

CASTLE GARDEN BRIDGE
(Cameron County Bridge No. 4)
Township Road 343 over Bennetts Branch
of Sinnemahoning Creek
Driftwood Vicinity
Cameron County
Pennsylvania

HAER No. PA-444

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

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Location: Township Road 343 over Bennetts Branch of Sinnemahoning Creek, Driftwood vicinity, Cameron County, Pennsylvania

UTM: 17.73920.4579610
U.S.G.S. Quadrangle: Driftwood, Pennsylvania

Date of Construction: 1901

Engineer: Nelson and Buchanan, Chambersburg, Pennsylvania

Builder: Nelson and Buchanan, Chambersburg, Pennsylvania

Fabricator: Cambria Iron Company, Johnstown, Pennsylvania

Present Owner: Cameron County, Pennsylvania

Present Use: Vehicular bridge

Significance: Castle Garden Bridge is a two-span, pin-connected, metal Pratt through truss bridge 212' in length. Erected by Nelson and Buchanan of Chambersburg, Pennsylvania, in 1901, with some members fabricated by the Cambria Iron Company, the structure is a representative surviving example of a popular truss type built to specifications by bridge companies in the late nineteenth and early twentieth centuries in Pennsylvania and throughout the United States. Relatively inexpensive and easy to manufacture, ship, and erect on site, Pratt metal truss bridges found widespread application on U.S. highways and railroads throughout the last quarter of the nineteenth century and well into the twentieth century.

Project Information:

This documentation was undertaken from May 1994 through October 1994 by P.A.C. Spero & Company for the Pennsylvania Department of Transportation as a mitigation measure prior to removal of the bridge.

P.A.C. Spero and Company
Historic Structures Consultants
Baltimore, Maryland
for the Pennsylvania Department of Transportation (PennDOT)

Located in Cameron County, Pennsylvania, and connecting Driftwood Borough with Gibson Township, the Castle Garden Bridge, also known as Cameron County Bridge No. 4, Bennetts Branch Bridge, and the Old Huntley Bridge, carries Gibson Township Road 343 over the Bennetts Branch of Sinnemahoning Creek. Historical research indicates that the bridge was built in 1901 by the firm of Nelson and Buchanan of Chambersburg, Pennsylvania, with some members fabricated by Cambria Iron Company of Johnstown, Pennsylvania.

Spanning Bennetts Branch in Cameron County, Pennsylvania, Castle Garden Bridge is a two-span Pratt truss 212' in length. The 103.8'-long trusses of each span are spaced 13.0' on centers and consist of six panels. Panel lengths vary from 17.0' to 17.26' and each panel is 17.0' in height, top to bottom chord. The trusses are pin-connected with hexagonal nuts. The top chords and inclined endposts are built-up members consisting of riveted 1'-5/16"-wide channels, 12.0"-wide cover plates, and lacing bars. The verticals consist of 4"-wide channels and lacing bars, and the hip verticals or endposts feature bars with 7/8"-square cross sections. The diagonals consist of 5/8" x 2" cross section bars with die forged ends and the counters consist of 3/4"-square cross section bars with die-forged ends and turnbuckles. The portal bracing consists of riveted angles with lacing bars. Lateral rod bracing connects the top chords. The verticals are embossed with the imprint "Cambria", indicating that they were made by the Cambria Iron Company of Johnstown, Pennsylvania.

The floor system of each span consists of five built-up floor beams with five 15" deep metal I-beam stringers spaced at 2.8' feet, and a bituminous asphalt surface overlaying a 4.5"-thick reinforced concrete deck. Lateral bracing below the deck consists of rods with turnbuckles. The railings consist of pipe rails fixed to simple metal posts. The bridge rests on cut stone masonry abutments with wingwalls and a cut stone masonry central pier with a concrete-encased nose facing upstream. Fixed bearings are located at the pier ends of each span and expansion bearings are located at the abutment ends. The roadway is 10.9' wide carrying a single lane of vehicular traffic and the deck to portal clearance is 13.15'. The lower chord is located 15.5' above the average water level of Bennetts Branch.

Built in 1901 to replace an earlier bridge, the present two-span single-intersection Pratt metal truss at Castle Garden was the last of three bridges built in the same location between 1875 and 1901. The bridge represented the efforts of county officials and the inhabitants of Driftwood Borough and Castle Garden to secure a reliable crossing of Bennetts Branch for use by local pedestrian, wagon and automotive traffic in the early

twentieth century. The Castle Garden Bridge also reflects standard highway bridge engineering practice during the early twentieth century, a period which saw the widespread adoption of the Pratt truss design for rural road and railroad bridges.

Appreciable settlement in Cameron County occurred only after mid-nineteenth century advances in transportation allowed access to the county's rugged interior. Reflecting the area's relatively late settlement, Cameron County was created on March 29, 1860, from parts of Clearfield, Clinton, Elk, McKean and Potter Counties. Following the acquisition of the "New Purchase," a vast area in northwestern Pennsylvania purchased from the Indians by the heirs of William Penn in 1784, the first settlers of the future Cameron County began to arrive in small numbers. The extreme ruggedness of the land and its relative inaccessibility resulted in a modest rate of settlement throughout the first half of the nineteenth century. The arrival of the railroads and the improvement of vehicular roads in the second half of the nineteenth century spurred the development of Cameron County. Increases in the amount of available farmland, as forest tracts were cleared by the mid nineteenth century, also boosted the region's population.

Unlike many eastern Pennsylvania counties, Cameron County did not fully develop large-scale grain processing facilities until the twentieth century. Consequently, small gristmills were the county's primary producers of processed grain through the nineteenth century. The earliest settlers had to transport their wheat to the gristmill at Lock Haven, on the Susquehanna, by pack horse or by boat. By 1818 local gristmills had been constructed at Mix Run on Bennetts Branch and on the Driftwood Branch several miles north of Driftwood, making the farmer's journey to market much easier. Such mills remained in operation through the nineteenth century; a grist mill at Dents Run, just over the county line, was in business until World War I.

