

HISTORIC AMERICAN ENGINEERING RECORD

SOUTH FORK BRIDGE

HAER NO. AR-27

LOCATION: Adjacent to State Highway 128, near its intersection with U.S. Highway 5, spanning South Fork of Saline River, vicinity of Fountain Lake, Garland County, Arkansas.

UTM: 15/3828845/50712

Quad: Fountain Lake, Arkansas

**DATE OF
CONSTRUCTION:** 1928

ENGINEER: H.S. Moreland

BUILDER: Garland County bridge crew under the direction of F.M. Kelley.

PRESENT OWNER: Arkansas State Highway and Transportation Department.

PRESENT USE: Pedestrian bridge.

SIGNIFICANCE: Characterized by its unique design, the significance of the South Fork Bridge, a spandrel filled deck arch, is further enhanced by its original status as a county bridge. Designed by H.S. Moreland and constructed by the Garland County bridge crew under the direction of F.M. Kelley, the bridge is part of a larger complex, including a road and a smaller bridge, which together form a uniquely personal interpretation of an already idiosyncratic design.

HISTORIAN: Sean O'Reilly

DESCRIPTION: Corinne Smith

Arkansas Historic Bridge Recording Project, 1988.

"Greatest Flood in History sweeps down River" was the headline greeting the readers of the Hot Springs newspaper, the Sentinel Record, on Saturday morning, April 16, 1927.(1) The Mississippi River and its tributaries broke their banks and devastated roads and bridges throughout the state, causing "the worst national disaster in modern Arkansan history."(2). It flooded 1242 miles of road and washed away 293 bridges on state highways.(3)

Though one of the less ravaged counties, Garland County in west central Arkansas still suffered greatly from the floods. Among the rivers submerging the county was the South Fork of the Saline River, which passed through the eastern side. It was the flooding of this river which prompted the erection of the South Fork bridge and its approaches.

The flooding of the South Fork of the Saline River severely damaged the road linking Lonsdale, a small town on the east side of the county, with Highway 70, now Highway 5.(4) This connecting road, now Highway 128 and part of the Arkansas State Highway System, was a minor route in the county in the 1920s. As such, the precise character of the route across the river before the flooding is uncertain. There was no suggestion of a pre-existing bridge across the river immediately prior to the building of the new bridge and access across the river may well have been gained via a ford.(5)

The flooding also damaged the nearby property of farmer William Dodson which was to contain the site of the new bridge and its approaches (6). In November of 1928, when the payments for many of the costs of the South Fork bridge were being made, Dodson was given \$750 by the county as "part payment of South Fork bridge."(7) This was probably compensation for a new routing of the road and its bridge.

BRIDGE FINANCE

The financing and intended construction of a bridge over the South Fork of the Saline River was first recorded in the county court records for November 14, 1927. The Quorum Court for that day had County Judge Charles H. Davis presiding over a record attendance of fifty County Justices.(8) The Quorum or Levying Court, sitting each November in the Garland County courthouse in Hot Springs, was the administrator of county finances. Each year it appropriated and dispensed funds required in the execution of the financial responsibilities of the county. The 1927 Quorum Court sitting was particularly important because much work needed to be done to organize the finances for the repair of roads and bridges after the spring floods.

The court procedure commenced in the morning session of the sitting with the levying of a 3 mill (3 x 1/10 cent) tax "for road and bridge purposes for the ensuing year".(9) This funding was significant, as the tax was levied against "all taxable property in Garland County".(10) Together with the income from car registrations it provided sufficient funding for the allotment, later that morning, of "\$65,000 out of the road and bridge revenue of this county for road and bridge purposes".(11)

The afternoon session was primarily devoted to the specific distribution of the appropriated funds. It was in this session that the financial allocation for the South Fork bridge, among other bridges, was made. It was recorded in the county court records as follows:

In the matter of the appropriation of \$3500.00 for Bridge over South Fork Saline: A motion is now made by Justice Lynch that this court appropriate the sum of \$3500 for the purpose of building a bridge over the South Fork of the Saline, and said motion being duly seconded by Justice Burrough, the motion was put with the result that all Justices present voted Aye, and the motion was unanimously adopted.(12)

