CARYVILLE BRIDGE
(George L. Dickenson Bridge)
State Route 10 (US 90), Spanning the Choctawhatchee River
Caryville Vicinity
Washington County
Florida

HAER No. FL-13

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Southeast Regional Office
Department of the Interior
Atlanta, Georgia 30303

HISTORIC AMERICAN ENGINEERING RECORD

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Location: State Route 10 (US 90), Spanning the Choctawhatchee River
Caryville Vicinity
Washington County
Florida

UTM: 16.612393.3405016
Quad: USGS Caryville, Florida Quadrangle

Date of Construction: 1927; modified in 1944

Engineer: Pensacola Shipbuilding Company
Architect: N/A

Present Owner: State of Florida
Department of Transportation
Chipley, Florida 32428

Present Use: Vehicular bridge

Significance: The Caryville Bridge was constructed in 1927 as part of State Route (SR) 10, to span the Choctawhatchee River between Washington and Holmes Counties, Florida. The original bridge, designed and fabricated by the Pensacola Shipbuilding Company, consisted of four Warren deck trusses and one double leaf "Scherzer Rolling Lift" bascule span. The approach spans employed timber trestles supported by cast-in-place concrete pile foundations. In 1943-1944, designs were developed to widen the roadway to accommodate the increased loads of vehicular traffic. These plans, which were carried out between 1944 and 1952, resulted in the reconfiguration of the Caryville Bridge to a Warren fixed deck truss design.

The Caryville Bridge is significant in an area of engineering for its innovative, 1940s design to modify the original bridge. In addition, the Caryville Bridge is one of the few surviving bridges in the state constructed by the Pensacola Shipbuilding Company, which was a principal bridge builder in the state.

Report Prepared by: The Florida Department of Transportation will replace the Caryville Bridge over the Choctawhatchee River with a modern, two-lane bridge. A Memorandum of Agreement (MOA) between the Federal Highway Administration (FHA), the Florida Department of Transportation, the Florida Historic Preservation Officer, and the Advisory Council on Historic Preservation (ACHP) stipulated the preparation of HAER Level II documentation for the Caryville Bridge to mitigate the effect of bridge replacement pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966.

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Date: November 1997

Introduction

The Caryville Bridge was erected in 1927 as part of the construction of State Route (SR) 10, an important transportation artery established in the early-twentieth century, during a period of substantial highway and bridge improvements in the State of Florida. Constructed by the Pensacola Shipbuilding Company, the bridge spans the Choctawhatchee River and connects the counties of Washington and Holmes, Florida. The Choctawhatchee River historically served as primary transportation corridor for the region and provided access to the important commercial center of Pensacola. With the coming of the Louisville & Nashville Railroad in 1882, commercial navigation on the river declined steadily.[1] By the early-twentieth century, U.S. Highway 90 (SR 10) supplanted the railroad as the primary transportation route.

The Caryville Bridge derives its engineering significance from the innovative 1940s adaptation of the original circa 1920s Warren truss bridge. The original bridge featured a main span consisting of four Warren pony trusses and a double-leaf bascule span, a common bridge type in Florida. Designs developed in 1943-1944 proposed the replacing the bascule span with a plate girder channel span and modifying the four central spans into a Warren fixed deck truss type. The resultant bridge represents a rare example of a Warren fixed deck truss type. In addition, the bridge is one of the few surviving examples of work undertaken by the Pensacola Shipbuilding Company, the principal builder of steel bridges in Florida.[2] The survival rate of Florida's early-twentieth century bridges is low and, as a result, documentation of extant bridges takes on increased importance.

Historical Development of the Caryville Bridge

Initial Construction Campaign, 1927

Construction of US Highway 90 (SR 10) during the 1920s required a bridge connection near Caryville to span the Choctawhatchee River and link the counties of Washington and Holmes, Florida. The town of Caryville was selected for the bridge crossing because of its sound economic base and favorable geographic setting. The Choctawhatchee River, which served as the primary transportation route for the surrounding counties up until the late-nineteenth century, runs in a north-south direction from Barbour County, Alabama to the Choctawhatchee Bay on Florida's Gulf Coast. Holmes and Washington counties relied on the river as a link to Pensacola, a major commercial center. With the introduction of the Louisville & Nashville (L&N) Railroad to the area in 1882, commercial navigation on the river declined in importance. Caryville, historically known as Half Moon Bluff, had been a historic loading site for passenger and commercial traffic along the Choctawhatchee River. With the coming of the L&N Railroad, the area was renamed Caryville after the company's secretary, R.M. Cary.[3]

In October 1919, the 66th Congress passed a bill allowing the Florida State Road Department to initiate construction of a bridge at Caryville. Each of the counties initially contributed $25,000 towards the bridge's construction budget, with the State and Federal governments covering the remaining costs. The Pensacola Shipbuilding Company was awarded the construction contract with a bid of $142,006.12. US Highway 90 reached completion in 1925 and represented the first hard-surfaced road in Washington County. The Caryville Bridge was completed two years later, at a cost of almost $300,000.[4]

The original bridge was constructed from plans initiated in 1922. The bridge was to be situated approximately 170 feet south of the L&N Railroad crossing. The original main span consisted of four Warren deck trusses and a double leaf bascule span, which was operated by a Scherzer rolling lift mechanism. Photographs 16 through 21 depict plans and elevations of the 1922 bridge design. The channel members of the top chord and end posts were constructed using stay plates and lattice bracing. The bottom chord was formed by two channel members braced with stays. The diagonals altemately used stays and lattice bracing.

The approach spens were constructed using timber trestles resting on cast-in-place concrete pile foundations. The original timber deck was supported by wide flange I-beams fixed about midsection of the vertical truss members. A bridge tender's house was constructed on the west approach of the bridge. The structure was raised on wood piles end meesured 30 feet by 30 feet. It appeers to have been a wood-frame structure terminating in a hipped roof; the structure is no longer extant.[5]

Modification of the Caryville Bridge, 1943-1952

The originel Warren pony truss end double leaf bascule span design was modified in order to accommodate the increased automobile traffic along US Highwey 90 during the mid-twentieth century. As originally designed, the bridge could hendle only limited automobile traffic, and allow for the passage of tall river vessels. By mid-century, traffic along this busy transportetion corridor included wider, heavier trucks transporting all types of cargo. Plens were drawn in 1943-1944 to widen the roadway, which resulted in the reconfiguration of the original bridge to a Werren fixed deck truss. Modifications to the Caryville Bridge were initiated in 1944 and continued until 1952; the reason for the eight-year delay is unknown.

The new design called for the replacement of the timber trestle epproaches with concrete approaches, widening of the road to 26 feet, and replacement of the bascule drew span. Plans and elevations of the 1943-1944 planned modifications are shown in photographs 22 through 26. In 1944, work was undertaken to replace the west epproach spans with concrete pile bents. A steel and concrete girder and floorbeem deck and e post and beam concrete railing were installed as part of this work. It is speculated that the west timber approaches were reconstructed as a result of a fire, which destroyed the bridge tender's house.[6]

The remaining work was not carried out until 1952, and included replacement of the bascule span and widening of the roadway to 26 feet. The east timber trestles also were replaced to match those on the west end, which were reconstructed in 1944. The original double leaf bascule span was removed and replaced by a fixed plate girder span; the plate girder span measured 92 feet long. An open steel grating was instelled in the deck of this main channel span. According to a survey conducted by the Florida Department of Transportation (FDOT) entitled *The Historic Highway Bridges of Florida*, the U.S. Army Corps of Engineers approved a design in 1950 that called for the Installation of e plate girder span as a temporary replacement until a vertical lift spen could be instelled. Installation of the vertical lift span, however, never came to fruition. According to news accounts from that year, the draw span was not constructed due to the limited amount of river traffic.[7]

The widening of the roadway from 18 feet to 26 feet adopted an innovative approach that utilized the original Warren trusses as support for the new road, which wes lifted from its original location. The original timber deck, located ebout halfway up the truss framework, was removed and replaced with a cast-in-place concrete deck. The originel floor stringers were salveged and reused in the new, raised deck. Vertical I-beam members were cantilevered on top of the trusses to provide additional strength to the panels. The innovative redesign of the Caryville Bridge was successful at creating a wider road span by cantilevering the road deck, while still retaining the original truss configuration.