The chief industry in Cameron County throughout the nineteenth century was the felling, transport and processing of timber from the region's vast forest tracts. Following the Civil War a significant tanning industry came into being due to the availability of tree bark. Cameron County's economy has also included the quarrying of various types of stone, particularly flagstone, since the nineteenth century. In time, the timber related industries which boosted the development of the county during the nineteenth century began to decline. By the mid-twentieth century, 50.1 % of the county's labor pool were employed in manufacturing, while the remaining half were largely engaged in services and extractive industries. Throughout its history, Cameron County has remained one of the most sparsely populated counties in Pennsylvania. Among totals recorded from 1800 to 1960, the county's peak population, 7,644 persons, was reached in 1910. In 1960, the

total population for the county was 7,586. Between 1820 and 1940 the county's population density, under twenty persons per square mile, remained among the lowest in the state.

As Cameron County developed during the nineteenth century, the need for a reliable system of roads and bridges to facilitate easier movement between population centers became increasingly apparent. The development of Driftwood Borough and Gibson Township from the mid-nineteenth century required the improvement of overland transportation. Connecting the Borough of Driftwood with the Castle Garden area, the Castle Garden Bridge over Bennetts Branch is located in Gibson Township, the southernmost township in Cameron County. Gibson Township is bounded on the north by Lumber Township, on the east by Grove Township, on the south by Clearfield County and on the west by Elk County. The township is watered by Sinnemahoning Creek, a tributary of the Susquehanna River; the Sinnemahoning is formed by the confluence of Bennetts Branch, which flows to the east, and Driftwood Branch, which takes a southerly course. Both Bennetts and Driftwood branches are fed by numerous "runs" or streams, including Dents, Hicks, and Mix runs. Although shallow, Bennetts Branch is subject to spring freshets and floods every fourteen years, on the average. Characteristic of Cameron County as a whole, Gibson Township is mountainous and rugged with narrow valleys following the course of the waterways. The township is heavily forested with pine, hemlock, oak, and other hardwoods. Other natural resources include supplies of coal, pig iron, salt, and some oil and natural gas. Agriculturally, the land is fairly productive, and the soil is underlain mainly by sandstone and shale.

Originally inhabited by the Seneca Indians, Gibson Township was officially surveyed in 1790 by Samuel Maclay, as part of a general survey of the Susquehanna River and Sinnemahoning Creek authorized by the Supreme Executive Council of Pennsylvania. Five years before Maclay's survey Major John Bennett, from nearby Lycoming county, established a farm at Trout Run near the head of the West Branch which was subsequently named Bennetts Branch in his honor. Bennett may also have been the first settler of Driftwood, the first town in Cameron County; he had a second farm near the confluence of Bennetts Branch and Driftwood Branch slightly north of the current town of Driftwood. Also recognized as one of the first inhabitants of the Driftwood area was John Jordan, a hunter, who arrived in 1804 with his five sons. Jordan was soon joined by others more interested in establishing farms and small orchards, but hunting remained an important and lucrative economic activity in Cameron County through the third quarter of the nineteenth century.

Gibson Township was formed in 1817 from part of Lawrence Township, Clearfield County, in response to the increasing numbers of settlers arriving in the area. The township was named for John Bannister Gibson, an attorney and jurist who in 1827 became Chief Justice of the Commonwealth of Pennsylvania. In 1820 the township became part of Clinton County. Originally larger than its present size, Gibson Township lost area when Benezette Township was formed in 1845. Gibson Township became part of newly-formed Cameron County in 1860. Emporium was established in 1810 on Driftwood Branch, north of Driftwood and was chosen as the seat of Cameron County.

Land in the Driftwood area was adequate but not outstanding for agriculture. The flat lands along the creeks were rich but narrow, and the steepness and rockiness of the surrounding hills made them suitable only for hay and pasturage. In the first years of the nineteenth century, the soil of the flat lands produced good crops of corn and wheat, but these crops soon reduced the fertility of the soil. As the quality of the soil degenerated, farmers switched to less intensive crops such as rye, potatoes, and buckwheat.

The earliest settlers cleared the land for agriculture and retained the felled timber for their own use. The first dwellings in the township were small log cabins, which required little dressing of the timber. HOLLOWED-OUT logs were also used by the settlers as canoes on the waterways of the township. As the local need for finished lumber increased, water-powered saw mills began to appear on the runs that flowed into Bennetts and Driftwood branches. In addition to such local use of timber, cut logs and trunks were lashed together and floated down the streams and rivers to market at Susquehanna ports such as Marietta in Lancaster County.

Since its settlement early in the nineteenth century, Gibson Township depended upon roads, waterways, and the railroad for transportation within the township and for commerce with the outside world. The waterways of the township (the Sinnemahoning, Driftwood Branch, and Bennetts Branch), through their connection to the Susquehanna River, provided the chief means of commercial transportation to the outside world during the nineteenth century. The crucial importance of waterborne transportation was acknowledged by the Pennsylvania State Legislature in 1804 when Sinnemahoning Creek was declared a public highway. Although timber was floated down the township's waterways beginning in the early nineteenth century, the commercial importance of the waterways increased dramatically in the 1850s when the timber business was transformed by the construction of the Williamsport timber boom on the Susquehanna River in 1848.

Commercial lumbering became the major business of Gibson Township following the construction of the Williamsport boom. Resting on the river bottom, the boom was an arrangement of log cribs connected by iron couplings. This apparatus was designed to collect floating logs so they could be pulled out and cut into lumber at Williamsport's sawmill. In 1849, the first "saw logs" (short logs) were put into Sinnemahoning Creek, and in 1851 the first logs were placed in Bennetts Branch 1.4 miles downstream from Hick's Run (located along the boundary between Gibson and Benezette Townships).