On November 15 the Sentinel Record recorded the allocation, giving a more precise location for the site of the bridge: "Other appropriations were \$3500 for a bridge on the South Fork of the Saline River, just near the Dodson farm which was washed out by the spring floods."(13)

BRIDGE CONSTRUCTION

The South Fork bridge and its approaches were built during the summer and fall of 1928 by the county crew under the supervision of Francis Marion Kelley, the county's bridge specialist.(14) The bridge was completed by November and Judge Davis, in his assessment of the year's work in the county made at the Quorum Court of 1928, noted that:

The county has just finished a very fine concrete bridge over the South Fork Creek in the eastern part of the county, which is 100 feet in length, of two 50 ft. arch spans, and the county is at present building the approaches to it.(15)

Records of the precise structural material used in the construction of the bridge have been conflicting. Judge Davis has described the South Fork bridge as "being of solid concrete."(16) However, F.M. Kelley's wife, Maily, who was in attendance during the construction of the bridge, remembered Kelley saying he "put a lot of steel into that bridge."(17) While Judge Davis certainly would have been familiar with the plans of the bridge, his close involvement with county roads has been documented below, F.M. Kelley was an experienced bridge builder and may well have made an on-site decision to use steel in the piers or the retaining walls. It is almost certain, however, that the arch construction was mass concrete rather than reinforced concrete.(18)

Included in the work on the bridge was the construction of the approaches, still incomplete by November 1928. The approach road, consisting of a new gravel surface, was laid to provide a

suitable passage to the bridge. Part of the approach was a second minor bridge, some 100 yards east of the South Fork. This bridge was built to span a gully on the approach, and may be considered as an intrinsic part of the whole South Fork complex.

THE BRIDGE COMPLEX

The South Fork bridge consists of two spans of concrete arch barrels with closed spandrels which rise to form the parapet walls. The flat deck consists of a sand and gravel infill--the material of the approach road--contained within the side walls. Splayed retaining walls set at angles of forty-five degrees from the bridge axis hold the loose road material at the river's edge.

The elements of this bridge provide powerful visual contrasts that are essential to the success of the bridge design. The parapet walls, decorated with recessed roundels flanked by curving panels, rise with the arch, echoing but not following its structural curve. As the walls spring from a line too low relative to the deck to form a protective barrier, they are supplemented by plain steel handrails. These handrails run horizontally from each rail-post and into the rising parapet walls. The curves of arch and wall contrast vividly with the horizontals of handrail and deck, creating a strikingly original and idiosyncratic bridge design that remains completely coherent.

Though of a dramatic but simple design, the South Fork bridge is part of a larger complex whose appreciation is important in understanding the broader significance of the bridge. This complex consists of the bridge itself, the gravel road which continues to form the deck of the bridge, and the small concrete arch bridge nearby. This small bridge, built soon after completion of the South Fork bridge is part of the same project.

This second bridge is notable because of the repetition in its walls of the round panel motif of the South Fork bridge in its own parapet walls. These roundels are to a similar scale, but are not flanked by framing panels. They float alone on the outside of the walls and are but a simple echo of the more integrated panels of the larger bridge.

The date for the completion of the entire complex is uncertain. However, the date for the completion of the South Fork bridge is recorded on a commemorative bronze plaque, removed from the south west end of the bridge in 1985.(19) This plaque, cast by The Egyptian Iron Works of Murphysboro, Illinois, dates the bridge to October 1928 and credits County Judge Davis, F.M. Kelley, builder, and H.S. Moreland, engineer.

