WALNUT STREET BRIDGE
Across the Tennessee River
at Market Street
Chattanooga
Hamilton County
Tennessee

HAER NO. TN-11

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Buildings Survey
National Park Service
Department of the Interior
Washington, D.C. 20013-7127

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HISTORIC AMERICAN ENGINEERING RECORD

Walnut Street Bridge

HAER No. TN-11

Location:	Across the Tennessee River at Market Street Chattanooga, Hamilton County, Tennessee
Date of Construction:	1889-1891; repaired several times during 20th century
Engineers:	Chief Engineer: Edwin Thacher Resident Engineer: J. A. Fairleigh Assistant Engineer: E. E. Betts
Present Owner:	City of Chattanooga
Significance:	The Walnut Street Bridge was apparently the first non-military highway bridge across the Tennessee River. Designed by the renowned engineer, Edwin Thacher, it played a major role in the economic development of southeastern Tennessee. Comprised of six camelback through trusses and an iron viaduct, the bridge comprised a major feat of structural engineering.
Historical Report Prepared by:	Kay Gaston, 1979
Edited for Transmittal by:	Donald C. Jackson and Jean P. Yearby, HAER, 1985

The city of Chattanooga, Tennessee, began as a trading center called Ross's Landing on the south bank of the Tennessee River where it passes through the southeastern corner of the State. It was established around 1800 by John Ross, who became Principal Chief of the Cherokees. Ross built a warehouse and operated a ferry which was located at the foot of Lookout Street.[1] In August of 1838, the summer of the Cherokee removal, Chattanooga was given its present name, was laid off in city lots, and began its commercial growth. But it was not until Union troops occupied Chattanooga during the Civil War that the first permanent bridge was built across the river.

Construction of the bridge began early in 1864 under the direction of U.S. Quartermaster General Montgomery C. Meigs. Because of its cost of $750,000, the bridge apparently became known in Army circles as "Meigs' folly." The wooden arch bridge was located at the foot of Market Street. Its length was 1,000 feet and its floor width was 40 feet. It comprised 90 ft. spans resting on pens filled with stones and braced with trestle bents between the wooden piers. It was constructed almost entirely of green oak timbers cut on the northern bank; the only iron used was for spikes and strap hinges.

When the army of occupation left Chattanooga in the spring of 1866, the U.S. Government gave the already rotting bridge to the city. It became an even greater liability when 25 mules stampeded over the drawbridge and drowned in the river, causing a damage suit to be brought against the city. Then came

the flood of 1867, the greatest on record in Chattanooga. The flood, caused by a storm extending across the entire southeastern United States, reached its crest in Chattanooga on March 11, 1867, at a maximum stage of 57.9 feet. The day before the flood crested it was reported that a section of the bridge at the city end had already washed out and was tied to the bank above Market Street.[2]

After the demise of the military bridge, river crossings were made with a succession of ferries. A steam ferry called the "Murry" was followed by a quaint swing ferry operated by John Fields. This ferry consisted of flatboats placed at intervals across the river and tied together with cables that swung traffic from bank to bank. A travelog writer named Oliver Bunce visited Chattanooga around 1872 and vividly described the difficulties of boarding the swing ferry:

> . . . the exact place of landing cannot be controlled, the rise or fall of the stream varying it considerably. On our return we found the nose of the boat thrust into a bank, and some apprehension prevailing about how the waiting cargo was to be got on board. Our horses were unharnessed, and the vehicle, by the strenuous efforts of half a dozen negroes, lifted on board. Then the horses, our own and several others, without much difficulty, jumped the space; but the cattle struggled, and backed, and plunged, with the most incorrigible perversity. Some charged back, and tried to escape up the hill; others plunged into the water; and one fine heifer was with difficulty saved from drowning. At last, after a great effort, much shouting, and woful [sic] confusion, cattle, horses, carriage, and pedestrians, were successfully shipped, but crowded together on the narrow flat with promiscuous disregard of class or species.[3]

Bunce reported that Chattanooga was an extensive cattle market for the southern States, adding that large herds constantly entered the city by ferry. He observed that the great throng of horsemen and cattle waiting on the banks gave evidence of an active business and indicated his surprise that the bridge had not been restored.[4] The next ferry was operated by Abe Beeson, who owned land on the north side of the river across from Pine Street. This ferry was operated with four mules in the manner of a sorghum mill. When Beeson died, George Dugger bought the ferry and swapped the mules to the Wheland Company for machinery to operate it.[5]

As early as May of 1882 agitation began for the construction of a bridge across the river.[6] H. C. Beck and R. M. Barton, Jr. brought the matter to the attention of the County Court at the July term, 1884. They proposed that the county build a free bridge at the foot of Market Street to be paid for with 20-year bonds.[7]

The court appointed a bridge committee which employed Major S. Whinery to draw up a plan for the bridge and estimate its cost. Major Whinery, assisted by local engineer J. A. Fairleigh, prepared a plan and presented it to the committee on October 6, 1884. The committee reported to the court in January 1885, recommending construction of the bridge with a bond issue and suggesting that another committee be appointed to implement the project.

A new committee consisting of A. J. Gahagan, H. C. Beck, F. J. Bennett, F. E. Tyler, and R. M. Barton, Jr. reported at the April term, 1885,

recommending a bond issue to finance construction of the bridge. H. C. Beck, S. J. A. Frazier, and R. M. Barton, Jr. went to Nashville to procure passage by the legislature of Chapter 149 of the Acts of 1885. This act, which they had drawn, authorized the court to build a bridge across the Tennessee River at Chattanooga and to issue bonds in payment of its construction.