Though rivers and streams remained important commercial routes, road building alone offered to link the small communities of the area. The topography of Gibson Township offered imposing challenges to the road builder. The steep inclines of the mountain slopes confined early road builders to the relatively narrow flat lands along waterways. The first roads followed paths established by the Seneca Indians. Reading Howell's 1791 map of Pennsylvania revealed that two paths were in use in the township area by that date. Approximately following today's State Route 120, one path proceeded north along the eastern bank of the Sinnemahoning then continued north along the eastern bank of Driftwood Branch. The other path (approximating present County Road 555) proceeded from Driftwood west along the northern bank of Bennetts Branch to its head. These paths were known as "turkey roads" since they were barely wide enough to accommodate a horse with packs (locally called "turkeys") slung over its back. In 1802, the precursor to State Route 120 along the Sinnemahoning and Driftwood Branch was widened by Joseph Ellicott to accommodate wagon traffic travelling to lands of the Holland Land Company, whose holdings included the site that would later become Emporium. The wagon traffic was not as heavy as the land company had hoped and by 1810 the road had to be cleared once again of vegetation.

The Mason Hill Road from the northern bank of Bennetts Branch to Sterling Run (located on Driftwood Branch nine miles north of Driftwood) was also built during the early nineteenth century. The road did not follow the flat lands along the township's waterways, but rather climbed a steep incline up Mason Hill. Township Route 343 currently consisting of Nanny Run Road, Hoover Road, and Lincoln Road led from the south bank of Bennetts Branch up the slope of Trump (alternately Bowes) Hill and followed the ridge line before descending to the village of Lincoln and then on to Benezette in Elk County. This route, which the Castle Garden Bridge would eventually carry, was shown in an 1872 atlas of Pennsylvania; it is likely that the road was constructed during the 1860s, when Driftwood was gaining local prominence due to its newly formed rail connections. Between the publication of the 1872 atlas and an 1880 geological survey of the area, a connecting road (currently a section of Hoover Road) was constructed from Hoover Road to Karthaus Road

(currently Wykoff Road), which led from the town of Sinnemahoning on Sinnemahoning Creek to Karthaus in Clearfield County.

Prior to bridge construction in the township, fords were the most common way to cross waterways. Foot bridges were constructed as an early means to avoid river fords. Often, they took the form of swinging bridges; planks were lashed to two ropes stretching across the stream accompanied by two additional ropes used as handrails. Later in the nineteenth century, as Driftwood became increasingly important commercially, highway bridges across Bennetts Branch and Driftwood Branch were needed. The arrival of the railroads and the consequent demand for reliable routes to and from rail transportation centers was partly responsible for the improvement of vehicular routes and bridges in the area. Currently, the major roads of Gibson Township follow closely the routes already established by the third quarter of the nineteenth century. Roads were widened and upgraded in the first half of the twentieth century to meet the demands of automotive traffic. Such improvements included the paving of the Bennetts Branch Road (County Road 555) during the Depression era.

The arrival of the railroads in the 1860s provided another option, aside from the waterways, for the transportation of timber. Not dependent on water levels, the railroads threatened the livelihood of local jobbers. In response, the Bennetts Branch Improvement Company built the so-called Big Dam in 1871 on Doctor's Rocks, near Benezette. The dam was opened in order to provide a water level sufficient to drive logs downstream even when the level would be naturally low. One "splash," or brief opening of the floodgates, would raise the water level two feet for two hours on the Sinnemahoning, making it possible to transport logs down the creek in virtually any season.

The railroads provided vastly improved access to supplies and markets for the residents of Gibson Township. The Sunbury and Erie Railroad first appeared in Cameron County in 1859; in 1861, the Pennsylvania Railroad took over the line and changed its name to the Philadelphia and Erie. The line was constructed to connect the Northern Central's tracks at Sunbury with Erie, on the shore of Lake Erie. The first train to make the trip passed through Driftwood in 1864. The line was double-tracked to Emporium in 1902. The low grade branch of the Allegheny Valley Railroad, running along Bennetts Branch to Driftwood, began operations in 1874. This railroad was a subsidiary of the Pennsylvania Railroad, joined with the Philadelphia and Erie Railroad at its terminus in Driftwood.

Shortly after the turn of the twentieth century, two logging railroads, the Mix Run Railroad and the Hicks Run Railroad, were established to haul timber from the hills

surrounding Bennetts Branch. These railroads were owned by the Central Pennsylvania Lumber Company, which also built a large saw mill at the mouth of Hicks Run. The production of the saw mills was formidable; in 1906, 47,293,000 board feet of lumber were produced. The Hicks Run Railroad was chartered in 1905 and by means of a bridge joined the Allegheny Valley Railroad on the south bank of Bennetts Branch. Contemporaneous with the establishment of the Hicks Run Railroad, the Goodyear Lumber Company built the Buffalo and Susquehanna Railroad along the northern bank of Bennetts Branch. This line was designed to haul timber to market, but when the timber was logged-out the line was used to haul oil to the Pennsylvania Railroad at Driftwood.

Through the growth of the logging industry and railroads in the nineteenth century, the towns of Gibson Township, as well as those of Cameron County as a whole, reached near-current sizes. Although Driftwood was the earliest settlement in Cameron County, it remained a small village until the late nineteenth century, when the railroads afforded local economic stimulus. The name "Driftwood", which appeared on the 1791 map, fell into disuse in the early nineteenth century and was replaced by "Second Fork". Small industries were established at Second Fork early in the nineteenth century. One of the first was the Lycoming Salt Company, which built salt production facilities in 1810. The company sank a 65-foot-deep well and pumped salt water to the surface; the water was then evaporated, leaving behind salt. Another early nineteenth century industry was a whetstone and grindstone manufacturing shop, located a few miles upstream on Bennetts Branch east of Hicks Run.

