No. 853,202. PATENTED MAY 7, 1907.

D. B. LUTEN.

ARCH STRUCTURE.

APPLICATION FILED JULY 25, 1904.

Fig. 1.

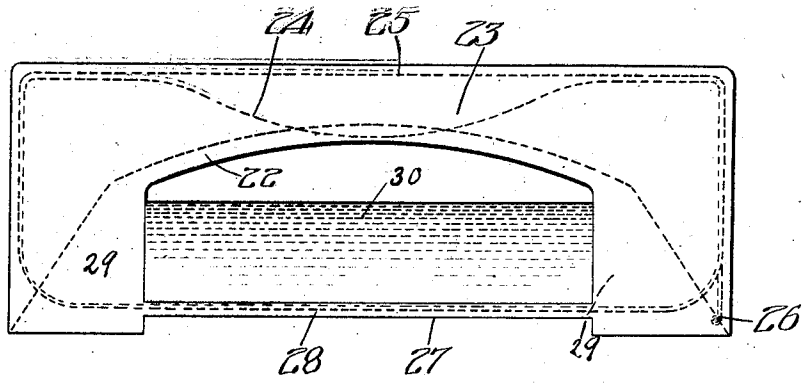
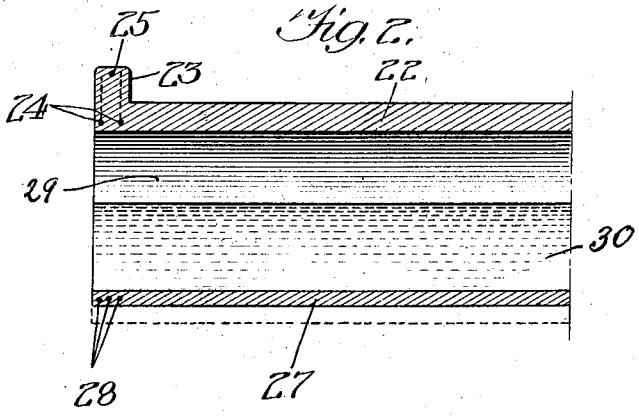


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ARCH STRUCTURE.

No. 853,202. Specification of Letters Patent. Patented May 7, 1907.

Original application filed May 17, 1902, Serial No. 107,812. Divided and this application filed July 25, 1904. Serial No. 217,936.

To all whom it may concern:

Be it known that I, DANIEL B. LUTEN, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Arch Structures, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this application.

This invention relates to improvements in arch structures of that class which are commonly designed to serve as bridges or viaducts across streams, roadways, ravines, etc., and which are usually constructed of concrete, stone, brick, cement, mortar and other materials; and the invention has for its general object to provide an improved arch structure for this and analogous purposes characterized by increased strength and capacity to resist the strains to which the same is subjected.

More particularly my invention relates to means for strengthening the railings or spandrels of the arch or bridge, and especially of arches or bridges constructed of concrete and like material.

The present application constitutes a division of my application filed on the 17th day of May, 1902, Serial No. 107,812.

In the accompanying drawing, I have illustrated an arch or bridge of the type referred to having a railing reinforced and strengthened in accordance with the present invention; and referring thereto,—Figure 1 is a side elevational view of an arch showing the spandrel wall or railing, provided with reinforcing or strengthening means; and, Fig. 2 is a central cross sectional view through a portion of the arch shown in Fig. 1.

In these figures, the arch is shown consisting of the crown or ring 22 resting upon the abutments 29, the lower ends of the abutments being joined by the pavement 27, under the bed of the stream and preferably of concrete or the same material as the crown and abutments. The bed of the stream is shown at 30. The spandrel walls 23 or railings as they are sometimes termed, serve to confine the earth covering of the arch, and to strengthen the structure as a whole. Owing to the cracking that may result in such spandrel walls or railings by changes in temperature or unequal loadings applied to the arch or by other causes, I provide reinforcing members preferably in the form of tension rods, though other sections capable of resisting tension may be employed.