CHARLES H. DAVIS, COUNTY JUDGE

Born on December 11, 1875, Charles Davis began his career as a reporter for the Hot Springs newspaper, the Sentinel Record, in 1893. For fifteen years he was involved with the newspaper and in 1908, at the age of 33, he began his career in the courthouse as deputy County Clerk. His career developed steadily until 1920 when he was elected judge of the county and probate courts. The greatest tribute paid to him was made by Dallas T. Herndon in his classic Centennial History of Arkansas (1922) when he spoke of Davis' public career:

Over the record of his public career there falls no shadow of wrong nor suspicion of evil... and the many times he has been re-elected to office is unmistakable proof of his capability and fidelity in discharging the duties that have developed upon him.(20)

Judge Davis was a frugal director of county finances. By 1927 he had reduced an incumbent debt of \$154,000 to \$15,000.(21) Yet, despite his careful bookkeeping he fully understood the

importance of maintaining roads and routes. He supervised the restoration of the county road system after the devastation of the 1927 spring floods, a task described as "a big job" by the Sentinel Record.(22) Furthermore, he was involved with the development of U.S. 70, now Highway 5, "The first paved Spa-Little Rock highway."(23)

F.M. KELLEY, BUILDER

Born in March 1891, Francis Marion Kelley was the fourth and youngest son in a family of six.(24) His father, James M. Kelley, came from Alabama and settled in Garland County after the civil war. A carpenter by trade, James Kelley was also a successful farmer and music teacher. His multi-talented abilities persisted in his youngest son, Francis Marion.

Francis Marion Kelley served in the First World War as a diesel mechanic. He returned to his home county to open a garage, but soon joined the county road crew. His technical expertise was welcomed by the county and he served as supervisor in the construction of a number of county bridges in the 1920s.(25)

Under Kelley's direction the South Fork bridge was erected by the county bridge crew, an unusual fact for a bridge of this scale and this date. Typically such bridges would have been erected either by the State Highway Department, if the route lay within the State Highway System, or the bridge construction would have been contracted to a bridge-building company. However, Garland County, under the direction of Judge Davis, consistently entrusted its bridge building to Kelley and his crew. This was a significant gesture of confidence in the abilities of F.M. Kelley.

H.S. MORELAND, ENGINEER

The plaque commemorating the completion of the South Fork bridge attributes its design to H.S. Moreland. However, Moreland remains an essentially anonymous figure. His practice is not known beyond its association with a number of contemporary bridges in the county.(26) Bridge plans with Moreland's name are in the possession of the Kelley Family, but no address is given. Nor can Moreland be associated with the erection of any of the bridges.(27) While Kelley certainly directed the entire construction of the South Fork bridge, and undoubtedly played a significant role in the details of its erection, the precise roles played by Moreland and Kelley cannot be determined from the information available on the bridge.

ROAD AND BRIDGE RESPONSIBILITY

At the time of the building of the South Fork bridge there were three distinct systems responsible for the maintenance and development of roads and bridges.(28) These were the county or municipality, in whose area the road lay; the improvement district, a local group organized together to improve a specific route or part thereof; and the State Highway Department. The improvement district and the State Highway Department were created successively to supplement route improvement at the county level.

The county was traditionally responsible for maintaining the routes, but, as such, it suffered two disadvantages. First, the county had only limited access to finances for the development of road and bridges. Second, any county road policy lacked the broad perspectives necessary for the development of a coherent statewide system of routes. These two problems were approached in succession by the State legislature in the early decades of this century.

The problem of limited county funds for the development of roads and bridges was a problem common to many southern states. Not only was the county too small an entity to provide sufficient capital but, also, the state had prohibited bonded debt by counties and municipalities since the financial abuses during the Reconstruction Period.(29) These limitations on borrowing by the county further curtailed the potential for development of routes within the county and, consequently, within the State.

The State General Assembly took the first step towards solving this dilemma in 1907: in Act 144 of that year it authorized the development of local Improvement Districts. Within the system of the Improvement District landowners could form road improvement districts, issue bonds, and tax themselves to build roads.(30)

By allowing local groups to gather capital, the Assembly could circumvent the constitutional prohibition against borrowing by the county; the improvement district became "the only political subdivision of the State, free of the constitutional prohibition against borrowing, and the only avenue for funding road improvement..."(31)

While the number of Improvement Districts grew rapidly after 1910, the results were basically unsatisfactory because its perspectives on routes were even more limited than those of the county: because the costs were met by local property owners, improvements were primarily designed to serve local traffic needs.(32) Thus Improvement Districts often merely compounded the counties' problem of total lack of co-ordination in interdistrict planning leading to a failure to provide all-weather linkage of county seats.(33)

To provide a stronger state perspective to route planning the General Assembly created the State Highway Commission by Act 302 of 1913. Initially the Commission did little more than advise

the road districts in technical matters, but it later administrated the State Highway System established under the Harrelson Road Law passed as Act 5 of the 1923 special session of the General Assembly.(34) As the State Highway Department developed, its work increasingly was characterized by the high standards of economy and efficiency in road and bridge work; progressive standardization was one of the characteristics of the Department's designs.