Though population figures for Second Fork were subsumed under those of Gibson Township as a whole until 1870, the town was sufficiently important to receive a post office as early as 1828. By 1860 Gibson Township's population had reached 1,236. The arrival of the Philadelphia and Erie railroad at Second Fork in the 1860s dramatically changed the small village. Construction of the railroad brought new businesses to the community in addition to requiring thousands of cross ties, which the local loggers supplied. The railroad workers, many of whom were recent Irish immigrants, were locally housed and fed. New areas of the town were laid out to accommodate new businesses and residents and the original name "Driftwood" was revived. The name of the post office was changed from Second Fork to Driftwood in September 1868 to reflect this development. In 1872 the village of Driftwood became Driftwood Borough, indicating not only an increase of population but also a new civic perception of the community. Two years later, in 1874, the low grade branch of the Allegheny Valley Railroad established its terminus at Driftwood. Further enhancing the regional importance of the town, Driftwood, by 1873, contained the junction of two important railroads, each controlled by the Pennsylvania Railroad.

A serious fire of 1871, caused by sparks from a passing locomotive, devastated the growing business area of Driftwood, but the community evidently recovered quickly. Buildings were rebuilt and new buildings added as the borough continued to grow in the final quarter of the nineteenth century and the first years of the twentieth century. By 1910, the population of Driftwood was 517; it reached an estimated 650 by 1916. At that time Driftwood boasted lumber yards, saw mills, a cannery, an aluminum cooking utensils plant, a newspaper, schools, two churches (Methodist and Roman Catholic), and four stores. The town also had a water system, electricity, and cement sidewalks.

Though Irish immigrants had helped Driftwood achieve prosperity, they were not warmly welcomed by long-time residents. The immigrants were sequestered in two areas as the town's population increased. The first area was "Goosetown", located on bottom land north of Driftwood's center. This community was so named because the immigrants raised geese to furnish meat and feathers for bedding. The other area was Castle Garden, named for the Federal immigration station in New York City. Castle Garden, adjoining the tracks of the Pennsylvania Railroad, is located southwest of Driftwood on the northern bank of Bennetts Branch. Though the borough was careful to include railroad property for taxation purposes when the municipal boundaries were laid out, it was equally careful to exclude Castle Garden from its territory. By the twentieth century, Castle Garden also included the area on the opposite bank of Bennetts Branch.

As Driftwood Borough and Castle Garden expanded during the second half of the nineteenth century, the inadequacies of the Bennetts Branch ford were increasingly apparent. Between 1875 and 1901, three bridges were built over the branch in the vicinity of Castle Garden. The last of these, a metal Pratt truss of two spans built in 1901, is the present Castle Garden Bridge.

The first recorded appeal for a bridge over Bennetts Branch at the location of the present Castle Garden Bridge was made in 1874. On November 10th of that year, a petition, signed by various "inhabitants of the Township of Gibson and the Borough of Driftwood," was submitted to the Cameron County Court of Quarter Sessions. The petition cited the need for a bridge due to "the ford there being frequently rendered impassible by reason of ice and high waters." On January 15, 1875, V.A. Brooks and Philip Smith, the court-appointed viewers, reported that a bridge over Bennetts Branch was necessary and that the cost of construction was more than the township could reasonably bear. On January 20th, the County Commissioners approved the proposed bridge over Bennetts Branch as well as the requisite funding. A site plan recorded by the Court Clerk clearly showed the location of the 1874 bridge in relation to a bridge over Driftwood Branch, the

tracks of the Allegheny Valley Railroad and the "Public Road to Beechwood" (present day Nanny Run Road). This location conforms to that of the present Castle Garden Bridge.

The 1875 span lasted no more than thirteen years, but records concerning its removal or destruction have not survived. By the late 1880s the citizens of Driftwood Borough and Castle Garden were petitioning once again for a bridge over Bennetts Branch. On November 17, 1887, twenty-three citizens petitioned the judges of the Cameron County Court of Quarter Sessions for a bridge "where the public highway from Driftwood to Karthaus" (present Nanny Run Road) crossed Bennetts Branch to connect with the "Road to Benezette" (present County Road 555). Stating that "the expense of erecting said bridge would be too heavy and burthensome upon the inhabitants of said township and borough", the petitioners requested the judges to have the bridge built at county expense. The court ordered J.O. Brookbank, John Brooks and George W. Huntley "to view the place proposed for the bridge" and to report if "the erection of such bridge would require more expense than it would be reasonable the said township and borough should bear." The viewers subsequently approved the site of the bridge and recommended that the expense of its erection should be borne by the county. Included in their report was a hand-drawn map of the area. The map revealed that an "old bridge," most likely that of 1875, had been built at one time across Bennetts Branch, slightly upstream from the recommended site for the new bridge. The map also showed the location of the "present ford" downstream of the old bridge. Additionally, the map showed the location of the bridge and the "old ford" across Driftwood Branch immediately north of that stream's confluence with Sinnemahoning Creek.

Selected to erect the 1888 bridge was the S.B. Palmer Company of Stroudsburg, Pennsylvania. Palmer's bridge company was an outgrowth of a series of business arrangements between Charles S. Palmer and his son, Samuel B. Palmer, beginning in the mid-1860s. In 1864, Charles Palmer bought a lumber yard at Moosehead, Luzerne County, from which he and Samuel Palmer began a lumber and later a paint manufacturing business. When Alexander Mitchell Palmer, third son of Samuel (and future U.S. Attorney General under Wilson) was born in 1872, he was named after the president of the Lehigh Valley Railroad. According to Stanley Coben's 1963 biography of A. Mitchell Palmer, the family "occasionally served as bridge builders and repairers" for the Lehigh Valley. In 1876 the reputation of the Palmers as bridge builders was firmly established when Charles Palmer patented a successful wood-and-iron combination bridge; shortly thereafter he sold his interest in the lumber business and moved to Stroudsburg where he established a construction company. By 1880, Samuel rejoined his father in business and the

construction firm became Charles S. Palmer and Son. Following the death of Charles in 1886, the firm became known as the S.B. Palmer Company.