The reconfigured Caryville Bridge was composed of 73 spans, including five main spans and 68 low approach spans that traversed the floodplain of the Choctawhatchee River. The total length of the five main spans measured 472 feet; the two outer deck trusses measured 81 feet long; and the two inner deck trusses measured 109 feet long. The five main spans were supported by six reinforced concrete pile bents with steel H pile foundations; these pile bents consisted of two round columns connected by a central concrete member. The approach spans consisted of concrete and steel girder and floorbeam spans supported on concrete pile bents with pre-cast concrete pile foundations. The railing elong the approach spans employed a typical post and beam design. The railing for the main spens consisted of a typical steel post construction.[8]

The newly retrofitted structure was renamed the George L. Dickenson at its rededication in 1967. Dickenson, who retired in that year, was an important figure in the Florida Department of Transportation (FDOT). Employed by FDOT for forty years, Dickenson served as the District Engineer for half of that time.[9] Dickenson was a graduate of Georgia Institute of Technology. When he arrived in Washington County, Florida, he may have worked on the original Caryville Bridge design. It is very likely, at least, that he witnessed its complete history from its 1927 initial construction date to its 1940s reconfiguration. By the 1940s, Dickenson was one of the engineers in charge of the 16 county districts that oversaw the Caryville Bridge project.[10]

Comparative Analysis

Twentieth Century Bridge Truss Types

The rapid expansion of the nation's railroad lines in the decades following the Civil War was a major factor in the design and development of new bridge types. The increasing traffic brought along with it increasing locomotive weight, which reached a peak with the introduction of the steam-powered locomotive. This necessitated the construction of bridge types that could accommodate the heavier load of the freight train, while still allowing passage along the navigable waterways. By the 1920s, however, the tremendous growth of the automobile traffic soon reached a point where the majority of bridges were constructed for highway use. The metal truss bridge emerged as the most prevalent bridge type constructed between 1850 and 1925 for both railroad and highway structures. By 1930, structural developments in metal truss types had ceased with the development of newer bridge types, such as suspension bridges and concrete bridge spans.[11]

Truss bridges come in many forms, which are determined by the arrangement of the structural members. A metal truss is composed of many comparatively small pieces of iron and steel that are joined together in a series of triangles. These structural triangles interconnect with one another to form the overall structure. Each of these members is placed in either tension or compression to resist the loads placed upon the structure. If a member is in compression, then the forces acting on it tend to push it together. If it is in tension, then these forces tend to pull it apart. The main members of a truss consist of either stiff, heavy struts or posts, or thin, flexible rods or bars. Stiff struts or posts are capable of withstanding both tension and compression, while the thin rods or bars are only capable of withstanding tension. This distinction provides an important factor in identifying the various truss configurations. That is, bridges that are characterized by a similar configuration of tension and compression members represent the same truss type. A diagram of a typical truss depicting its various components is shown on page _17. All the different forms of bridge trusses are based on three basic types: the through truss, the pony truss, and the deck truss A longitudinal and transverse view of these different truss types is shown on page 18. A through truss carries its traffic load on the bottom chords. A pony truss is a through truss with no lateral bracing between the top chords. A deck truss carries its traffic load level with the top chords.[12]

The Warren and Pratt trusses emerged as the two most prevalent bridge types constructed during the early-twentieth century for both rail and highway spans. A diagram of both forms is depicted on page 19. Although both bridge types were invented in the 1840s, they did not gain popularity until the turn-of-the-century. The Warren and Pratt trusses were characterized by their versatility, durability, and low cost.[13] At the beginning of the twentieth century, the major highway spans were concentrated in regions of the older, well-established cities located on wide waterways. Except for truss depth and the size of individual members, there was little distinction between the design of long-span rail and highway bridges for the first two decades of this century.[14]

The Pratt truss, which was patented in 1844 by Thomas and Caleb Pratt, is distinguished by vertical members acting in compression and diagonals acting in tension. This design feature reduced the length of the compression members to help prevent them from bending or buckling. Many bridges adopt the Pratt configuration of compression and tension members, while altering the shape of the top and bottom chords. Advancements in the design of the standard Pratt truss were made during the 1870s to strengthen the existing truss by incorporating sub-struts and sub-ties. These additional supports served to stiffen the truss under heavy moving loads. The increased size and weight of trains and their rolling stock dictated these advancements in bridge designs.[15]

The Warren truss, which was patented in 1848 by two British engineers, was adopted quickly by American engineers and reached its peak during the 1920s. Its simple, straightforward design is formed by a continuous pattern of diagonal members alternately placed in either tension or compression. The Warren truss is easily distinguishable due to its triangular outline. Most Warren trusses employ vertical members, which act to stiffen the entire structure. The most common form of the Warren truss employs rigid metal posts for both the diagonal and vertical members. Some older examples of the Warren truss were built using thin eyebars for the diagonal members, which act in tension. During the first two decades of the twentieth century, the Warren truss had been confined to simple spans of moderate length. The development of high-strength alloy steels during the 1930s made it possible to employ this truss type for long-span rail and highway bridges, in the form of continuous and cantilever trusses.[16]

Another popular type of bridge constructed for rail and highway use was the girder span, which was introduced in the United States in 1846. The truss and girder have undergone a separate but parallel development since the beginning of iron bridge construction in the U.S. The built-up flanged type, which was developed during the Civil War, continued to be popular into the twentieth century. The simple through girder was a standard type for railroad crossings, while the continuous form was adopted for highway bridges. During the first third of this century, the continuous girder followed the traditional structural form and rarely spanned lengths greater than 100 feet.[17]

By the early-twentieth century, substantial improvements had been made in the design of the movable span, which were employed at railroad and highway crossings that needed to accommodate navigation traffic. These bridges utilized the technology of metal truss bridges to swing pivots, and lifting towers to move the structure and provide clearance for ships in the channel. By this period, a variety of different types of movable bridges had been developed, including the swing type, bascule rolling lift, and vertical lift bridges. The swing bridge gained popularity in Florida due to its simple design, low cost, ease of construction, and dependability. The swing span operated by turning about on a vertical axis. The Champion Bridge Company was one of Florida's major fabricators of this type of bridge.[18]

