the threaded ends of the vertical truss diagonals, which are rectangular in section with round threaded ends. These ends thread through beveled receiving bosses cast onto the junction block to accept the diagonals' 45-degree inclination.

Beneath the sophisticated junction castings, the intermediate columns form the compression elements of the truss proper. These intermediate vertical elements, having an open octagonal section with vertical slots, allow one diagonal tension bar to pass through the slot while the countervailing diagonal elements, consisting of two bars, pass outside the same column. Connected to the top of every intermediate vertical member, the diagonals bisect adjacent compression elements, passing through or around them on the way to connecting to the bottom of the vertical member comprising the far side of the next panel. Because diagonals issue from each vertical, and attach two verticals further down the structure, the diagonal bracing overlaps to form a double-intersection truss. This rather elaborate double diagonal lacing efficiently distributes load throughout the truss, creating a very strong, if somewhat elaborate, bridge. The two sets of diagonals form redundant load paths, by which the structure could carry loads even if certain members failed.

Together, the two Whipple double-intersection trusses form a bridge 268'-5-1/2" feet long carrying a roadway 19'-0" wide, and two cantilevered sidewalks that are each 6'-9" in width. When new, it was locally touted as an impressive structure without peer.³⁵ The bridge's ornament was a matter of accentuating rather than disguising the beauty of the truss work. The faceted columns were finished with similarly faceted flaring octagonal finials which are completely functional castings. Complementary portal dressing was effected with cast iron

³⁵ "Bridge Repairing About Completed," *Meadville Tribune-Republican*, 22 Jan. 1912.

tracery of star shapes set in circles arranged to fill the uppermost corners of the portals. Centrally located high above the roadway, a cast plaque bearing across the top of its face the name of the bridge fabricators, "PENN BRIDGE WORKS," and beneath, its agent, "T. B. White & Son, New Brighton PA.," lent an air of authority to the entrance. The portals thus provide a solid contrast to the web-like trusses spanning behind, impressive and solid in their repetition of lines and forms. The bridge is functional and solid as a consequence of complexity, durability, and thoughtful, subtle ornamentation.

The Mead Avenue Bridge continues to span French Creek 125 years after its construction, in part because of careful and economical attention given to reinforcing a structure designed for wagon loads as it was adapted to handle modern vehicular traffic. During 1911, two additional trusses were added by Rodgers Brothers of Albion, Pennsylvania. These Baltimore through trusses strengthened the Mead Avenue bridge to modern capacity. The later truss work is composed of riveted 4" x 4" angles, rolled in the Cambria Steel and Lackawanna Steel works, and attached to the earlier Whipple truss at each panel.

Being a rather spare truss system, the Baltimore trusses completely cocoon the earlier structure without overpowering the original design. Each Baltimore truss consists of a lower chord joined to a shorter upper chord by two inclined end posts. The Baltimore truss form is essentially a subdivided Pratt truss (a truss with evenly spaced vertical elements and diagonal elements inclined outward from the center). These subdivisions consist of additional vertical, horizontal, and half-panel diagonal stiffening elements intersecting at the center of each panel.

Mead Avenue Bridge Today

The newer truss is connected to the earlier structure with threaded rod suspenders clamped around the lower chord of the Baltimore truss and around the original floor beams. Additional stiffening coupons were welded between the upper chord of the Whipple double truss and that of the Baltimore truss. While no doubt helping preserve the older structure, the exterior truss probably also hindered maintenance efforts by obstructing the earlier structure. Persisting in carrying daily traffic, the Mead Avenue Bridge and its reinforcement trusses are testament to the versatility of iron and steel, and the sometimes odd conclusion of public works struggles.

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