The County Court opposed immediate action but the committee continued to bring the matter before the court at each session. Finally the members of the committee became discouraged. They decided to organize a stock company and build a toll bridge:

> On August 13, 1887, a charter was obtained by which C. E. Stivers, R. M. Barton, Jr., G. W. Thompson, G. H. Jarnagin, I. B. Merriam, H. C. Beck and P. D. Sims were incorporated as the Chattanooga Bridge Company. An organization was perfected by the election of S. J. A. Frazier, President, and R. M. Barton, Jr., Secretary. Four days later this company signed a contract with the Decatur Iron Bridge and Construction Company to which the latter agreed to build the bridge within one year after that date. The contract was that the local parties were to take $50,000 of the stock of the company; the Decatur Company to take $50,000 in stock, and to take the bonds of the company for $100,000, and build the bridge for $200,000.[8]

The toll bridge was to be located at the foot of Market Street and was to have a draw span. (Note: Chattanooga engineer Clifford A. Betts, Jr. has an original drawing for this bridge submitted by the Decatur Iron Bridge and Construction Company which was then headed by Edwin Thacher). The incorporators of the Chattanooga Bridge Company and a few others subscribed the stock of $50,000, while Mr. Barton (with help in Washington) secured the passage of an Act of Congress allowing the bridge to be built across the

river. The company procured by condemnation and gift the right-of-way for the bridge at the foot of Market Street.

For unknown reasons, the Decatur Iron Bridge and Construction Company failed to comply with its contract and finally abandoned it on May 3, 1888. Undaunted, the Chattanooga Bridge Company proposed at the January 1889 term of the County Court to build a toll bridge for the county at a cost of $200,000 of good subscriptions as well as provide a $200,000 bond, for a total liability of $400,000. The company immediately began soliciting subscriptions and apparently closed a conditional contract with Philadelphia bridge company.

At the April 1889 term of the court, R. M. Barton, Jr. proposed that the Chattonooga Bridge Company donate to the county $25,000 and the right-of-way and franchises of the bridge company, if the court would agree to build a free bridge. The court accepted his proposal by a vote of 28 to 12. A. J. Gahagan, F. B. Thompson, B. R. Thomas, W. H. Converse, and F. de Tavernier. The duties of the commission were to located the bridge, close the contract with the Chattanooga Bridge Company, procure a plan, employ an engineer, and obtain bids.

A. J. Gahagan was elected Chairman and R. M. Barton, Jr., Secretary. Squire Gahagan "immediately took hold of the project in that vigorous and effective style with which he does everything pertaining to the welfare of the community."[9] Barton, the mild-mannered attorney who had originally

conceived the idea of the bridge and had demonstrated "tireless persistency, indefatigable energy and enthusiatic zeal,"[10] resigned as secretary after the contract was let. County Court Clerk John H. Messick was elected to serve in his place.

For Chief Engineer and bridge designer the commission engaged the services of Edwin Thacher, who had established a consulting engineer's office in Louisville, Kentucky. Thacher had been Chief Engineer, Vice-President and General Manager, and finally Receiver of the Decatur Iron Bridge and Construction Company which closed its shops on May 15, 1888.[11]

Thacher, who had previously served as Chief Engineer of the Keystone Bridge Company, was already well known among engineers for his invention of the Thacher Cylindrical Slide Rule patented on November 1, 1881. He developed a reputation "for rational and scientific design, combined with practical methods and details"[12] and would occupy an important place in the history of bridge building in the United States.

Working with Thacher as Resident Engineer was J. A. Fairleigh, a native of Brandenburg, Kentucky, who graduated from Rensselaer Polytechnic Institute in 1879. After working on various railroad lines Fairleigh had come to Chattanooga in December of 1880, where he achieved considerable success as city engineer and later as senior member of Fairleigh & Betts.[13]

Assistant Engineer on the bridge project was Edward Everett Betts, a native Chattanoogan who first worked with the civil engineer Robert L. Reed. Betts had received several promotions for his work on the New Orleans & Northeastern Railroad and in March of 1887 he took charge of an engineer corps on the Chattanooga & Lookout Mountain Railroad. He began the hydrographic surveys to determine the location of the new bridge in August, 1888.[14]

The transactions between the Chattanooga Bridge Company the county were completed by the time the County Court met for the July 1889 term. The court voted $200,000 in 5%, 20-year bonds. On the first day of October these bonds were sold at a premium of 4.34 per cent, yielding $208,680. Those funds plus the $25,000 from the incorporators of the Chattanooga Bridge Company and other donations amounted to a total fund of approximately $250,000 for construction of the bridge.[15]

The Bridge Commission opened correspondence with many bridge companies in the United States and apparently received bids on Thacher's design from approximately 20 companies. The commissioners arrived at the July term of the court with these bids and full plans, specifications, and surveys of the river and approaches to the bridge. The Market Street location had been abandoned in favor of Walnut Street, probably because the high bluff would eliminate the need for a draw span and would require less construction for the southern approach.

On July 10, 1889, the contracts were let to Neely Smith & Co. of Chattanooga for the substructure and to the Smith Bridge Company of Toledo, Ohio, for the superstructure. The Smith Bridge Company, one of numerous independent bridge companies then operating in the United States, was founded in 1867 by Robert W. Smith.[16] Smith was a largely self-educated engineer who had designed a Smith patent truss for wooden bridges. By the 1880's, his company had become involved in fabricating a variety of iron bridge designs.[17]

After the contracts were let it was decided to run two lines of streetcar tracks over the bridge, and the floor plan was changed accordingly. The contract for this work was let August 22, 1890, to McCauley & Morse of Pittsburgh. The Smith Bridge Company had already subcontracted the superstructure to this firm with L. L. Gross serving as foreman.[18]

The masonry work was commenced on September 20, 1889, by Neely Smith & Company. All of the work on the substructure was done by this firm except for the small abutment at Walnut Street and Pier No. 1, which was built by John Trout.[19]

E. E. Betts, who had located the center line of the structure and made the survey of the crossing for the triangulation work before construction began, recalled:

> "The Thacher plans, calling for excavating for foundations within open-top caissons by dredging, were abandoned as being impractical and coffer-dams were built. The bed rock of the Tennessee river is overlaid at the Walnut Street location with compact gravel, small sizes and increasing in