Much of the significance of the South Fork bridge lies in the fact that it was built outside these developments. It was built by a county road crew out of funds provided by the county, at a time when the complex evolution of the State Highway Department was taking an effective form. The bridge, sufficiently important to have \$3500 of county funds devoted to it, remained within a financial tradition that reached back into the nineteenth century.

ENGINEERING DESCRIPTION

The South Fork Bridge is a concrete spandrel filled arch bridge, with two arches each 57 feet long, and a road width of 16 feet. The bridge may be classified as a deck arch because the main structural support element, the arch barrel, is completely beneath the roadway. A parapet wall is formed by an upper arch line which flattens at the crown and at the ends of the span, thus not forming a true arch. This flattening makes the bridge appear thinner at the crown and thicker at the spring line, alluding to the unseen actual thickening, for strength, of the arch barrel.

Concrete is an ideal material for an arch, which is theoretically a compression structure. Concrete is strong in compression, but cannot support tension forces of any great magnitude. In practice, tension is introduced in an arch bridge by the uneven loading produced by a traveling vehicle. When steel reinforcement is not used to carry tensile forces, extra weight on the bridge

creates excess compression forces which can counterbalance tension forces. The South Fork Bridge is not reinforced, so its parapet walls and piers are massive and the spandrels are filled to contribute considerable weight.

The spandrels of the arches are filled with a sand and gravel mixture which also helps to drain the deck. Water flows from the crowns to the ends or center of the bridge; at the center the draining water seeps through the gravel down to drainage spouts set in the concrete piers. This gravel was also used to surface the road although, at present, the concrete crowns of each arch barrel are exposed at road level, and it is not known whether the gravel originally covered the arch barrel completely or left it partially exposed.

The piers and abutments are rectangular concrete blocks. The upstream side of the central pier is triangular in shape to direct the water around the pier and prevent blockage from debris in the river. The low rise-to-length ratio of the arch creates large horizontal thrust at the piers. This force is resisted by wing walls at each abutment, which also retain the bank.

Possibly in an attempt to dress up the simplistic structural design, the unique shape of the parapet wall is enhanced by a recessed circular pattern at the crown of the wall. The edges of the caps and corners of the rail posts and the parapet walls are chamfered. Conversely, plain steel pipe serves as a rough handrail where the parapet wall follows the arch line down to the haunches.

All the formwork was laid horizontally except for the arch panels. Here planks were placed radially to the arch curve. The formwork for the bridge is easily seen because the surface was never finished. Normally, a concrete bridge is sanded or a finish layer of concrete applied to create a smooth surface. This rough surface of the South Fork Bridge is curious in view of the trouble taken to erect formwork that would create the circle pattern.

Thin, flexible metal rods protrude from the wing walls and the end posts, marked by rust trails down the side of the walls. Research has shown that steel may have been used in the piers and retaining walls and, if so, the rods were probably employed to anchor the steel. Other such rods are not found anywhere else on the bridge.

ENDNOTES

1. "Greatest Flood in History sweeps down River", Sentinel Record, April 16, 1927, p. 1.
2. Ferguson, John L., "Highways and Hope", Record, 1967, p. 78.
3. Hume, John "The Automobile Age in Arkansas", Part VI, Arkansas Highways, Summer 1978, p. 11.
4. Highway 70 today is south of the old Highway 70.
5. In conversation with Buster Coleman. At low water the river would have been crossed without difficulty, consequently a ferry crossing was unlikely.
6. "Appropriation for Bridge Made", Sentinel Record, November 15, 1927, p. 7.
7. Garland County Court Records, Book P, p. 493.
8. "Appropriation for Bridge Made", loc. cit.
9. Garland County Court Records, Book P. November 14, 1927, p. 124.
10. *ibid.*
11. *ibid.*, p. 126.
12. *ibid.*, p. 130.
13. "Appropriation for Bridge Made", loc. cit.
14. In conversation with Maily Kelley-Byres and Buster Coleman.
15. "Quorum Court Recognizes Need for New County Jail", Sentinel Record, November 13, 1928, p. 6.
16. "New Jail is Given \$60,000", Sentinel Record, November 13, 1929, page 10 ? (incomplete copy).
17. In conversation with Maily Kelley-Byres.
18. See Description below.