The bascule span, which was well suited to Florida's many navigable waterways, emerged as one of the most popular movable bridge types. Typically, when local conditions were unfavorable for the use of swing spans, the bascule type was selected. The bascule span combined principles of the new technology with those of the ancient drawbridge; in place of crude lifting chains, it utilized a motor-operated mechanism. The term bascule means "see-saw" in French; in bridge terminology, it refers to a bridge that counterbalanced itself as the bridge span lifted by sinking a heavy back end into a "tailpit." The term is applied to any type turning about a horizontal axis (either fixed or moving) and rolling back on a circular segment, or turning about a movable horizontal axis. Bascule spans may consist of a single leaf spanning the channel, or two symmetrical leaves (double leaf) meeting at the center. Pages 20 and 21 provide illustrations of a double-leaf bascule highway bridge.[19]

Developments in the modern bascule bridge began after the introduction of the steam locomotive in 1829. The bascule bridge steadily won wider acceptance among bridge builders due to its many advantages – it opened a clear channel, operated swiftly and dependably, utilized simple mechanisms, offered strength and safety, and could be aesthetically treated. Bascule spans were desirable in cities having narrow waterways, as in Chicago. Engineering firms, many of which were from Chicago, sold patented designs. Most bascule types contain large trunnions (or pivots). In this type, the bascule span rotated around a trunnion or axle and made use of a heavy counterweight. The piers and foundations at the trunnion end had to be capable of handling the weight of the bridge and the counterweights. Joseph Strauss, a

Chicago engineer, made improvements to the trunnion type, which became the dominant type constructed in Florida.[20]

The rolling lift was one of many forms of bascule bridges developed to accommodate the needs of rapid transport. In 1893, William Scherzer was commissioned by the Metropolitan West Side Elevated Railroad Company of Chicago to design a drawbridge over the Chicago River. The end result was the Scherzer Rolling Lift Bridge. Scherzer claimed that his rolling lift type operated with less friction and reduced power. The rolling lift was similar in appearance to most bascule bridges, but instead of being pivoted, it moved along a horizontal axis during opening and closing. Quadrant girders were positioned at the ends of the leaves, which rolled back on tracks when the bridge was opened. These types of bridges became popular due to their simple design and ease of operation. The Champion Bridge Company of Ohio, one of the state's most prolific fabricators of metal truss bridges, was credited with introducing the rolling lift bascule bridge to Florida.[21]

Contextual Background

Florida's Road and Highway System during the Nineteenth Century

Transportation played a significant role in shaping Florida's development during the nineteenth and twentieth centuries. In many cases, the region's growth can be tied to improvements made in transportation networks. Florida's highway system was established officially during the mid-nineteenth century (1821-1845), at which time the United States government began appropriating funds for the construction of important roadways.[22]

Florida recognized the need to expand and to improve its road system to link the various towns. Previously, towns relied on navigable waterways as the primary transportation links. Construction of an overland transportation network posed a difficult task due to the swampy nature of the terrain. In 1824, Congress allocated $20,000 for the construction of a road from Pensacola to St. Augustine.[23] This road, which passed south of Caryville, consisted of little more than a winding trail. Portions of this roadway incorporated the old Indian Trail along the Choctawhatchee River and the old Spanish road near St Augustine. The Army Quartermaster Corps, under the command of Captain Daniel Burch, was responsible for road construction. The eastern portion of the project was contracted to a planter named John Bellamy, who used slave labor to complete the stretch of road from St. Augustine to Tallahassee. Construction of this new transportation route encouraged the expansion of cotton and cattle production in northern Florida. Captain Burch also supervised the construction of a military road, which extended between Tallahassee and Pensacola, and served as a trade and communication route. This road, however, was short-lived due to a lack of maintenance.[24]

The U.S. Army continued to play a role in shaping and expanding Florida's road system throughout the mid-nineteenth century. During the Seminole Wars, federal troops created new trails and erected temporary bridges to transport supplies between forts. Colonel Zachary Taylor, who operated in the area north of Lake Okeechobee, was credited with "constructing 848 miles of wagon roads and 3,643 feet of causeways and bridges during the late 1830s."[25]

Prior to the Civil War, Florida had not established a comprehensive system of roads and bridges. Existing roads, which consisted of hard-packed dirt, fell under the jurisdiction of local county commissioners, who appointed road overseers to maintain roads and bridges. In many cases, the road overseer had little or no experience in road or bridge construction. No standards were established for the construction and maintenance of roads. Instead, decisions on road maintenance were made on a local level. Each year, adult males of a locality were assessed to provide labor, or to pay a tax in lieu of service. As a result of this informal arrangement, roads were characterized as "rudimentary, scratched-out paths, unconnected with each other, and serving only the needs of local property owners."[26]

Privately owned and operated toll roads, bridges, and ferries also were established to serve local transportation needs. During the 1850s, Florida constructed plank roads to expand its existing network. Due to Florida's wealth of timberland, many plank road companies sprang up during this period. A number of thriving lumber enterprises were established in the town of Caryville; the Sanford Lumber Company was the first large-scale lumber business. By the time the town was incorporated in 1913, the Sanford Lumber Company laid claim to most of the town's land.[27]

Throughout the late-nineteenth century, steamboats and railroads continued to serve as the primary means of transportation in the state. Roads remained a secondary transportation route and were not well maintained or improved substantially during this period. Florida's steamboats operated along the coasts, hauling goods as well as passengers. The St. Johns, St. Marks, and Apalachicola rivers served as the major traffic arteries for steamboat operations. Caryville was a loading site for passenger and commercial traffic along the Choctawhatchee River. With the arrival of the Pensacola & Atlantic Railroad in the 1880s, however, rail traffic quickly supplanted river traffic. The Caryville area, historically known as Half Moon Bluff, was renamed for the railroad's company secretary, R. M. Cary.[28]

Railroads first were introduced to the region during the 1830s primarily to transport agricultural products from the interior to the seaports. One company established a mule-driven railway that covered a 23-mile route from Tallahassee to St. Marks on the Gulf Coast. The state assembly created the Internal Improvement Board in an effort to promote transportation improvements and to assist railroad companies with public funds. The board supported the completion of the Florida Railroad, which extended across the state from Fernandina to Cedar Key, and linked the Atlantic and Gulf ports.[29]

The Civil War suspended progress in transportation improvements. The railroads and other transportation facilities emerged from the war in a deteriorated and damaged condition. The Internal Improvement Fund was disbanded. Florida's transportation network did not recover until the 1880s and 1890s, at which time the railroads entered a new phase of development. The Louisville & Nashville Railroad was constructed across West Florida during the 1880s, connecting Pensacola to the Apalachicola River. A rail line also was established along the northern part of the state. Henry Flagler invested his personal fortune to construct the Florida East Coast Line. The beginning of the twentieth century was marked by the construction of the Overseas Railroad. This engineering feat was built between 1903 and 1912 and consisted of a series of bridges and viaducts erected over open water to access Key West. The expansion of the railroad during this period was successful in opening previously unoccupied lands to settlement, and in providing an integrated transportation network that linked towns, as well as the State of Florida to the rest of the nation.[30]

The state's network of roads failed to keep pace with the railroads during the late-nineteenth century. By the turn-of-the-century, however, local governments again recognized the need for improved roadways and bridges to support the nation's growing reliance on automobiles.