> size until the larger sizes overlay the rock. No particular difficulties were experienced except at Pier 3, opposite Chattanooga island, where there was a four-inch crevice. All of the pumps concentrated on the pier did not avail, even after the river bed was blanketed with a tarpaulin and clay, but the "city fathers" were sympathetic and lent a fire steamer so that the water was lowered enough to permit stuffing concrete-filled sacks in the crevice and rammed tight."[20]

Neely Smith had for their superintendent William A. Slayton, who had previously worked on the foundation of the Cincinnati Southern Bridge at Chickamauga. E. E. Betts said that Monroe Hilton was the outstanding mason working on the bridge. "Col. Neely, lovable old man, would come out to a barge and fume around when things were not going to suit him -- and there is lots of opportunity for grief on river work." Betts continued, "The colonel would, while looking up to men high up on the pier, edge over to the side of the pier and fall overboard. Knowing his habit, a boat was always kept handy and the colonel was rescued."[21]

Commenting on the supply of stone used in the substructure, Betts said that some of the lower courses in several piers came from the old Beck quarry where the Chattanooga Golf & Country Club is now located, but this supply was limited because much of it was used on the Cincinnati Southern Railway Bridge. The balance of the rock for the facing came from Concord, in east Tennessee near Knoxville. John Trout provided stone for his contract locally, a portion of it coming from the Stone Fort quarry where the Hotel Patten now stands.[22]

Three men, John Peacock, Jim Murphy, and Sam Sifford, were killed in accidents during construction of the bridge. Another accident occurred when the steamer "Conn," a screw type vessel chartered to do towing around the bridge, was shifting a barge lying upstream from Pier 5 near the north shore. The empty barge strung out behind the "Conn" swung out and knocked down about six bents of the high false work.[23]

An article appearing in Engineering News only three months after the dedication of the bridge gave complete information about materials used in the substructure:

	Cubic yards
Masonry, Class B	8,588
" rubble	305
Concrete in foundations	324
Excavation from coffer dams	735
Excavation from dry foundation, earth	1,107
Excavation from dry foundation, rock	80
Grading in approaches	670
Timber in coffer-dams	99,200 ft. B. M.
Puddling	3,150

> Masonry specified as 'Class B' was used in all piers from 0 to 6 inclusive, and ranged rubble masonry was used in the north abutment and viaduct pedestals. Class B masonry is the usual first-class masonry, laid in courses of from 12 to 30 ins. in thickness, except that concrete was allowed for backing. The projections beyond the pitched lines for face stones were limited to 4 ins. in the body of the pier and 2 ins. on the pointed ends. The copings of piers and starlings, the string course under copings, and the pedestal blocks on top of the copings are bush-hammered.
>
> Louisville quick-setting cement was used for all work under ordinary water level, and 'Howard cement,' which is a good cement, but sets more slowly, was used for all work above that level. Limestone of good quality was used through the work; 3,300 cu. yds. were quarried at Concord ... and the balance came from Beck's quarry and Stone Fort, near Chattanooga.[24]

A complete account of the work done on each pier was prefaced with the notation that low water, or 0 of government gage, had been taken as datum for all elevations, and that the average stage of water when foundations were put in was 4 ft. above datum:

Pier No. 0 -- The excavation for this pier was carried to elevation 90.5, or about 9 ft. below the natural surface of the ground. The foundation is a hard red clay mixed with flint rock. The masonry rests on a bed of concrete 18 in. deep; 105 cu. yds. of earth were excavated, and the grading on slope in front of pier amounted to 220 cu. yds.

Pier No. 1 -- Masonry is commenced at an elevation of 15.0, about 4 ft. below the surface of ground, and rests on a thin bed of concrete, used for leveling up. The foundation is solid rock. About 97 cu. yds. of earth and 80 cu. yds. of disintegrated rock were excavated from this foundation. A seam about 4 ft. deep, running diagonally across this foundation, as shown on the plan (Note: This article was accompanied by drawings showing the elevations, grades, design of masonry, strain sheets, distribution of material and details of superstructure) was cleaned out and filled with concrete.

Pier No. 2 -- The foundation for this pier is solid rock, which was reached at elevation -13.6, or 17.6 ft. below the surface of water and 7.6 ft. below the bed of river. It is the deepest of the foundations. The rock is smooth and level and is free from seams and imperfections of any kind; 320 cu. yds. of cemented sand, gravel and boulders were excavated. Masonry commences at elevation -13.0 and rests on a bed of concrete having a uniform depth of 0.6 ft.

The coffer-dam was 18 ft. high, or 8 ft. above the surface of water, to provide for future rise. A clear space of 4 ft. was allowed all around the foundation, and a clear space of 9 ft. between lines of sheet piling. This space was puddled with clay to an average height of 12 ft., requiring 900 cu. yds. About 450 cu. yds. of puddling were also deposited around the outside of dam. The coffer-dam and breakwater protection contained about 38,000 ft. B. M. of lumber. After the dam was puddled the water rose 30 ft. above its top without other damage than to wash out about half of the puddling. The dam was exposed to a strong current and had one end crushed by a raft, but the break was soon repaired, and work proceeded without serious delays.

Pier No. 3 -- The foundation is solid rock, which was reached at an average elevation of 9.3 ft., or 13.3 ft. below the surface of water and 3.5 feet below bed of river. The rock dips uniformly to the west, 2 ft. in the length of the pier, and is unbroken with the exception of the small open seam shown on plan. The total excavation was 155 cu. yds., consisting of cemented sand, gravel and boulders, interspersed with pockets of pure coarse sand. Masonry commences at elevation of -8.0, and rests on a bed of concrete having a depth of from 0.3 ft. to 2.3 ft. The coffer-dam was built 3 ft. above the surface of water, 5 ft. between sheet pilings, and contained 650 yds. of clay puddling; 300 cu. yds. of puddling was deposited around the outside of the dam. The coffer-dam and breakwater protection contained about 32,600 ft. B. M. of lumber.

