

High-Strength Concrete Used in New Fort Worth, Tex., Bridge

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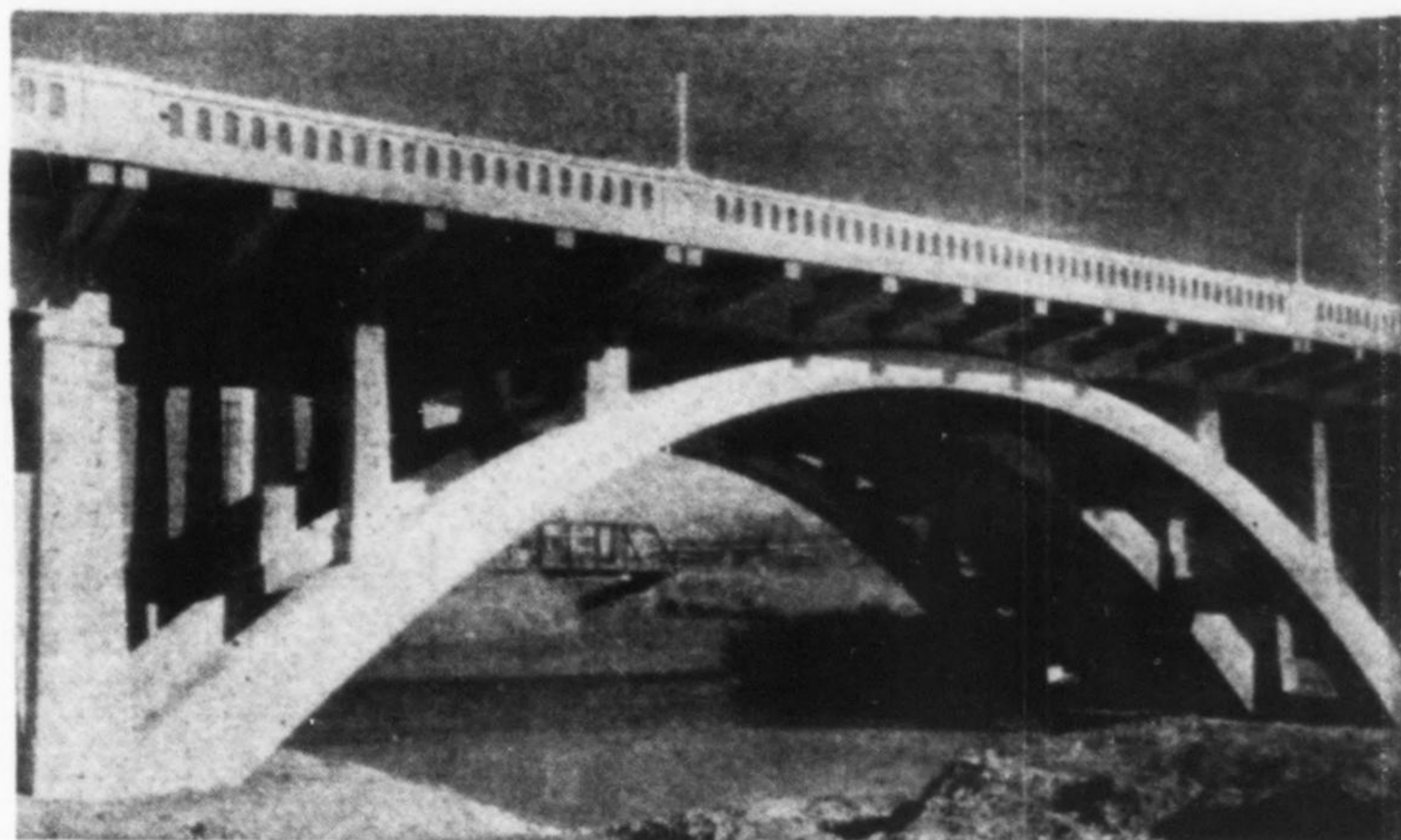
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THE Royal Street Bridge recently completed by the city of Fort Worth, Tex., is an example of the comparatively recent trend toward the use of higher working stresses in the design of major highway bridges. All parts of the structure above the footings were designed for 3,500 lb. concrete using 1,050 lb. per sq.in. as the working stress for positive moment and 1,200 lb. per sq.in. for negative moment above supports. The footings were designed for 2,500-lb. concrete using 875 lb. per sq.in. working stress. Intermediate grade billet steel was used throughout with a working stress of 18,000 lb. per sq.in. The live loading used in the design consisted of 20-ton trucks with 80 per cent of the weight on the rear axle, or 150 lb. uniform live load per square foot. The sidewalks were designed for a uniform live load of 80 lb. per square foot. An impact stress of 25 per cent of the live load was used in designing all parts of the structure.

The bridge consists of fourteen concrete beam-and-girder spans of 48 ft. each and one open spandrel four-rib arch of 124-ft. span, giving a length of 796 ft. be-

approximately a 1:2½:4 field mix and a minimum of 2,500 lb. per sq.in. when tested in cylinders. The concrete used for all parts of the structure above footings consisted of 7¾ bags of cement per cubic yard of concrete in place, giving approximately a 1:1½:2½ field mix and a minimum of 3,500 lb. per sq.in. when tested in cylinders. All concrete was poured with a slump of from 4 to 5 in., to permit satisfactory placing in the heavily reinforced sections.

An interesting feature in the design of the arch span consists of a 7-ft. slab between the two interior ribs to carry two 20-in. water mains across the stream. Ex-



Slab cast between two interior ribs of Royal Street Bridge arch supports 20-in. water main



Royal Street Bridge in Fort Worth, Tex., presents a pleasing combination of arch and girder spans.

tween abutments and 836 ft. total length. The clear width of roadway between curbs is 56 ft. providing four 9-ft. and two 10-ft. traffic lanes. A sidewalk 7-ft. in width is provided on each side of the roadway so that the total width is 70 ft. between handrails.

The entire structure with the exception of the arch abutments rests on concrete piles varying in length from 15 to 35 ft. which were driven to rock. The arch abutments are embedded a minimum of 3 ft. in solid rock about 30 ft. below the surface of the ground. A cofferdam 27×65 ft. composed of steel sheetpiling with timber bracing was used for each arch abutment. All footing concrete was poured in the dry.

The concrete used for footings utilized 5½ bags of cement per cubic yard of concrete in place, giving

pansion joints are placed every two girder spans, or 96 ft., apart. Two bronze plates each ½ in. in thickness are used under each girder to allow expansion. Rock asphalt 2 in. in thickness is used for the wearing surface.

The contractor, Frank Parrott, Dallas, Tex., completed the structure exclusive of asphalt topping in nine months' elapsed time at a cost of \$236,000. The asphalt was placed at a cost of \$5,000. The structure was designed and the plans and specifications were prepared by the writer under the supervision of D. L. Lewis, city engineer, with Ira G. Hedrick, Hot Springs, Ark., as consultant. W. O. Jones, assistant engineer, had supervision of construction, with W. W. O'Farrell as resident engineer.