Federal and State Partnerships in Road Building during the Twentieth Century

The early-twentieth century marked an important period in the history of transportation, as state and federal highway agencies embarked on a program to expand, modernize, and standardize transportation systems. New organizations formed during this period were responsible for the early efforts to improve and to expand existing transportation networks. These organizations supported federal transportation bills that resulted in changing the way roads and bridges were built. In 1911, the American Association for Highway Improvement sponsored the First American Road Congress in Richmond, Virginia. The Road Congress resulted in the passage of two important resolutions, including: (1) Congress should provide financial assistance to state governments for road building and maintenance and (2) individual states should oversee the construction and maintenance of main highways through the creation of state highway departments. As early as 1913, the Office of Public Roads was involved in developing standards for the design and construction of bridges. That same year, the American

Association of State Highway Officials (AASHO) was formed to provide "mutual cooperation and assistance to the State highway departments and the several States and the Federal Government".[31] The organization was instrumental in drafting federal legislation enacted in 1916, which authorized federal aid to highways.[32]

The cooperative efforts of organizations such as the AASHO were successful in addressing the demands of the increased overland automotive and trucking traffic, as well as the need for greater standardization. Their efforts were instrumental in prompting Congress to pass the Federal Aid Road Act on 11 July 1916. The act, which signaled the beginning of federal and state partnerships in interstate road construction, committed federal funds to the construction of rural post roads and required that each state establish a "competent and adequate" road department to administer the program.[33] The bill also established standards for road and bridge construction, such as paving materials, construction methods, and design. Passage of the Federal Aid Road Act ushered in a new age in road building that would continue throughout the twentieth century.[34]

Federal legislation spurred the growth of state highway departments and building programs. In 1915, Florida established a State Road Department and subsequently appointed William F. Cocke, an engineer in the Virginia Highway Department, as the first State Road Commissioner. By this date, Florida's state highway system contained 33 miles of high and medium type paved roads. The State Road Department first was awarded federal funds in 1919 to carry out a comprehensive road building program. Florida's expenditures on road construction and improvements steadily increased.

The onset of World War I had a major influence on road building. During the war years, U.S. industries dramatically increased production and thus shipping of finished goods. These industries also generated greater shipments between points of supply and production. These increased shipping volumes imposed severe demands on the rail system, and eventually led to greater reliance on trucking and overland shipping to transport freight. In turn, the rise of the trucking industry necessitated the construction of new and improved highways. New construction standards were implemented to accommodate increased traffic and heavier vehicular loads. In 1916, the Department of Agriculture, with assistance from AASHO, developed general specifications for the design of metal truss bridges. These specifications were based on traffic volume, load capacity, and safety. Following World War I, surplus materials and equipment were transferred to state highway departments and many industries shifted to the production of highway construction materials.[35]

The 1920s were characterized by a thriving post-war economy and automobile-oriented society. The national highway program entered a productive period in highway and bridge construction in an effort to keep pace with the increasing demands of automobile traffic. Railroad bridges became rarer, while highway spans increased in numbers. The decade was highlighted by monumental engineering feats in bridge design and construction, such as the suspension bridges of New York and San Francisco. The simple metal truss bridge, however, emerged as the predominant bridge type erected during this period of expansion.[36]

Florida's road system entered a boom period during the 1920s, primarily in response to the active real estate market. The Caryville Bridge was constructed in this climate of expansion and modernization. The number of new, modern roads and bridges expanded exponentially during this decade. A number of Florida's counties voted substantial bond issues in support of road and bridge building. Orange County offered seven million dollars in bonds, Lake County budgeted six million dollars, and Monroe County spent four million dollars. *Florida Highways* magazine provides insight into popular support for highway construction projects during this decade. Women's groups were active in highway beautification programs; ceremonies were held at highway and bridge openings; and, milestones were dedicated across the country.[37]

Civic projects undertaken during this period were characterized by their grand scale. The transcontinental US Highway 90, which covered a distance of roughly 4,000 miles of road, represented a major undertaking that was completed during the late-1920s. The Florida portion of US Highway 90, State Route (SR) 10, represented the largest road construction project in western Florida; the system extended from Saint Augustine, Florida, to San Diego, California. Completion of US Highway 90 was accompanied by much fanfare. A motorcade stretching from California to Florida celebrated the opening of the new highway and ushered in the new era of the automobile.

The frantic pace of Florida development during the 1920s presented a challenge for the State Road Department in supervising construction activities. Roads and bridges often were erected hastily to keep pace with the demand. Although this boom period produced a record number of bridges, relatively few structures were characterized by their innovative engineering techniques or high quality of design.[38] Many of Florida's bridges dating from this period were fabricated by out-of-state manufacturers. The industrial belt of the Northeast and Midwest led the nation in the technology and manufacture of metal trusses. Salesmen marketed the latest types of metal truss bridges through company catalogues. The Champion Bridge Company of Ohio was one of the most prolific fabricators of metal truss bridges in Florida. Active throughout the 1890s to the early 1930s, the company was credited with introducing the "rolling lift bascule" bridge to Florida. The bascule span became a predominant type of movable bridge erected in Florida since it could accommodate navigation traffic in the waterways. Two Tennessee companies, the Converse Bridge Company of Chattanooga and the Nashville Bridge Company, also emerged as prominent companies. The Nashville Bridge Company was founded in 1902 by Arthur Dyer, an engineer graduate of Vanderbilt University, and claimed to have built more than half of the bascule bridges in Florida.[39]

The Pensacola Shipbuilding Company emerged as Florida's principal native producer of steel bridges, with a base of operations in Pensacola, Florida. The company was formed by Chicago financiers in 1917 to build ships for the war effort. One of the founders, Fayette Fletcher Soule, as well as several of his colleagues, previously had been employed with the Scherzer Rolling Lift Bridge Company. The company obtained a nine million dollar contract from the federal government to build U.S. merchant fleet vessels. With the end of World War I, contracts for ship building ceased. By the 1920s, the company shifted its focus to building bridges. The Pensacola shipyard, which was equipped to construct steel ships, made for a fairly smooth transition into the fabrication of steel bridges. Many of the bridges erected by the Pensacola Shipbuilding Company, including the original Caryville Bridge, employed the Scherzer type lift due to the founders' connection with the Chicago company.[40]

The American Bascule Bridge Corporation was an outgrowth of the Pensacola Shipbuilding Company and was formed by Fayette Soule, along with the company secretary. The company was short-lived, however, and ceased operations in the early 1930s with depression era. Records are unclear on whether the two companies operated from the same location or were integrated in any way. This transition may provide some explanation for the delay in construction of the Caryville Bridge, which was commissioned by Congress in 1919 and not completed until 1927. Other bridges constructed by the Pensacola Shipbuilding Company and American Bascule Bridge Corporation include the Ellaville-Hillman Bridge over the Suwanee River; the St. Mary's River Swing Bridge in Naussau County; the Ortega River Bridge in Duval County; the Blackwater River Bridge at Milton, Florida; the Ocmulgee River bridge in Hawkinsville, Georgia; and, the Apalachicola River Bridge at Chattahoochee, Florida.[41]

During the early decades of this century, the design of bridges reflected local needs and resources. Population base, economic development, transportation requirements, and geographic location dictated the type of road and bridge projects planned by the counties. Timber remained a common bridge material and was used for erecting inexpensive trestles or deck bridges. Reinforced concrete gained popularity during the 1910s and 1920s due to its durability, and was used on heavily traveled routes. In 1927, the State Road Department estimated that approximately 11,214 feet of concrete bridges and 12,875 feet of timber structures existed on State Route Number 1.[42]

Federal highway bills were passed in 1922 and 1935 that served to reaffirm the federal-state partnerships and to assure the support of highway programs through World War II. During this period, state highway departments evolved into larger, more effective organizations. By 1929, approximately 80,000 miles of roadway were added to the federal aid system. Comprehensive highway surveys conducted by state departments influenced planning, policy, and engineering decisions.[43]