The pockets of coarse sand and the open seams in the foundation rock gave much trouble, and the pumps, with a capacity of 5,000 galls. per minute, could not keep the water down. After the first course of masonry was laid the seams were closed with concrete in sacks laid across them and covered with large stones.

Pier No. 4 -- The foundation is solid rock, very irregular, and with numerous pockets, as shown on plan. The surface of the rock was ragged and honeycombed, and many detached pieces were found. This was all removed, and the pockets, which were filled with pure red clay, were cleaned out and filled with concrete, except when too narrow to excavate; they were then driven full of 4 x 4 in. piles, packed with concrete. This foundation has an elevation of from 5 ft., the highest point of rock, to 15.3 ft., the lowest point of pockets. Masonry was commenced at 5.0, resting on a bed of concrete, filling the intervening space. The depth of water was about 8 ft. About 2 ft. of sand and gravel were excavated to reach the highest point of rock, and below this the material was red clay. About 180 cu. yds. were excavated.

The coffer-dam was 10 ft. high, or 2 ft. above the surface of water. It was 4 ft. wide between the sheet piling, and contained 500 cu. yds. of clay puddling, while 200 cu. yds. were deposited around the outside of the dam. The coffer-dam and breakwater contained 24,700 ft. B. M. of lumber. Masonry was commenced Oct. 4, 1889, and resumed some time after the high water of March, 1890, when it was found out that at the west end of the dam the puddle was

washed out and the dam raised 1 ft., causing a break under the puddle. This gave much trouble; but after three weeks' work the cavity under the puddle was filled, the dam was pumped out, and the masonry was completed without further difficulty.

Pier No. 5 -- The foundation is solid rock, somewhat irregular and cut up with numerous pockets, as shown on plan. The elevation of bed rock ranged from 3.7 ft., the highest point, to 8.4 ft., the lowest point of pockets. The pockets, which were found filled with red clay, were cleaned out and filled with concrete. Masonry was commenced at 3.7 ft., all space below this elevation being filled with concrete. The depth of water was about 5.6 ft. From 2 ft. to 3.5 ft. of compact sand and gravel, amounting to about 80.0 cu. yds. were excavated. The coffer-dam extended 2 ft. above surface of water, had a clear width of 3 ft. between walls, and contained 150 yds. of clay puddling. The coffer-dam and breakwater contained 11,900 ft. B. M. of lumber. This dam was pumped dry at the second attempt, and remained dry until foundation was finished.

Pier No. 6 -- The excavation for this pier was carried to elevation 15.0, or about 17.0 ft. below the natural surface of the ground. The foundation is firm blue clay. The masonry rests on a bed of concrete 3 ft. deep; 490 cu. yds. of earth were excavated.

Pedestals -- The excavation for the pedestals supporting the iron viaduct were carried 5.0 ft. below the surface of ground. The foundation is blue clay from pier No. 6 to Meadow St., and red clay from Meadow St. to end of structure; 375.0 cu. yds. of earth were excavated.

North Abutment -- Excavation was carried 4.5 ft. below the surface, where the masonry rests on red clay; 40.0 cu. yds. of earth where excavated and the approach required 450 cu. yds. of embankment.

The coffer-dams for piers 2, 3, 4, and 5 were located accurately by aid of the breakwaters, and no trouble was experienced in moving them in any direction. After the frame of dam was in place it was weighted with rock, and sheet piling was commenced at the lower end. Puddling was then commenced and continued while sheet piling was being driven.

> The solid rock in the foundations was of the same general character, and dipped toward the south and 1 ft. in 100. When the rock was smooth no clay was found, nothing but sand, gravel and boulders, the latter getting larger as they neared the rock; but when the rock was rough and full of pockets the gravel extended only to the level rock, and all below that was pure red clay.
>
> The attempt was made to dredge the sand and gravel from the coffer-dams with sand pumps. One pump having a capacity of 3,000 galls. per minute and another of 5,000 galls. per minute were tried; they would take out the loose sand and small gravel, but made no impression on the cemented gravel, and this method was abandoned. These pumps were afterwards used to pump out the coffers, but all excavating was done by hand labor.[25]

Erection of the superstructure began on May 29, 1890. The entire length of the pin-connected Camelback through truss bridge was 2,370 ft. It consisted of an iron viaduct 780 ft. in length forming the approach on the north side and 6 spans crossing the river channel. Three of the spans were 210 ft. between centers of end pins and three spans were 320 ft. The superstructure contained the following quantities of materials, exclusive of spikes and handrailing:[26]

3 spans of 320 ft. each, iron and steel	1,102,351 lbs.
Average weight per ft.	1,141 "
3 spans of 210 ft. each, iron and steel	519,660 "
Average weight per ft.	872 "
Viaduct, 780', iron and steel	309,221 "
Average weight per ft.	396 "
Total iron and steel	1,961,232 "
Entire bridge, yellow pine creosoted	333,222 ft. B. M.
" " " " not "	126,606 " " "
" " white oak	106,660 " " "
Total timber	666,488 " " "

The report on materials for the superstructure noted that the engineer's estimate of iron and steel was a variation from the actual finished weights of about 1,465 lbs., or about one-fourteenth of 1%.