On April 30, 1888, the Commissioners of Cameron County met to discuss plans for the Bennetts Branch bridge in addition to a bridge at Portage. According to the Commissioners Minutes, "Sam. B. Palmer, of Stroudsburg, Pa., offered to build both bridges" for a lump-sum price. Among the dimensions listed by Palmer for the bridge at Bennetts Branch was the central pier, which was to be 16 feet in height and 20 feet long. Additionally, Palmer gave the dimensions for two abutments at 16 feet in height, 20 feet long, 6 feet wide at base and 4 feet at the top. Palmer also included 60 feet of wing walls, 16 feet high, and 210 feet of "combination bridge." The total cost for the bridge was estimated at \$4,711.00. While the masonry work totalled \$2,199, the "combination bridge" came to an estimated \$2,512.

The abutment and pier dimensions of Palmer's bridge approximate those of the present Castle Garden Bridge. The latter, however, is clearly not a Palmer "combination bridge," as patented by Charles S. Palmer on May, 2, 1876. In applying for the patent, Palmer described the usefulness of his bridge improvement by noting that "...the wooden bridges found in general use throughout the country are not susceptible of proper repairs without stopping all travel during the same..." As a remedy for this problem, Palmer's wood-and-iron bridge, in which the principal wooden members were doubled and secured with specially designed iron fittings, allowed the removal and repair of the bridge members while the bridge remained in service. Palmer reported that "I construct the arches double throughout, and set their bases in a peculiar metal shoe, which rests upon the usual masonry abutments, the entire arch being jointed at the center by means of a peculiar metal cap or joint, and tied at the bases by a suitable metal chord."

Palmer's combination bridge was built in 1888 at the site of the present Castle Garden Bridge. As work on the bridge progressed, the Commissioners met several times at the site between March and November, 1888 to monitor the progress of construction. On November 30, 1888, the court-appointed viewers reported that "...said bridge is completed in a substantial and workmanlike manner according to the contract entered into with the Commissioners of said County." County Commissioners Minutes from the 1880s revealed that S.B. Palmer was active in bridge contract bidding throughout Cameron County. In addition to the Castle Garden Bridge, Palmer successfully bid on a contract for an 84 foot iron bridge at Portage in April 1888. On December 4, 1889, Palmer bid unsuccessfully on a contract for a bridge at Cameron but nineteen days later, his company was awarded the contract for a bridge at Driftwood. Palmer apparently remained active

in bridge building into the 1890s and in 1896, the company constructed an iron pony-truss bridge over McMichael's Creek in Sciota, Monroe County.

S.B. Palmer's 1888 combination bridge over Bennetts Branch lasted no longer than its 1875 precursor. By the turn of the century the Cameron County Commissioners entered into a contract for the replacement of the 1888 span over Bennetts Branch. According to a bridge docket of December 19, 1901, A.H. Schafer, J.O. Brookbank, Riley Warner, John E. Smith, Charles F. Barclay and Harry Mitchell, court-appointed viewers, reported the completion of a bridge "over the Bennets Branch of the Sinnemahoning Creek at the place where the public highway to, etc., crosses the said stream, in the township of Gibson...". The docket further listed "Messrs. Nelson and Buchanan" as the builders and noted that the cost had been estimated at \$4300. No reference to the deficiencies of earlier spans were made in the 1901 docket.

The choice of the Pratt truss configuration for the 1901 Castle Garden Bridge reflected the county's official preference for a metal truss bridge type which had long been tested in highway bridge engineering practice during the mid-to-late nineteenth century. Hundreds of metal truss bridges had been erected in the nation by the 1880s, and many more hundreds would be built in subsequent decades. In his 1908 handbook, The Design of Highway Bridges and the Calculation of Stresses in Bridge Trusses, the well-known consulting engineer and civil engineering professor Milo S. Ketchum offered a succinct definition of the truss:

A truss is a framework composed of individual members so fastened together that loads applied at the joints produce only direct tension or compression. The triangle is the only geometric figure in which the form is changed only by changing the lengths of the sides. In its simplest form every truss is a triangle or combination of triangles.

The basic components of a metal truss include top and bottom chords, web members characterized as verticals or diagonals and connected to the chords at joints, the portals, stringers, floor beams and deck. The top and bottom chords, the verticals, and the diagonals are the structural members that carry the loads exerted on the superstructure and transmit them to the substructure. The particular arrangement of the chords and the web members determines the specific truss type. The portal is the space of a truss which forms the entrance to the bridge, while the stringers consist of the longitudinal members, placed parallel to the direction of traffic, which transmit the deck loads to the floorbeams. These are placed transverse to the direction of traffic in order to convey the deck loads to

the bridge trusses. The floor system provides direct structural support for the loads caused by vehicular traffic. The truss generally rests on piers or abutments at points designated as bearing seats.

Truss bridge design was greatly advanced by the sixteenth century Italian architect, Andrea Palladio. Although Palladio built a number of bridges using the truss, and included his designs in his architectural treatise, his discovery received little attention until American engineers began to use the form in the first half of the nineteenth century. Truss bridges were initially constructed of wood; cast iron truss bridges were first erected during the 1840s along the route of the Erie Canal. Although timber was generally in plentiful supply, the limited longevity of untreated wood necessitated frequent replacement. At first deterred by the higher cost of iron, early bridge builders gradually made the shift from wood to iron, with many transitional structures featuring iron rods solely for tension members and wood for the remainder of the truss.

In 1847, the renowned bridge builder, Squire Whipple, noted that cast iron, which fractures on impact and is less than ideal for carrying tensile loads, was desirable for use in compression members, while wrought iron, being ductile and not brittle, was better suited for tensile members. By 1850, rolled wrought iron shapes were becoming more widely available, and increasing numbers of bridges were being built of iron. In the last quarter of the nineteenth century, the greater tensile strength of structural steel led to its ascendancy over wrought iron, despite the latter's superior resistance to corrosion.