The optimism of the 1920s quickly dissipated as the nation plunged into its most severe economic crisis in history. Franklin Roosevelt initiated the New Deal program as a means to stimulate the economy and to provide jobs for the unemployed workforce. One important aspect of Roosevelt's program focused on road and bridge projects. Legislation, including the Hayden-Cartwright Act of 1934, was passed that committed greater levels of national support for roads. Between 1933 and 1938, the federal government expended roughly one billion dollars on highway construction. By this date, Florida had spent roughly 250 million dollars on highway improvements, 9,000 miles of hard surface roads, and a multitude of highway structures.[44] By the 1930s, there was a move away from the popular metal truss bridge to the more economical and graceful cantilever and continuous truss bridge types.[45]

In 1935, a devastating hurricane swept through the Florida Keys and destroyed a portion of the Florida East Coast Line Railroad, halting service and crippling the local economy. The state responded swiftly to this emergency by securing federal assistance from the Public Works Administration (PWA) in order to convert the rail line into the Overseas Highway. The existing concrete arches, steel plate girders, and steel trusses were transformed into vehicular spans. The Bahia Honda through truss bridge, which was unable to accommodate two lanes of automobile traffic, was modified into a deck truss by building the roadway on the top chords and cantilevering cross beams off each side. The Overseas Highway, which linked the mainland with Key West, was completed in 1938 and represented one of its largest projects ever undertaken by the state. The Overseas Highway was helpful in reviving the region's economy. It also enabled Key West to serve military purposes during World War II.[46]

The United States' entry into World War II in 1941 curtailed most state highway projects and shifted the focus to defense-related work, as set forth in the Defense Highway Act. The State Road Department was involved in providing access roads to military establishments and improving highways designated as crucial to the movement of military traffic. Projects were conducted at Pensacola, Tampa, Jacksonville, and Orlando. The Overseas Highway, which served an important role during the war years, was modernized and shortened. New bridges were constructed over the Banana and Indian rivers to serve naval facilities at Cocoa. The Caryville Bridge was modified substantially between 1944 and 1952. The bridge retrofit was conceived during the early 1940s, when the country was immersed in a wartime "recycle and save" mentality. In July 1943, the Defense Highway Act was amended to authorize the preparation of plans, specifications, and estimates for proposed construction projects following the end of the war. The 1944 highway act authorized funds for the creation of a secondary highway system. The Bureau of Public Roads, the AASHO, and the National Association of County Engineers established minimum standards for road and bridge design as part of this system.[47]

With the end of World War II, the nation witnessed another explosive rise in automobile traffic. During the post-war period, Florida experienced a construction boom in its road building history. Technological advances accompanied the construction boom and, as a result, many new products were introduced to the expanding market. The post-war years witnessed the introduction of new types of innovative bridge designs across the United States. The emergence of the Florida sunbelt as a highly desirable place to live and work, as well as its growing tourist trade, put considerable pressure on the state highway system to expand and improve. The State Road Department initiated a widespread plan during the 1950s to enlarge roads linking major cities with four-laned highways. Between 1954 and 1964, the number of four-laned roadways increased from 350 miles to 1,700 miles. Much of this construction activity was concentrated around urban centers; however, rural construction also increased during the early 1960s.[48] Federal legislation passed in 1954 resulted in a major change in the federal-state role. "The Secondary Road Plan" allowed states to discharge most of its engineering and administrative review responsibilities for secondary road systems by certifying that projects had been designed within state standards. Local highway agencies benefited from this program through streamlined review and increased funds to local roads.[49]

William E. Dean, state bridge engineer from 1948 to 1962, gained national prominence for advocating the use of prestressed concrete in bridge construction. Prestressed concrete slabs were used to replace the timber decks on spans along the Tamiami Trail. Many of Dean's progressive ideas were used in the construction of the Sunshine Skyway across lower Tampa Bay in 1954. The Skyway, which extended approximately fifteen miles and linked the St. Petersburg and Bradenton areas, was built at a cost exceeding 22 million dollars. Long filled-in causeways connected to a cantilevered steel truss that rose 155 feet above the bay, allowing clearance for ships entering the busy Gulf ports.[50]

Conclusion

As originally designed, the Caryville Bridge was a representative example of the Warren pony truss with a double leaf Scherzer Rolling-Lift bascule, a common bridge type constructed over Florida's waterways. Modifications carried out between 1944 and 1952 made substantial changes to the bridge's original configuration, and included replacing the bascule span and widening the roadway. The innovative approach transformed the main span of the bridge into a Warren fixed deck truss. The original floor stringers were salvaged and incorporated into a new cantilevered deck positioned on top of the original Warren trusses. Its distinctive concrete pile bents also were retained.

If the Caryville Bridge had retained its original configuration, it would stand as a representative example of this type. Its innovative adaptation to a Warren fixed deck truss, however, makes it a rare surviving example of its type. Only one other documented example of a Warren fixed truss bridge still survives in Florida, the Helena Run Bridge in Lake County. Two other examples, the Toronto Bridge and the Fanning Springs Bridge have been demolished subsequently. The Helena Run Bridge was designed as a pony truss bridge and is believed to be the oldest example of its type; the bridge is longer included in FDOT's maintenance list and may no longer exist.[51]

Only one other bridge, the Bahia Honda Bridge in Monroe County, is similar to the Caryville Bridge in its innovative adaptation of an existing metal truss. The Bahia Honda Bridge is located on the Overseas Highway and connects Florida's mainland to Key West. The original metal truss bridge was converted from a railroad to a highway bridge in 1938 by the addition of a deck on top of the Pratt through trusses to widen the road for vehicular traffic. The bridge is listed on the National Register of Historic Places for its historical and engineering significance. [52]

Lastly, the Caryville Bridge stands as one of the few surviving bridges constructed by the Pensacola Shipbuilding Company, the principal builder of steel bridges in Florida. The company, which had its start in the bridge building business during the 1920s, was established initially to construct ships for the war effort. Formed by Chicago financiers in 1917, the company brought with it a core group of former employees of the Scherzer Rolling Lift Bridge Company. As a result of this connection, many of the bridges erected by the Pensacola Shipbuilding Company employed the Scherzer type lift.[53]

[1] Janus Research, *Cultural Resource Assessment Survey of the Choctawhatchee River Bridge Project Site on State Road 10, Washington and Holmes Counties, Florida* (Prepared for the Florida Department of Transportation, October 1995), 54,60.

[2] Janus Research, *Cultural Resource Assessment Survey*, 60.

[3] Janus Research, *Cultural Resource Assessment Survey*, 54.

[4] Carswell, *Washington, Florida's Twelfth County*, 199; Janus Research, *Cultural Resource Assessment Survey*, 54.

[5] Senate Committee on Commerce, *Bridge Across the Choctawhatchee River, Fla.*, 66th Cong., 1st sess., 1919, S. Rept. 260, 1; Janus Research, *Cultural Resource Assessment Survey*, 54.

[6] Janus Research, *Cultural Resource Assessment Survey*, 54-56.

[7] Janus Research, *Cultural Resource Assessment Survey*, 56.

[8] Janus Research, *Cultural Resource Assessment Survey*, 49-52; FDOT, *The Historic Highway Bridges of Florida*, 5.

[9] Carswell, *Washington, Florida's Twelfth County*, 200.

[10] Carswell, *Washington, Florida's Twelfth County*, 200.