The total cost of the bridge that passed through the engineering department was $238,561.75. Of that amount, $96,197.50 was spent on the substructure; $130,189.16 on the superstructure; $3,980.75 for inspection; and $8,194.34 on engineering and incidentals.[27]

Colorful stories have survived from the period when the bridge was under construction. One concerns the birth of Clifford Aull Betts on March 4, 1890. His father, E. E. Betts, was at work on the bridge when the news came that a first child had arrived at his home in St. Elmo. To weigh the new little son, engineer Betts thought to take with him the scales used to weigh the bridge materials. Perhaps inevitably, the son weighed in on the bridge scales also grew up to become a civil engineer.[28]

Perhaps the first traffic violation on the bridge was attempted by E. R. ("Lige") Betterton, who later became commissioner of the department of streets and sewers that was responsible for repairing the bridge in 1938. Mr. Betterton was a ten-year-old boy when the bridge was nearing completion. He rounded up a pony from the farm where his brother lived on the north bank and set off for an early morning ride across the bridge, which was not yet open to the public. It was 5 a.m., but the watchman on the bridge spotted young Betterton and turned him back without ever letting the pony set foot on the structure.[29]

As construction drew to a close there was a major delay caused by the disappearance of a cargo of bridge joists. Two carloads of lumber 16' x

5'1/2" and 22' in length had been shipped from Washington, N. C.., but only one arrived in Chattanooga. On February 10, 1891, two members of the Smith Bridge Company left in search of the missing car, which they found three days later in the Atlanta yards. East Tennessee Railroad officials had refused to receive the car because it was out of repair. Meanwhile, the Times reported, the sidewalk on the east side had been put in temporarily for use by pedestrians as well as several horses that had been led across from Hill City to Chattanooga, "a rather dangerous proceeding."[30]

Although it was raining on Monday, February 16, Bridge Foreman L. L. Gross and Chief Carpenter Jimmie Rothermel began with a force of workmen to complete the six panels in the driveway of the bridge. Chairman Gahagan was on hand when the first of the missing joists arrived at 8 a.m. The last load arrived at 11 a. m. and by 5 p. m. they were all in place and the first course of flooring had been laid.

Carpenter Rothermel told the Times reporter who had come to watch the work with other interested spectators that he had been away from home nearly a year and was anxious to get back to Pennsylvania. When questioned about the lumber he was using, Rothermel replied, "No! We do not use creosoted timber up North. This is the first that I have ever handled. Yellow pine and live oak is what we use; but this creosoted timber will outlast the other five times. We expect to get through tommorrow (Tuesday) night and I intend to leave for home Friday."[31]

While the carpenters worked on the bridge floor, crews of the Chattanooga & Northside Street Railway Company were busy filling in the north approach with stone and gravel. The brick for the paving on Walnut Street had been delivered and the pavers were scheduled to begin operations. Electric light wires had been strung over the tops of the spans and along the sides of the viaduct. The pulleys and wrought iron posts for the lights were in place. The handrail manufactured by the Manly Manufacturing Company of Dalton, Georgia, was up and receiving its last coat of paint.[32]

At 4 p. m. on Tuesday, February 17, the first car of the Chattanooga & Northside Street Railway Company crossed the bridge, company president Sam R. Read having obtained special permission from the bridge commission. The car was drawn by mules, as the County Court had initially prohibited the use of electricity as a motive power on the bridge. The streetcar company had contracted for complete electrical equipment, however, and plans had been made to locate the power house in Hill City about three blocks from the north approach to the bridge. The carshed had been completed but was not yet in use because the turnouts were not in place.[33]

Wednesday, February 18, 1891, was "a soft balmy day" with a "clear, bright sky." As early as 1:30 p. m. a crowd estimated at 4,000 to 6,000 began gathering at the new bridge for the dedication ceremonies. At 1:45 p. m. five little girls -- May Gahagan, Martha Merriam, Mabel Stivers, Tennie Kendrick, and Florence Whiteside -- took turns driving the last spike in the last plank.[34]

The Times did not record the presence of one little boy Jesse Gahagan, who later claimed to have also taken part in the driving of the spike. In 1938, Mr. Gahagan reminisced, "'The little girls all did fine driving their nails. But I had chosen a large hammer and bent every nail I tried to drive, much to my chagrin, as the little girls, amused, stood by sniggering. A carpenter came to my rescue by giving me a small hammer. With this I was able to drive my nails in the bridge and save my reputation as a hammer wielder.'"[35]

The bridge was packed with people halfway across, and the crowd extended as far down Walnut as 6th Street. Women gasped as two or three small boys climbed atop the first span. The windows and verandas of neighboring houses were filled with spectators. Then master of ceremonies H. C. Beck, riding on a handsome bay horse, led a march of dignitaries from the Chamber of Commerce office down Market Street to 4th and down Walnut Street to the bridge.

Beck was followed by the 16-piece Hughes Military Band. The band had chosen a "gloomy funeral sort of composition," the Times noted with a hint of disapproval, but added that it was played very well. Next came Lt. Hankins and the police force, followed by 50 militia led by Col. Percy J. Fyffe. They in turn were followed by the County Council, City Council, Board of Public Works, Chamber of Commerce, Board of Trade, and various citizens.

Ceremonies at the bridge were opened with a prayer by Dr. Jonathan W. Bachman, pastor of the First Presbyterian Church. Included in Dr. Bachman's prayer was the supplication, "May this bridge be a means of blessing and help to us and

all our neighbors." Mayor I. B. Merriam followed with a speech enumerating the benefits the bridge would bring to Chattanooga. It would encourage the large wagon trade lying to the North and cause Hill City to be built up, the Mayor said, as well as improve access to timber, coal, farm products, and building sites.

Squire H. J. Springfield's remarks on behalf of Hill City were followed by a brief statement by County Judge Hugh Whiteside. United States Judge D. M. Key made a more lengthy speech, recollecting that when he had come to Chattanooga 38 years earlier "the little boats used as ferries wouldn't cross when the shade of evening came." Of A. J. Gahagan, who had guided the bridge project through to completion, Judge Key said, "He is a small man, but he has a large heart and a wonderful brain." In conclusion he observed, "This great river is 1,200 miles long and passes through scores of counties, yet the Court of Hamilton County is the only one in the entire State that has yet built a bridge across it." (Note: This statement, if accurate, indicates that the Walnut Street Bridge was the first civilian highway bridge built over the Tennessee River).

Commissioner Gahagan was next to address the crowd. "We have labored patiently and faithfully to meet the demands you have made on us, and now that the work is practically done, if our stewardships meet with your approbation, we will feel grateful for the privilege of having served you in this work," he said. "Mr. L. L. Gross and his chief workman, Jimmie Rothermel, under whose watchful care the superstructure has gone up, have shown their ability as

workmen, and by their many acts of courtesy to the public have won the respect of everyone who has had to cross the bridge before it was completed."

