A 150-FOOT ARCHBRIDGE WITH SUSPENDED ROADWAY IN REINFORCED CONCRETE.

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THE bridge described below (Fig. 1) carries a 14-foot 8-inch roadway and two 2½-foot sidewalks. It is calculated for a load of 120 lbs. per sq. ft. uniformly distributed and an additional load on the roadway of one road roller, weighing 30,000 lbs.

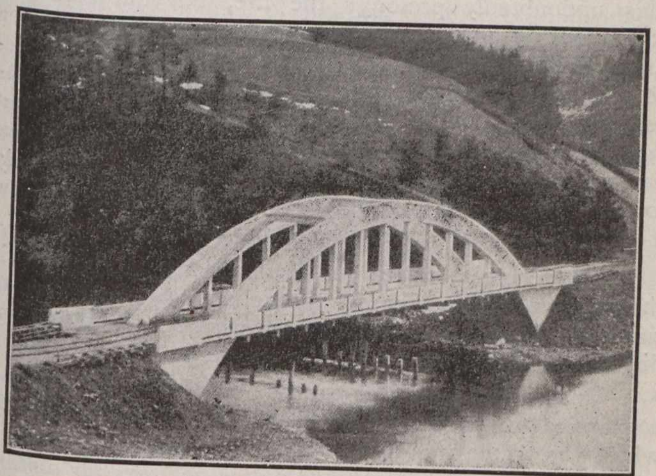

Fig. 1.—View of Finished Structure.

The macadamizing of the road rests on a crosswise reinforced slab, which again is supported by the floor-beams, spaced 9 ft. 10 in. centre to centre, and stringers. These are placed in the planes of the two archgirders and in the centreplane of the bridge. The sidewalks are supported by cantilevers from the floor-beams. The load from the floor is carried over to the arches through hangers.

The statical computation for the arches is made as for arches without hinges and by employment of influence lines. As basis for the figuring was used an allowable tensile stress in the steel of 14,000 lbs. per sq. ft. and

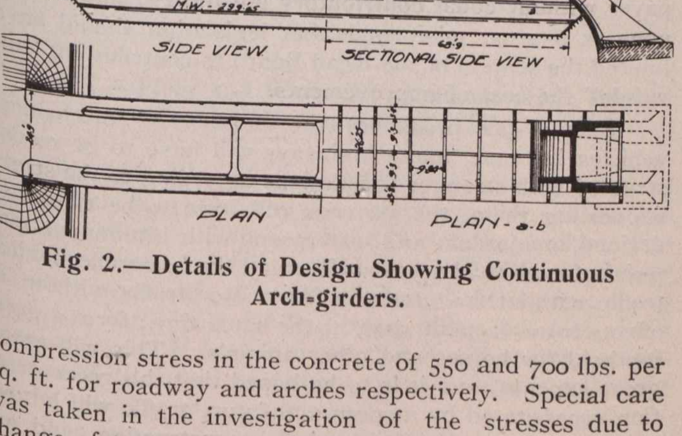

Fig. 2.—Details of Design Showing Continuous Arch-girders.

compression stress in the concrete of 550 and 700 lbs. per sq. ft. for roadway and arches respectively. Special care was taken in the investigation of the stresses due to change of temperature, which plays quite an important part in long-span arches with fixed ends, though, of course, much smaller than for a steel arch, as the conductivity of steel is much higher than that of concrete.

Fifty degrees F. was considered as an average temperature at the time the bridge was constructed, and the limits of the temperature of the concrete in the finished structure were taken as 10° F. and 80° F. By this assumption the maximum bending moments produced by the live load and dead loads were increased by 20% at the crown and 69% at the springing line. This proves once more that the approximate figuring usually employed by designers without knowledge of calculating statically indeterminate structures, is nothing less than a menace to safe construction. As result of the statical computation the necessary depth at the crown of the arches was found to be 4 ft. and the width 2 ft. 2 in.

The usual design of placing the tie-rods for the arches in the roadway slab was not employed in this case, owing to the high value of the maximum horizontal pressure (290 tons for each arch). It would have been difficult to arrange the steel, necessary to resist this great pull, in the longitudinal beams between sidewalks and roadway, and also to ensure a safe connection between tie-rods and arches. The arches are stiffened by means of three cross T-beams, placed at their crowns.

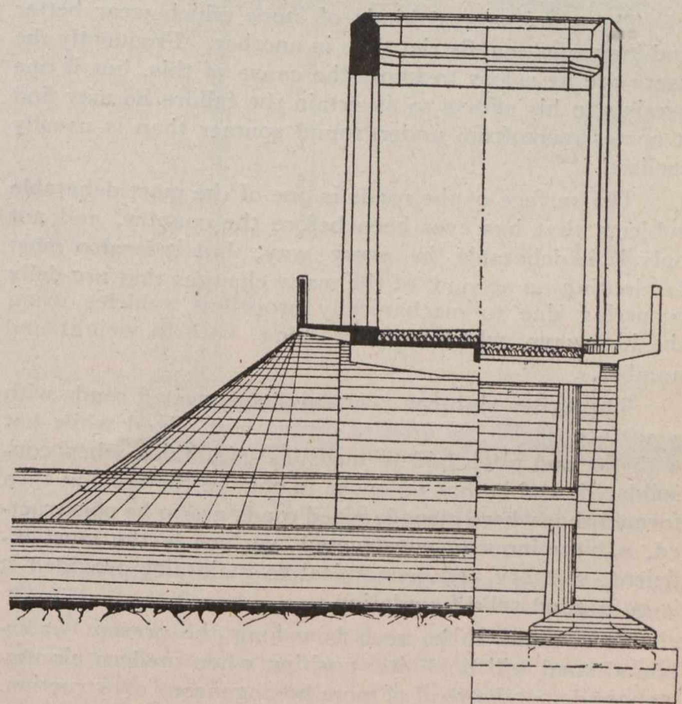

Fig. 3.—Cross-Section.

A somewhat unusual, but very economical, design, as compared with the solid concrete abutments, was employed for the abutments. The arch-girders are continued through the roadway to meet the foundation slab, which extends under both arches. (Fig. 2). Between the arches, and having the same curvature, a slab is constructed which, together with the extensions of the arches and two triangular wing-walls resting on the arches, form a container for the earth filling. The wing-walls and the arches are tied together by two cross-beams in each abutment. (Fig. 3).

The quantity of coal used for coke-making in the United States in 1912 was 65,485,801 short tons. The coke produced from this coal amounted to 43,916,834 short tons, valued at $111,523,336, besides large quantities of gas, tar, ammonia, etc., as by-products from the 11,048,489 tons of coke produced in by-product ovens.