[11] T. Allan Comp and Donald Jackson, *Bridge Truss Types: A Guide to Dating and Identifying*, Technical Leaflet 95 (Nashville, TN: American Association for State and Local History, 1977), 1; Carl Condit, *American Building: Materials and Techniques from the Beginning of the Colonial Settlements to the Present* (Chicago, IL: The University of Chicago Press, 1968), 214.

[12] Comp and Jackson, *Bridge Truss Types*, 2.

[13] Comp and Jackson, *Bridge Truss Types*, 2-3.

[14] Condit, *American Building Art*, 82-83.

[15] Comp and Jackson, *Bridge Truss Types*, 3.

[16] Janus Research, *Cultural Resource Assessment Survey*, 56; Comp and Jackson, *Bridge Truss Types*, 3, 8; Condit, *American Building Arts*, 87.

[17] Condit, *American Building Arts*, 99; Condit, *American Building*, 225-226.

[18] FDOT, The Historic Highway Bridges of Florida, 27; Otis Hovey, Movable Bridges Volume 1-Superstructure (New York, NY: John Wiley & Sons, 1926), 16.

[19] Torrington Company, *Anti-Friction Bearing Design For Movable Span Bridges* (South Bend, IN: Torrington Company, 1950), 27; Otis Hovey, *Movable Bridges Volume 1-Superstructure* (New York, NY: John Wiley & Sons, 1926), 16,18.

[20] FDOT, *The Historic Highway Bridges of Florida*, 33; Hovey, *Movable Bridges*, 101.

[21] H. Shirley Smith, *The World's Greatest Bridges* (New York: Harper & Row, 1953), 93; Torrington Company, *Anti-Friction Bearing Design*, 27.

[22] Florida Department of Transportation (FDOT) Environmental Management Office, *The Historic Highwey Bridges of Florida* (Tallahassee, FL: Prepared for FDOT, 1992), 10.

[23] Edwin Clarence Carter, *Territorial Papers of the United States, Territory of Florida,* (Washington, D.C.: General Services Administration, 1958), 736-737.

[24] E.W. Carswell, *Washington, Florida's Twelfth County* (Chipley, FL: E.W. Carswell, 1991), 195; FDOT, *The Historic Highway Bridges of Florida*, 10.

[25] FDOT, *The Historic Highway Bridges of Florida*, 10.

[26] FDOT, *The Historic Highway Bridges of Florida*, 10.

[27] Carswell, *Weshington, Florida's Twelfth County*, 382.

[28] E.W. Carswell, *Holmesteading, the History of Holmes County, Florida* (Chipley, FL: E.W. Carswell, 1986), 97.

[29] FDOT, *The Historic Highway Bridges of Florida*, 11.

[30] FDOT, *The Historic Highway Bridges of Floride*, 11-12.

[31] U.S. Department of Transportation, Federal Highway Administration, *America's Highways 1776-1976; A History of the Federel-Aid Program* (Washington, D.C.: U.S. Govemment Printing Office, 1977), 78.

[32] U.S. Department of Transportation, *America's Highways*, 78.

[33] American Association of State Highway Officials, *The American Association of State Highway Officials, A Story of the Beginning, Purposes, Growth, Activities, and Achievements* (Washington, D.C.: AASHO, National Press Building, 1964), n.p.; FDOT, *The Historic Highway Bridges of Florida*, 20.

[34] American Public Works Association 1977:81; Smith, "Exposition Roads," 144.

[35] American Public Works Association 1977:115-116; Mary K. Smith, "Exposition Roads: The Dissemination of Road Building Technology at American Exposition, 1876 to 1915" (Masters diss., Comell University, 1997), 138.

[36] Carl Condit, *American Building Arts, The Twentieth Century* (New York: Oxford University Press, 1961), 87.

[37] H. B. Ayres, "Zero Milestones Along the Old Spanish Trail," *Florida Highways* 1, no.8 (1924): 1-5; FDOT, *The Historic Highway Bridges of Florida*, 20-21.

[38] FDOT, *The Historic Highway Bridges of Florida*, 21.

[39] FDOT, *The Historic Highway Bridges of Florida*, 13,16-17.

[40] Mary Merritt Dawkins, "The Pensacola Shipbuilding Company" (Pensacola, FL: Pensacola Historical Society, 1994), 1; FDOT, *The Historic Highwey Bridges of Florida*, 17.

[41] Dawkins, "The Pensacola Shipbuilding Company," 3; FDOT, *The Historic Highway Bridges of Florida.*

[42] FDOT, *The Historic Highway Bridges of Florida*, 17,22.

[43] American Public Works Association 1977:82.

[44] FDOT, *The Historic Highway Bridges of Florida*, 20,33; Florida Department of Public Instruction, *Florida: A Guide to the Southemmost State* (New York, NY: Oxford University Press, 1939), 72.

[45] Condit, *American Building Arts*, 87.

[46] FDOT, *The Historic Highway Bridges of Florida*, 33.

[47] American Public Works Association 1977, 84,117; FDOT, *The Historic Highway Bridges of Florida*, 34.

[48] AASHO, *The American Association*; FDOT, *The Historic Highway Bridges of Florida*, 35.

[49] American Public Works Association 1977:85.

[50] FDOT, *The Historic Highway Bridges of Florida*, 35.

[51] FDOT, *The Historic Highway Bridges of Florida*, 102; Janus Research, *Cultural Resource Assessment Survey*, 56-58.

[52] FDOT, *The Historic Highway Bridges of Florida*, 33; Janus Research, *Cultural Resource Assessment Survey*, 58.

[53] Dawkins, "The Pensacola Shipbuilding Company," 1; FDOT, *The Historic Highway Bridges of Florida*, 17.