A wide variety of truss types was eventually developed by the early twentieth century. One of the most important and popular was the Pratt truss, patented by Thomas and Caleb Pratt in 1844, and built from the middle of the nineteenth century and well into the twentieth century. The Pratt truss has its vertical members in compression while its diagonal members resist the tensile force. By 1910, Pratt through trusses (in which the top chords are connected with lateral bracing and the deck is located slightly above the bottom chord) were available in a number of variants, including the Parker truss (having a polygonal top chord), the Camelback truss (a Parker truss with a polygonal top chord of exactly five slopes), and the Pennsylvania (or Petit) truss, a Pratt or Parker truss with subdivision of the panels by an auxiliary framework of sub-struts. Bridge engineer and historian J.A.L. Waddell observed in 1916 that the Pratt truss was the most commonly used truss type for spans under 250' in length, noting that "nearly all trusses of ordinary span lengths are being designed of the Pratt or Petit type."

Like other metal truss bridge types, the Pratt truss could be fabricated at a shop to specifications provided by a customer, then shipped to the site and erected on abutments with the aid of markings on the members. During the late nineteenth and early twentieth centuries, numerous bridge companies published catalogs of their structures, along with order forms and detailed instructions on how to determine which bridge type was suitable for a given site. Although built-up members fabricated at the shop were riveted, the initial difficulty of riveting in the field led to the widespread use of pin connections assembled at the site. Resembling large metal bolts with threads on both ends, pins were inserted through holes drilled through, or welded to, the members and capped on both ends with hand-tightened nuts. Although pins allowed for speedy erection and easier analysis of stresses in a truss, they were also susceptible to loosening, especially when the vehicular traffic was heavy and fast-moving. The development of portable pneumatic riveting systems in the last decade of the nineteenth century led to the gradual abandonment of pin connections.

Nelson and Buchanan, builders of the 1901 Pratt truss, double span bridge over Bennetts Branch, were based in Chambersburg, Pennsylvania, and had acted as agents for the Pittsburgh Bridge Company until about 1900, when they began a series of independent bridge companies. Thomas McDowell Nelson received a degree in civil engineering from Lafayette College in 1870. After working for a number of railroad companies, including the New York Central Railroad, he returned to Chambersburg by 1876. In 1879, Nelson joined the lumber firm of Craig & Nelson where he became involved in bridge design and construction. In 1882, Nelson joined with Andrew Buchanan in starting a separate engineering and contracting firm. In 1896, Nelson became president of the Pittsburgh Bridge Company, overseeing the company's operations until its absorption by the American Bridge Company in 1900. In 1901, the company of Nelson and Buchanan became the Nelson-Merydith Company following the addition of Alexander H. Nelson, son of Thomas McDowell Nelson, and E.A. Merydith to the firm.

The Nelson and Buchanan Company, or successor firms, are known to have built a variety of truss bridges in Pennsylvania; additionally, the firm successfully made the transition from metal bridge fabrication to reinforced concrete construction, marketing reinforced concrete arch bridges to officials of Washington County, Maryland, and other jurisdictions during the 1900-1910 period. Nelson and Buchanan bridges built in Pennsylvania included a Pratt pony-truss over Little Cove Creek in Franklin County as well as a three-span truss bridge consisting of two pony trusses and one Baltimore Truss, over Marsh Creek in Adams County. Nelson and Buchanan also constructed the Smithton Bridge, a cantilever truss bridge, over the Youghiogheny River in Westmoreland County,

Pennsylvania. In Virginia, Nelson and Buchanan also are known to have built a three-span through (high) single-intersection Pratt truss bridge in 1896 to cross the Cowpasture River in Allegheny County, and two other through (high) single-intersection Pratt truss bridges within the Staunton Construction District.

The distinctive low placement and appearance of the lower chord on the present Pratt truss over Bennetts Branch further suggests construction of the Castle Garden Bridge by Nelson and Buchanan. Between the L_0 and L_1 panel points the lower chord angles upward to meet the top of the abutment. The lower chord also angles upward between the L_5 and L_6 panel points to meet the top of the central pier. These characteristics, in addition to the placement of the lower chord well below the floor beams are features shared with two other known Nelson and Buchanan Pratt trusses. On the Little Cove Creek bridge, a Pratt pony-truss built in 1887 and located in Franklin County, Pennsylvania, the lower chord is placed below the floorbeams and is angled upward to meet the abutments. On the 1894 Marsh Creek Bridge in Adams County, Pennsylvania, the lower chord of the two Pratt pony-truss spans features the same characteristic upward angle at the abutments and also at the pier between the pony-truss spans and the central span. Finally, an 1889 Pratt through-truss constructed by the Pittsburgh Bridge Company in Huntingdon County, Pennsylvania exhibits a lower chord connection similar to that of the Castle Garden Bridge. The floor beam on the Huntingdon County Bridge is suspended by means of a plate riveted to its end, rather than by means of a stirrup, as on the Castle Garden Bridge.

The verticals of the Castle Garden Bridge are embossed with the imprint "Cambria," indicating that the rolled members of the bridge were produced by the Cambria Iron Company of Johnstown, Pennsylvania. As a result of expansion and improvement of its physical plant beginning in the 1850s, the Cambria Iron Company emerged as an important U.S. metal manufacturing establishment by the late nineteenth century. When the members were produced for the Castle Garden Bridge, Cambria's chief products included railroad rails, steel wire, and a variety of structural shapes used in buildings and bridges. The primary facility used in the production of structural shapes was the company's rolling mill which manufactured various types of I-beams, bars, channels and angles. Transportation of the bridge members was facilitated by the close proximity of the bridge site to the rail connection at Driftwood Borough. Once on site, they were most likely erected by local labor on the locally-built abutments and central pier under Nelson and Buchanan supervision.