19. Now in Possession of Kelley Family. It reads: "South Fork; Chas. H. Davis, Co. Judge; H.S. Moreland Eng'r; F.M. Kelley, Builder; Oct 1928".
20. Herndon, Dallas T., Centennial History of Arkansas, Chicago-Little Rock, 1922, Vol. II, P. 488.
21. "County Roads are Given Attention", Sentinel Record, May 1, 1927, p. 7.
22. *ibid.*
23. Moore, M., "First Paved Spa-Little Rock Highway", Record, Hot Springs-Garland County Historical Society Yearbook, 1967, p. 82.
24. Kelley, G.A., "James M. Kelley Family", Record, Hot Springs-Garland County Historical Society Yearbook, 1987, pp. 190-192.
25. In conversation with Gene Aalton Kelley.
26. Gene Aalton Kelley holds drawings by Moreland for other Garland County bridges, including Gulf of Gorge Bridge and Cedar Creek Bridge.
27. Neither Buster Coleman or Maily Kelley-Byres recollect Moreland's attendance during construction of the South Fork bridge. In fact, Coleman stated that he was unaware of an engineer's involvement until he saw the plate.
28. *c.f.* Ferguson, J.L. *loc.cit.* and Hume, J. *loc.cit.*
29. Hume, John "The Automobile Age in Arkansas", Arkansas Highways, Part IV, Winter, 1977, p. 18.
30. *ibid.*
31. Ferguson, J.L. *loc.cit.* p. 76.
32. Hume, John, "The Automobile Age in Arkansas", Arkansas Highways, Part III, Fall, 1977, p. 14; *ibid.* Part IV, Winter, 1977, p.16.
33. *ibid.*, p. 18, 16.
34. Ferguson, J.L. *loc.cit.* p. 76.

BIBLIOGRAPHY

Builder's Plate: "South fork" formerly on south west corner of South Fork bridge now in possession of Kelley Family, Dallas, Texas.

City and Business Directory, Little Rock, 1923-1933.

Buster Coleman, Hot Springs, former county employee, who worked with F.M. Kelley on South Fork bridge. Telephone conversation, July, 1988.

County Court Records, Book P, Garland County. Garland County Courthouse, Hot Springs.

Ferguson, John L., "Highways and Hope", Record, Hot Springs-Garland County Historical Society Yearbook, 1967, pp. 75-81.

Herndon, Dallas T., The Centennial History of Arkansas, S.J. Clarke Publishing Company, Chicago-Little Rock, 1922.

Hume, John "The Automobile Age in Arkansas", Arkansas Highways, Quarterly Publication by Arkansas State Highway and Transportation Department, Spring, 1977 to Fall, 1979.

Maidy Kelley-Byres, F.M. Kelley's widow, who was in attendance during construction of South Fork bridge. Telephone conversation, July, 1988.

Gene Aalton Kelley, F.M. Kelley's son. Telephone conversation, July, 1988.

Kelley, Gene Aalton, "James M. Kelley Family", Record, Hot Springs-Garland County Historical Society Yearbook, Garland County Historical Society, 1987, pp. 190-192.

Moore, M. "First Paved Spa-Little Rock Highway", Record, Hot Springs-Garland County Historical Society Yearbook, Garland County Historical Society, 1967, pp. 82-86A.

The Record, Hot Springs-Garland County Historical Society Yearbook, Garland County Historical Society, 1959-1987.

Road Records, Garland County. Garland County Courthouse, Hot Springs.

Sentinel Record, Hot Springs, 1925-1929.