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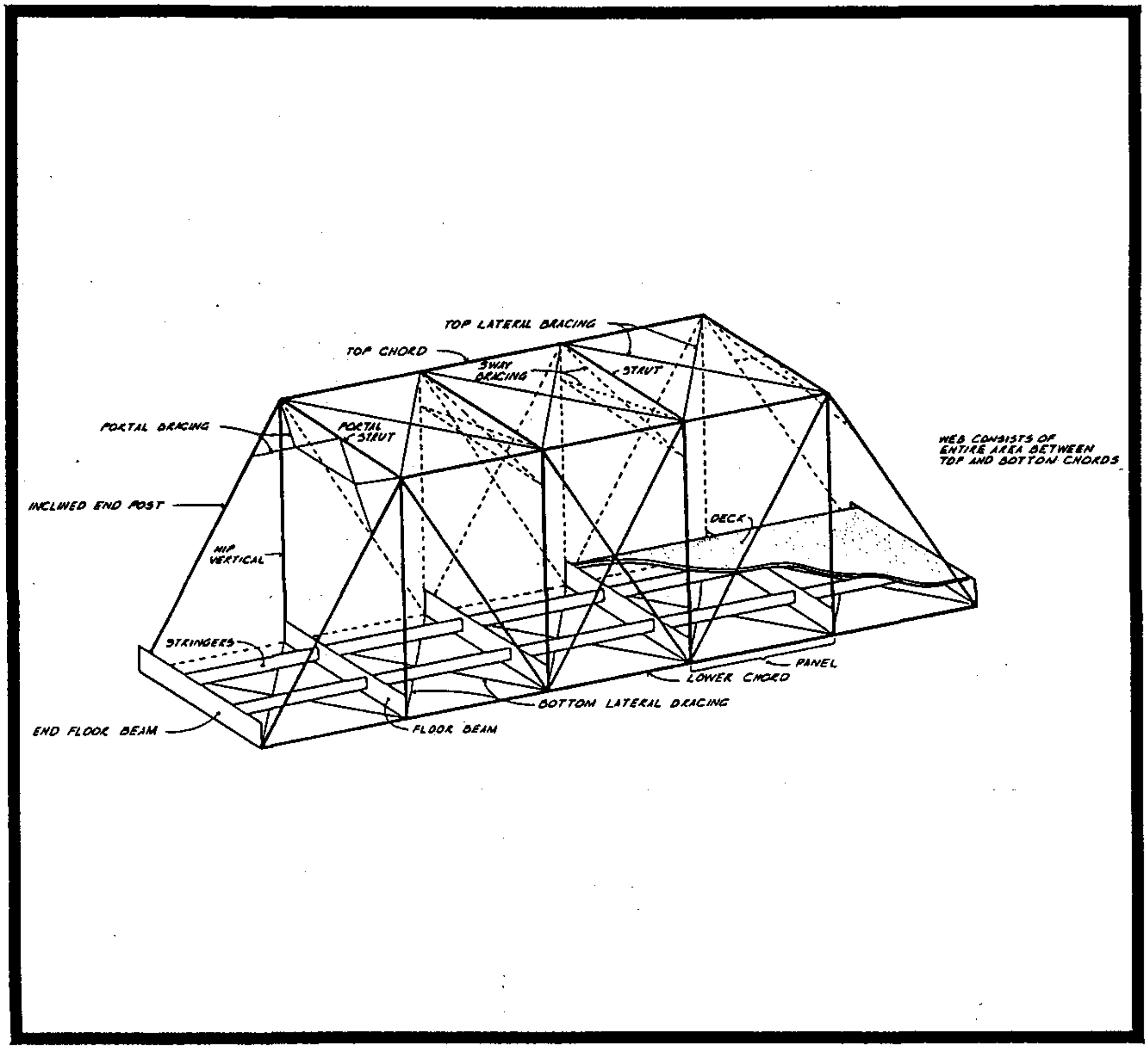
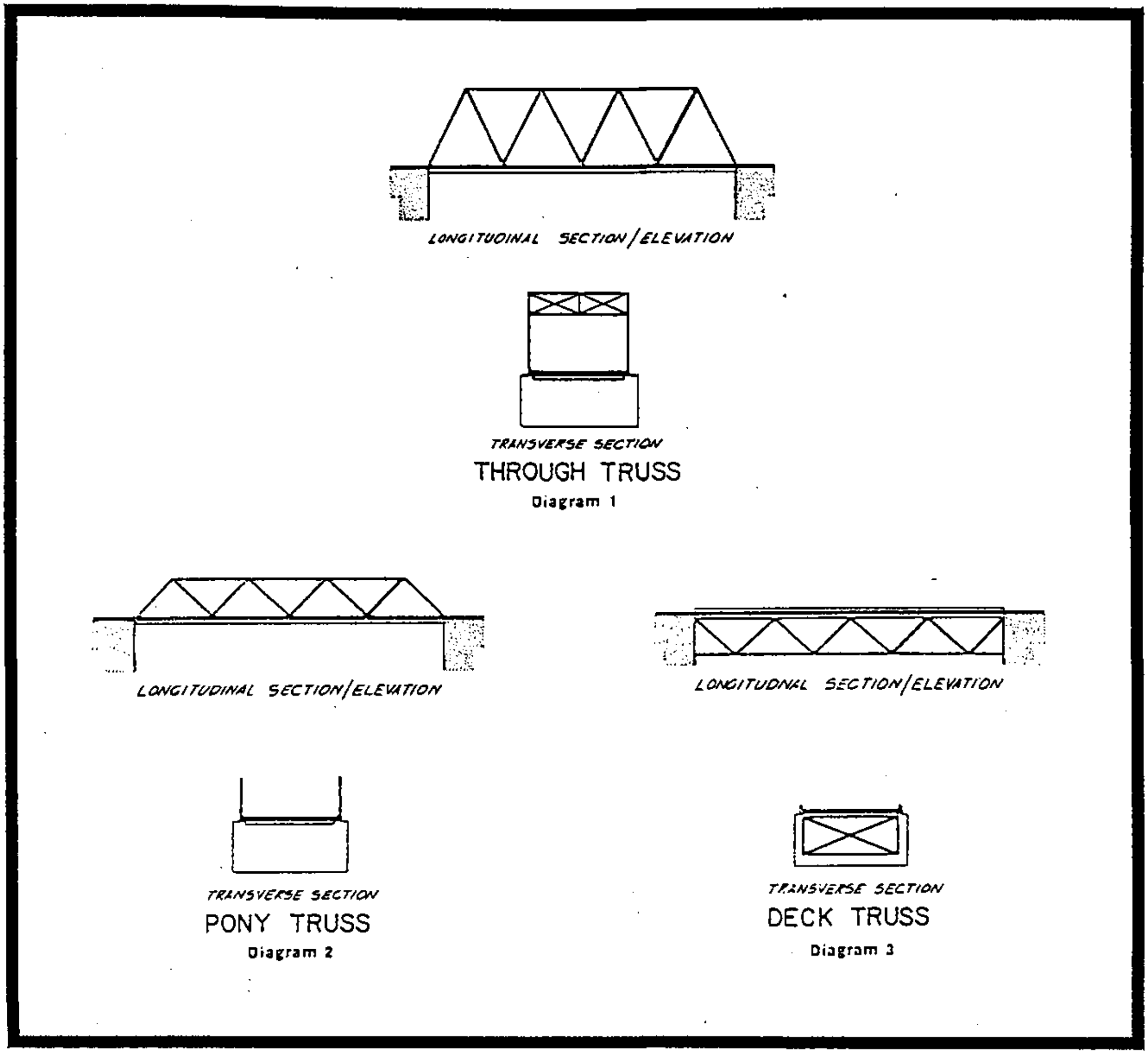
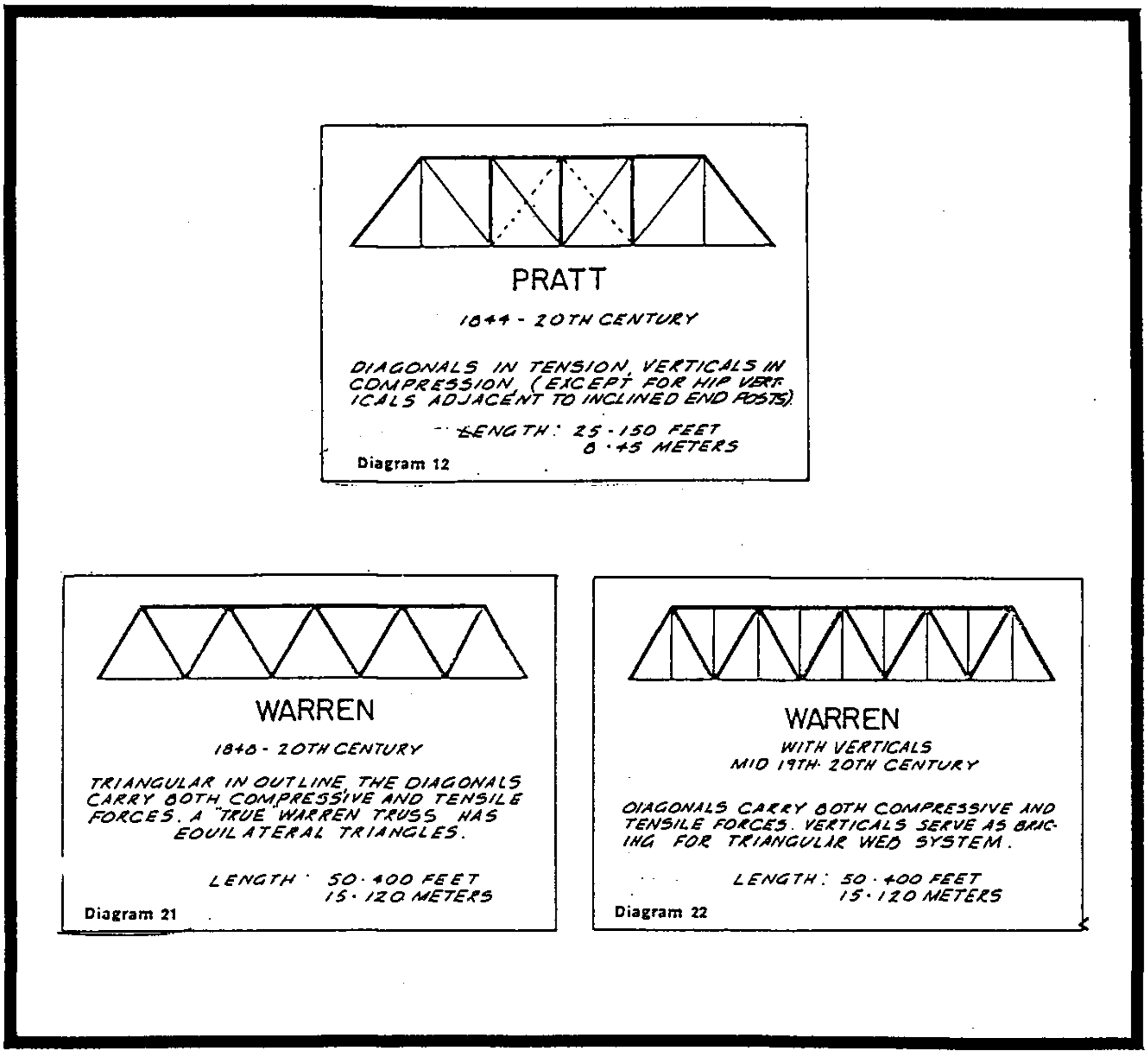