Although no pre-1980s maintenance records have survived for the Castle Garden Bridge, the original piers, abutments and bridge members appear to be intact. Inspection

by PennDOT in 1985 revealed moderate to significant rusting on the steel members throughout the bridge. Although the current bridge deck is reinforced concrete with an asphalt overlay, the original deck was most likely timber. Currently, most sections of the curbing consist of 6" x 6" timbers.

The Castle Garden Bridge over Bennetts Branch remains open to vehicular traffic subject to a load restriction of 3 tons. The Pennsylvania Department of Transportation proposes to replace the existing Pratt truss; planning is underway for such replacement.

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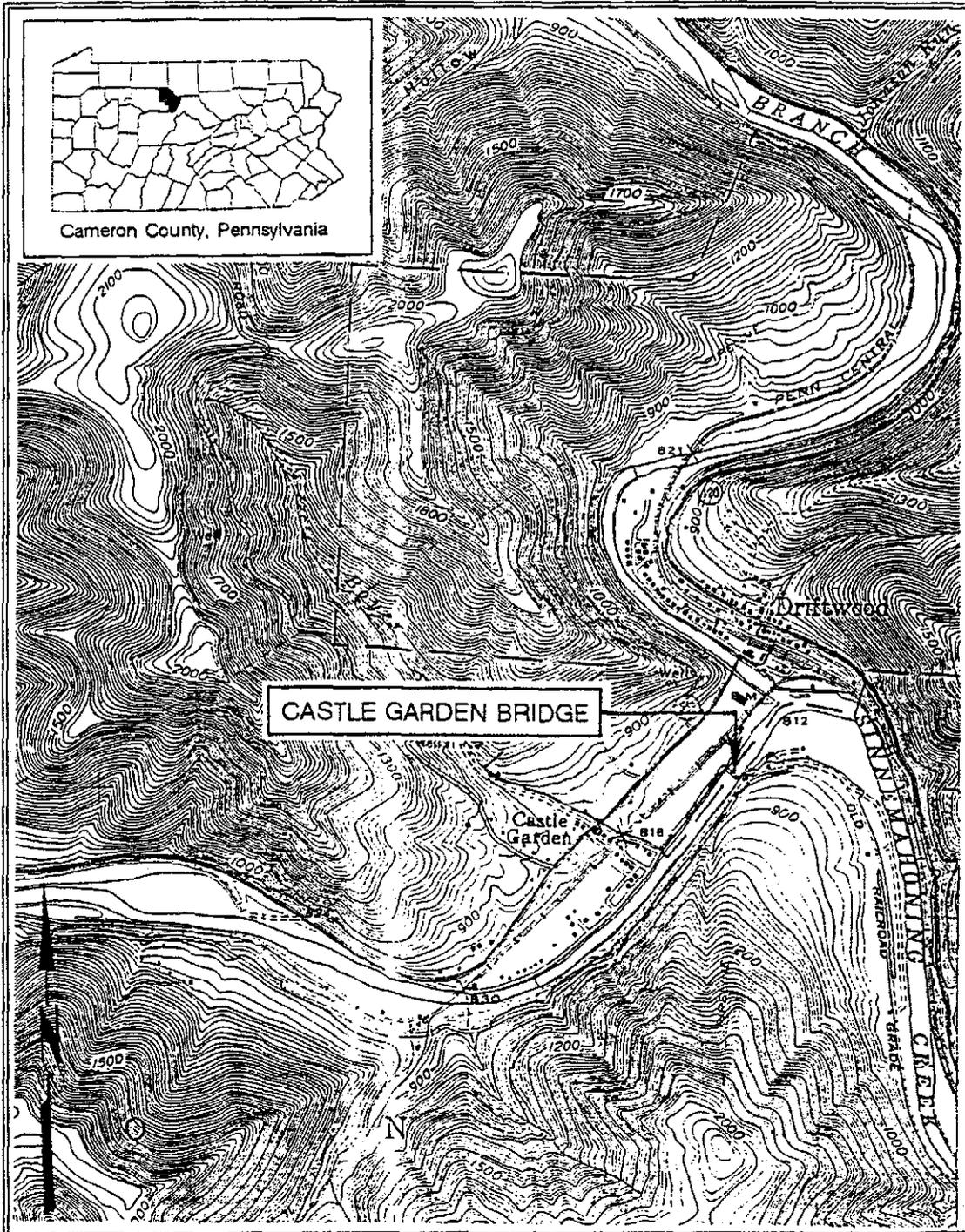