The work had been promptly paid for as it progressed, said Gahagan, who reported that Neely Smith & Company had been paid in full $96,197.50; $121,229.44 had been paid on the iron work, with a balance due of $1,131.71; and McCauley & Morse had been paid $7,149.44 on the streetcar track with a balance due of $678.56. He turned the bridge over to the people of Hamilton County, saying, "It has been pronounced by high authority as the best free bridge south of the Ohio River. It is an evidence of your progressive spirit. You have a right to feel proud of it, and you can receive it with the assurance that unless it is destroyed by unforeseen forces, it will stand the test of ordinary use for years to come."

Col. Tomlinson Fort, President of the Chamber of Commerce, made a speech in acceptance of the bridge and was presented with a basket of violets by Misses May Gahagan and Tennie Kendrick. Mrs. J. A. Fairleigh raised the American flag over the bridge and the crowd gave three cheers. After the militia had fired a volley and the band had played "Land of the Free," the citizens of Chattanooga and Hill City walked together over the bridge to the north bank.[36]

The next day the Times reported that all of Hill City, North Chattanooga, and Northside were crossing and recrossing the new bridge. Although the brick paving was completed, tarring remained to be done, and cars did not run until

evening. Two cars from the corner of 9th and Broad would run across the bridge to the junction of N. Market Street and Dallas Road, and then connect with a single car running to the terminus at the top of Stringer's Ridge.

Workmen were still lining up the railing and connecting tension bars, but the electric lights were in position. "The bridge has a beautiful appearance at night," the article continued, "and the river in its vicinity will no doubt be a favorite place for boating parties in the warm weather. The bridge is used by many as a promenade at the present time, and indications are that it will be one of the popular places for those sentimentally inclined." Engineer Betts had completed arrangements for placing the 6 red and 4 green signal lights on the piers and channel spans; these would be placed in charge of bridge watchman Thompson.[37]

Soon after its completion a cast iron sign was erected above the bridge naming the Smith Bridge Company, Toledo, Ohio, as Contractor for Superstructure; Neely Smith & Co. of Chattanooga as Contractor for Superstructure; and Commissioners A. J. Gahagan, Chairman, F. B. Thompson, W. H. Converse, and R. B. Thomas. Engineers named were Edwin Thacher, Chief; J. A. Fairleigh, Resident, and E. E. Betts, Assistant. The sign said the bridge was erected in 1890. (Note: A photograph of the sign appeared in the Times on November 9, 1960, with the information that it had been cleaned and was ready to be relocated on the bridge).

Before long the old mule cars were taken off the Walnut Street Bridge and electric cars were substituted. At first the County Court required that the electric streetcars be preceded by a horse or mule whose driver would stand on the platform with the motorman. It was specified by the court that all horse-drawn vehicles would have the right-of-way. After this arrangement had continued for about 90 days, the Court acceded to the suggestion of A. J. Gahagan and Squire Thompson that the local animals had become used to the streetcars and the mules could be removed.[38]

An article appearing in the Times shortly before the dedication of the bridge noted that the population of the suburb on the north bank of the river had grown in the last 5 years from a dozen houses to a population of 1,500. The article predicted that the population north of the river would reach 20,000 by the end of the decade and suggested that another bridge or two would soon be required.[39]

The streetcar company participated in imaginative efforts to attract passengers north of the river. A pavilion was built in 1892 or 1893 at Valombrosa on the crest of Stringer's Ridge where the red carline ended, just above the tunnel. It was a favorite gathering place for dancing until a rough element took over and a killing took place. Amateur theatricals were held at a playhouse built at the end of the yellow car line in Hill City. Balloonist John Thompson drew crowds on Sunday afternoons to the field on the north bank where the Chattanooga Country Club golf course is now located. In the late

1890's the streetcar also carried students across the bridge to Normal College, where Normal Park Elementary School is now located.[40]

In the spring of 1894, New England naturalist and writer Bradford Torrey took the electric streetcar across the Walnut Street Bridge to the new development named "Riverview." He reported that "the country was a suburb in its first estate: that is to say, a land company had laid out miles of streets, but as yet there were no houses, and the woods remained unharmed."[41]

A day or so later he set out to spend a week on Walden's Ridge and rode across the bridge in a hack driven by Tom Conner. "As we drove upon the bridge, where straight before his eyes was a sign forbidding anyone to drive or ride over the bridge at a pace faster than a walk, under a penalty of five dollars for each offense, he whipped up his horse and his mule ..., and they struck into a trot," Torrey wrote. "Halfway across we met another wagon, and its driver too had let his horses out."[42] The purpose of this sign, which remained in place for many years, was to prevent the amplification of a resonant frequency set up by the rhythmic motion of trotting animals.

"County Bridge Nearly Destroyed By Fire," the Times reported in a special edition on Thursday, September 23, 1897.[43] The fire was discovered by Robert Jones from his residence on the Chattanooga side about 1:30 p.m. Jones notified watchman Brown and the two started for the bridge with a pail of water. Then Dr. Y. L. Abernathy came across the bridge from Hill City and

told them a pail of water would do no good, advising them to call the fire department. A man was promptly dispatched to call the chemical engine company.

Smoke poured from between the planks of the first span on the north side and a strong wind from the north fanned the blaze. By the time the firemen arrived, the entire second span was a seething mass of flames. Chief Mulligan directed the laying of two lines of hose on the bridge. The wind shifted to a northeasterly direction driving smoke into the face of the fire "laddies" and driving the fire toward the Chattanooga end of the bridge. The firemen fought on as citizens congregated on the banks and in small craft on the river to watch the spectacular scene.