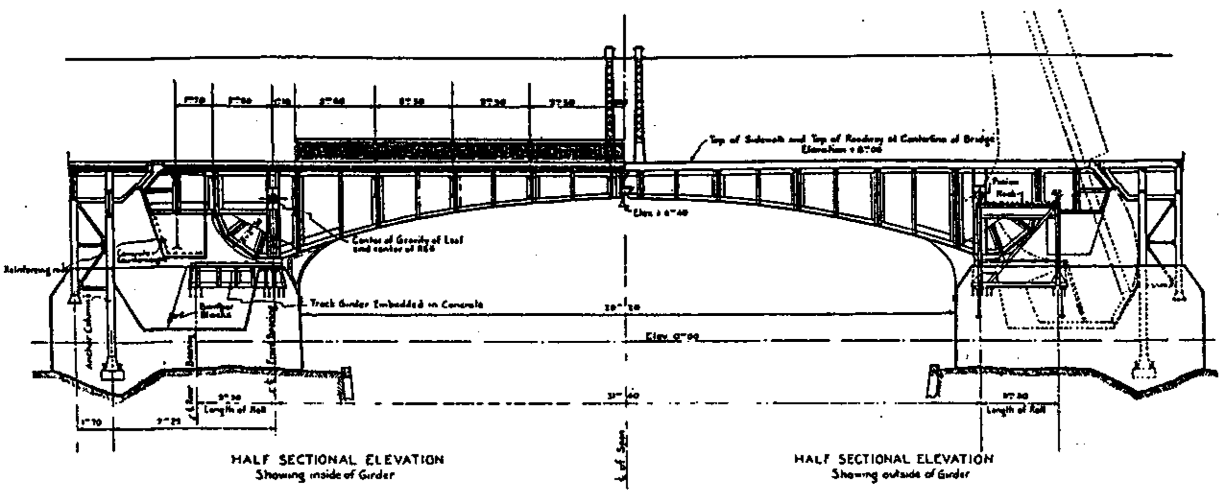
Isometric drawing depicting components of a typical truss bridge (derived from T. Allan Comp and Donald Jackson, *Bridge Truss Types: A Guide to Dating and Identifying*).



Diagrams of through truss, pony truss, and deck truss types (derived from T. Allan Comp and Donald Jackson, *Bridge Truss Types: A Guide to Dating and Identifying*).



Diagrams of Pratt and Warren truss types (derived from T. Allan Comp and Donald Jackson, *Bridge Truss Types: A Guide to Dating and Identifying*).



Elevation of double-leaf Sherzer bascule bridge (taken from Otis Hovey, *Movable Bridges, Volume 1: Superstructure*, p. 107).

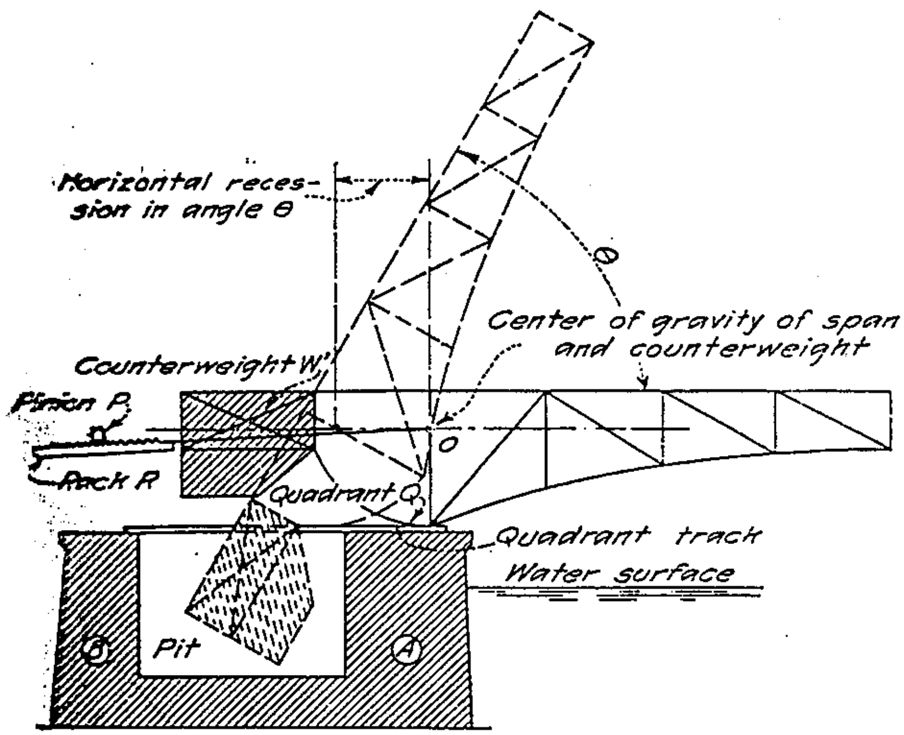


Diagram of Scherzer rolling lift type bascule span (taken from George Hool, *Movable and Long-Span Steel Bridges*, p.15).