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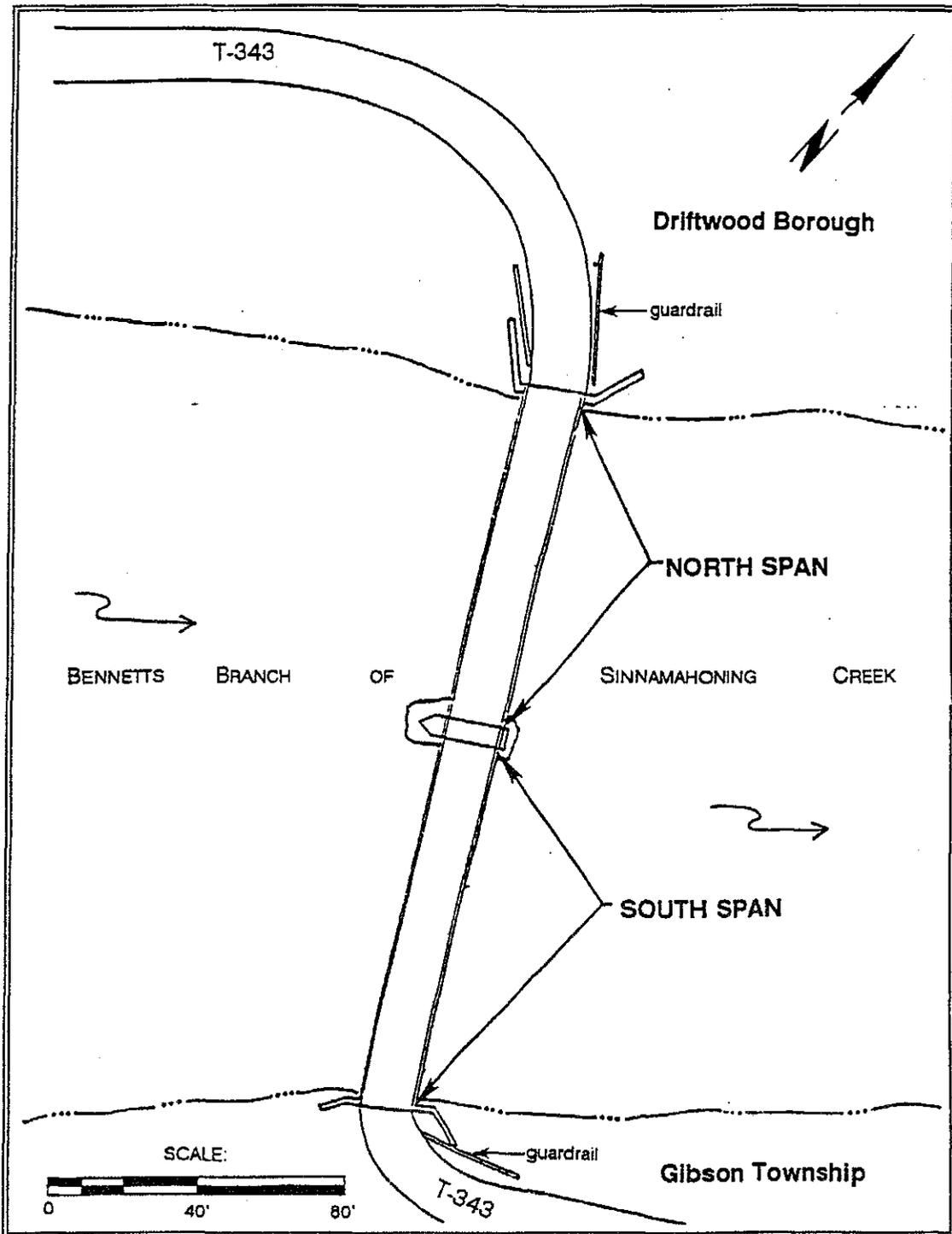
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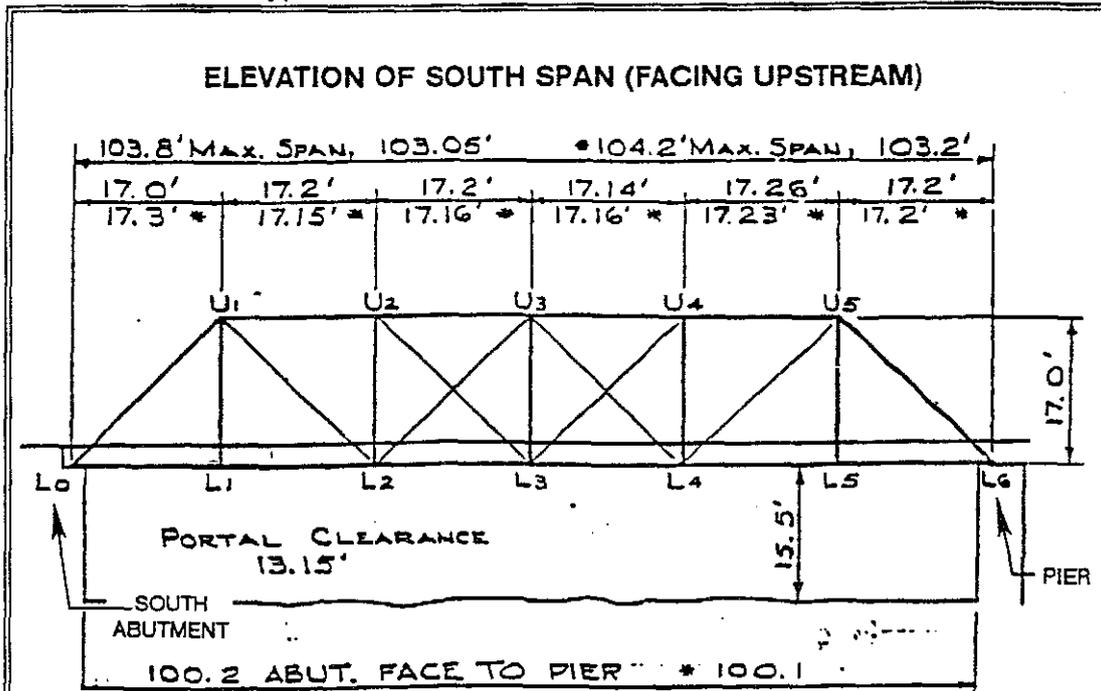
Project Location Map



Site Plan



Typical Elevation and Schedule of Members



SCHEDULE OF MEMBERS

MEM.	SIZE	SHAPE	REMARKS
LoU1		R 12" x 1/4" 2C 6" x 11 5/16" x 3/32" LACING 1 1/2" x 1/2" x 1/2"	1'-8" RIVET TO RIVET
LoL1		2 BARS 2" x 1 1/16"	
U1L1		2 BARS 7/8" x 7/8"	
L1L2		2 BARS 1/16" x 2"	
U1L2		2 BARS 5/8" x 2"	
U2L2		2C 1 7/16" x 4" x 3/16" LACING 1 1/2" x 1 1/2" x 3/16"	
L2L3		2 BARS 3/4" x 2 1/2"	
L2U3		1 BAR 3/4" x 3/4"	
U2L3		2 BARS 1 3/16" x 1 3/16"	
U3L3		2C 1 5/8" x 4" x 3/16" LACING 1 1/2" x 1 1/2" x 3/16"	

Cross Section at Portal