A telephone message was sent to Hill City asking citizens there to tear up a portion of the north approach to stop the fire in that direction. Joe A. Kerr and a few other gentlemen who happened to be on the north side organized a bucket bridgade and carried water from the river. Another group of men, hampered by a lack of proper tools, began tearing up the floor of the bridge. They retreated to the first pier on the north side and removed 10 feet of floor, which checked the fire.

It was 4 p.m. before the fire was under control. The "laddies" remained on the bridge until 6 p.m., pouring water on the smouldering ruins. A span and a half of the bridge floor was almost totally destroyed, the iron handrails on both sides were twisted out of shape, and the streetcar tracks were badly

warped. E. E. Betts said there was no damage to the heavy iron work, however, and W. A. Slayton, foreman of the crew which had built the piers, found only one upper stone cracked from the heat. The bridge watchman suggested that the fire had been caused by a spark from the bond wire (i.e. A small copper wire 1/4" in diameter soldered onto the ends of the rails and used to carry current from one rail to another) of the electric streetcar system. He said he had successfully put out other small fires near the track with a pail of water.

Judge Seth Walker said the county had taken no insurance on the bridge and added that he "never dreamed of the bridge burning." The losses in this case amounted to around $4,000. The double floors were highly flammable, constructed of seasoned oak and pine saturated with coal tar and resin. There would be many other fires over the years, usually attributed to lighted cigarettes carelessly thrown on the wooden sidewalks; the most recent occurred on October 30, 1952.[44]

Other disasters occurring on the bridge included occasional suicides and at least one hanging, which took place around 1910. The victim was a young black man named Ed Johnson who was accused of raping a white girl. Some residents of Chattanooga's black community still associate the bridge with this incident, which they remember as a grave miscarriage of justice in that the girl never directly accused Johnson as her attacker. Nonetheless, Johnson was taken out of the jail during the early hours of the morning by a group of citizens and was hung from the bridge. The hanging is documented in newspaper

accounts of the history of the bridge only by occasional references to one or more hangings which took place there. This account is from local historian Rosa McGhee, who learned of the incident from her father and from a local schoolteacher who knew the family of Ed Johnson.

The first significant study of the condition of the bridge was made in 1911 by Major William Dunbar Jenkins, a civil and consulting engineer employed by the finance committee of the County Court. Jenkins recommended an expenditure of $250,000 to restore the structure which he said had "pratically served its purpose." He also recommended that the bridge be widened and floored with concrete.

In his report Jenkins stated that the metal in the bridge was "in comparatively good condition" but said the wooden stringers carrying the floor and the floor itself needed to be replaced. He found the stone piers and abutments "of excellent workmanship" and "as good today as the day they were built." He suggested that the sudden rush of humanity and automobiles onto the bridge the night of the Loomis & Hart fire had greatly increased the live load and perhaps weakened the structure.

The Times was skeptical, noting that only a short time ago another eminent engineer had said, with the tightening of a few rods to stop the vibration, he would not hesitate to run the four tracks of the Pennsylvania Railroad over the county bridge.[45]

Nothing was done about the deteriorating condition of the bridge deck until March 11, 1914, when the announcement was made that the Walnut Street Bridge would be rebuilt, with 500 tons of steel girders replacing the wooden stringers. Girders 28" wide would be placed under the 4 car tracks and 15" wide girders would be placed on 28" centers to support the bridge floor. Creosoted timbers would be laid on the girders and the bridge would be paved with creosoted wood blocks. As a result of these improvements, the speed limit was to be removed and "the old rule of the slow drag across the bridge will be a thing of the past."[46]

It was essential to strengthen the bridge because of the increasing use of the automobile in Chattanooga, the rapid growth of North Chattanooga, and the increasing dependence of Hixson, Soddy, and Sale Creek on the city. Even after the repairs had been made, the Walnut Street Bridge was no longer adequate to handle the increased traffic, and by 1916 County Judge Will Cummings had decided to build another bridge across the river at Market Street.[47] After this bridge was completed in 1918 the Walnut Street Bridge assumed a secondary, although still important, role in the movement of traffic across the river.

There is no evidence of the bridge receiving any major repairs from 1914 to 1938, when the bridge was repaired at a cost of $65,000 as a WPA project. Commissioner Betterton was quoted as saying that 26 carloads of material went into these repairs, including one carload of nails alone. A Tuthill guard

rail was placed on top of the wheel rails as an additional safety feature. The Tuthill guard rail extended 780 feet along the north approach, where two fatal accidents had occurred.

City engineer Ashby Black found the 48-year-old-structure in good condition for its age, but he nonetheless suggested that the maxium load limit be reduced to 12 tons. Mr. Black recalled that the bridge had not undergone major repair since 1914, but said it had been surfaced with amesite 7 or 8 years earlier. Continuing repairs had included painting of the bridge and keeping the pins, bolts, and turnbuckles in proper adjustment. A new floor installed in 1938 had joints allowing for expansion and contraction and were said to be the invention of engineer Black.[48]

The firm of Peerson & Hedman submitted an engineering report on the bridge in 1948. It stated that the bridge could not be made safe for modern traffic and recommend that it be closed to all except passenger vehicles and closed to all traffic when winds reached 35 m.p.h. With an expenditure of $158,000, the report claimed the bridge could be made safe for passenger vehicles for 4 to 5 years. It was estimated that a replacement for the bridge would cost $2,100,000.[49]

The following minimum repairs were recommended in the report: reduction of the walkway from 7'1/2 to 5'3"; reinforcement of the portal bracing; replacement of expansion rollers; replacement of fixed shoes at south end of

span 1; reinforcement of damaged web verticals; cleaning and painting of all structural steel. It was at this time that city engineer M. E. Boriss observed that the bridge was last painted in 1933.[50]

Commissioner P. R. Olgiati recommended that a $160,000 contract for reconditioning and painting the bridge be let to Lindsay-Davis Company of Chattanooga. Of that amount, $140,000 would be spent on materials and $20,000 on engineering fees. Even though the bridge would be made safe for passenger vehicles, no trucks would be allowed on the bridge after the repairs were made.[51]

The Walnut Street Bridge was closed for repairs again in 1955. The 3" thick primary wooden subflooring was replaced at a cost of $25,000.[52] New expansion joints were added and the handrails, curb, and verticals were repaired.[53]

Further rebuilding of the bridge was proposed in February of 1957. These repairs were to be completed under the direction of John Martin Company, Inc. and were to take 70 days and require an expenditure of $270,355.40.[54] As performed, these repairs included the replacement of the timber stringers on the floorbeams with steel wide-flange sections and the installation of corrugated metal bridge decking covered with asphalt.[55]

Additional repairs amounting to $200,000 were begun on July 18, 1960. Industrial Steel Erection Company did the work with L. O. Hopkins & Sons of

Nashville carrying out the planning and engineering work. The rods were replaced by lattice work girders in the lateral, horizontal, and diagonal bracing of the superstructure.[56] There were also repairs to the pin plates at joints,[57] and all of the steel handrails were cleaned and painted.[58]

L. O. Hopkins & Sons inspected the bridge in 1965 and submitted a report in December showing the structure to be sound and recommending only minor repairs in the amount of $8,000.[59] Eight years later, the city contracted with Howard, Needles, Tammen & Bergendoff Engineering Company of New York to inspect the bridge at a cost of $92,420.[60] In a letter of December 17, 1973, the firm informed city engineer Ellis Spencer, "It is our judgement that the bridge could remain open to traffic for no more than three to six years only if the repairs and alterations listed in Chapter IX are undertaken immediately. At the end of that period, the bridge should be permanently closed."[61] On August 4, 1978, repairs which included the removal of the pedestrian walkway were begun at a cost of $178.000.[62]

Once it became apparent that the bridge would be permamently closed, some thought was given to its restoration for the use of pedestrians and bicyclists. Mayor Pat Rose envisioned the bridge serving a revitalized downtown area in this capacity in 10 to 15 years. Mr. Spencer also suggested that ways should be investigated to save the bridge for posterity.[63]

On May 11, 1978, the bridge was closed to all traffic with no plan for its restoration, although it was nominated to the National Register of Historic Places on June 12, 1978, by the Tennessee Department of Transportation.

The Howard, Needles, Tammen & Bergendoff report had noted that "the repairs performed over the last several decades were no longer designed to restore the structure to its best possible condition, but were rather meant to prolong its life for a limited time only."[64] This approach to bridge maintenance would probably have displeased Edwin Thacher, who was known for a rare appreciation of the strength and durability of materials and who grieved "to see a splendid structure neglected and deteriorating through lack of ordinary care in keeping the structure clean or painted."[65]

On the other hand, "his satisfaction and delight in finding structures that he had built 30 or 40 years ago still in good condition and showing every indication of capacity and excellence of construction was beautiful to behold, and an inspriration."[66] Although a more far-sighted program of bridge maintenance might have prolonged its life beyond 1978, Mr. Thacher would surely have been proud to know that the bridge he built across the Tennessee River at Chattanooga completed 87 years of useful service. The Walnut Street Bridge had indeed fulfilled Reverend Jonathan Bachman's supplication, "May this bridge be a means of blessing and help to us and all our neighbors."

FOOTNOTES

1) Times, June 5, 1938, page 1.

2) "The Chattanooga Flood Control Problem," 1939, page 74.

3) Picturesque America, Vol. I, 1874, page 67.

4) Ibid., page 63.

5) Times, June 5, 1938, page 1.

6) Ibid.

7) Times, February 15, 1891, page 1.

8) Ibid.

9) Ibid.

10) Ibid.

11) ASCE Transactions, Vol. 84, 1921, page 918.

12) Ibid., page 923.

13) Times, February 15, 1891, page 1.

14) Ibid.

15) Ibid., page 2.

16) Civil Engineering, October, 1977, page 100.

17) Covered Bridges of the Middle West, 1970, page 21.

18) Engineering News, 1891, page 462.

19) Times, June 5, 1938, page 1.

20) Ibid.

21) Ibid.

22) Ibid.

23) Ibid.

24) Engineering News, May 16, 1891, pages 462 and 463.

25) Ibid.

26) Ibid., page 462.

27) Ibid.

28) Times, June 5, 1938, page 1.

29) Ibid.

30) Times, February 14, 1891, page 5.

31) Times, February 17, 1891, page 4.

32) Ibid.

33) Times, February 18, 1891, page 6.

34) Times, February 19, 1891, page 5.

35) Times, June 5, 1938, page 1.

36) Times, February 19, 1891, page 5.

37) Times, February 20, 1891, page 6.

38) Times, October 17, 1948, page 34.

39) Times, February 15, 1891, page 2.

40) Times, October 17, 1948, page 34.

41) Spring Notes From Tennessee, 1896, page 113.

42) Ibid., page 128.

43) Times, September 23, 1897, page 5.

44) Times, October 31, 1952.

45) Times, July 2, 1911, page 5.

46) Times, March 11, 1914, page 5.

47) The Age of Will Cummings, 1962, pp. 58-59.

48) Times, June 5, 1938, page 1.

49) Times, May 11, 1949.

50) News-Free Press, May 10, 1949.

51) Ibid., May 11, 1949.

52) Ibid., January 31, 1955.

53) National Register of Historic Places Inventory - Nomination Form.

54) Times, February 15, 1957.

55) Walnut Street Bridge Inspection Report, December, 1973, page II-1.

56) Times, August 30, 1960. News-Free Press, September 15, 1960.

57) National Register of Historic Places Inventory - Nomination Form.

58) Times, January 4, 1961.

59) Times, December 18, 1965.

60) News-Free Press, March 20, 1973.

61) Walnut Street Bridge Inspection Report, December, 1973, page 1.

62) News-Free Press, August 26, 1974.

63) Times, June 30, 1975, page 1.

64) Ibid.

65) ASCE Transactions, Vol. 84, 1921, page 921.

66) Ibid.

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