The rods indicated in Fig. 1 by the dotted line 24 are embedded in the spandrel walls 23 and are so disposed as to be low at the crown and high at the ends. A suitable anchorage may be provided for the ends of these rods, or they may be extended down the ends of the spandrel and through the pavement 27, or the adhesion of the concrete or other material to the rods may be depended upon to prevent slipping. These rods may occur in the positions indicated in Fig. 2, and any desired number of them may be employed. Other rods such as 25 are preferably carried straight across the top of the wall of railing and these are preferably brought down at the ends of the walls to the base of the structure, where they may be anchored as shown at 26 at the right hand end of the arch of Fig. 1 or they may be carried across the bottom of the structure through the pavement 27 as indicated at 28. These rods effectually and primarily resist the cracking that might be induced in the spandrel walls by the changes in temperature, unequal loadings and other causes. The rods 24 thus occur near each face of the spandrel, and together with the rods 25 form a reinforcement or strengthening medium at both the top and bottom of the same, since the rods 25 pass near the upper surface. The anchoring of the rods 25 near the base as indicated at 26 or in fact by turning the rods and carrying them across through the pavement, form a means for reinforcing the spandrel wall on its back surface, and the arch structure as a whole is thus cantalivered on its abutment by the embedded reinforcing members thus provided. The rods thus shown and described are not confined to the specific location or arrangement thus specified, but may be otherwise situated without departing from the spirit or scope of the present invention.

I claim:

1. An arch having a spandrel wall, and suspension rods passing through said wall, said rods being low at the center and high at the ends and continuing down into the abutments, and anchors therefor, substantially as described.

2. An arch having a spandrel wall, suspension rods in said wall high at the ends and low at the center, and other rods in the said

wall extending straight through the same, substantially as described.

3. An arch having a spandrel wall, suspension rods in said wall low at the center and high at the ends and continuing down into the abutments, and other rods in the said wall extending straight through the same, substantially as described.

4. An arch having a spandrel wall, suspension rods in said wall low at the center and high at the ends and passing down through the abutments and across the bed of the stream, a pavement covering said rods across the stream, and other rods in the said wall extending straight through the same, substantially as described.

5. An arch having a spandrel or railing of concrete or similar material reinforced with longitudinal members near both faces.

6. An arch or bridge having a spandrel or railing of concrete or similar material reinforced at top and bottom and at both faces.

7. A bridge spandrel, railing or retaining wall of concrete with rods or bars embedded near the stream and roadway surfaces thereof.

8. A bridge spandrel, railing or retaining wall of concrete or similar material, with longitudinal rods or bars embedded near each surface.

9. An arch having a spandrel wall with rods or bars embedded, said rods or bars being depressed at the center and near the upper surface at the ends of the spandrel.

10. A concrete spandrel wall or railing with tension members embedded and passing near the upper surface at the ends and near the intrados at the middle of the span.

11. A concrete spandrel for a bridge with tension members embedded and other tension members across the bed of the stream.

12. A bridge spandrel of concrete or like material with reinforcements extending across the span both above and below the waterway.

13. A concrete bridge with abutments tied together below the springing and above the waterway by tension members embedded in the spandrel.

14. An arch or bridge having a spandrel wall or railing with reinforcing members embedded high at the ends and low at the center.

15. A bridge spandrel of concrete or similar material with a tension member embedded passing continuously through all the regions of tension.

16. A concrete bridge having a concrete spandrel extended back of the abutments with upright rods or bars embedded near the ends of the spandrel.

17. A bridge of concrete or similar material having a reinforced spandrel or girder extending across the abutment or pier, and cantalivered on the abutment or pier, with tension members extending across the abutment or pier near the upper surface of the spandrel or girder.

18. In a concrete bridge a roadway between girders of concrete reinforced with rods or bars extending continuously through all the regions of tension and of shear.

19. A bridge having a roadway between spandrels or girders of concrete or similar material, with tension members embedded near their lower surfaces, said tension members having a plurality of shear members extending upward and inclined toward the ends of the spandrels or girders.

20. A bridge consisting of a roadway of concrete between concrete girders or railings reinforced with tension members near lower surface and extending upward toward the ends of the girder or railing.

21. A bridge consisting of railings or girders of concrete or similar material projecting above the roadway and reinforced with longitudinal tension members near the lower surface of said railings or girders, said tension members having upward extensions toward the ends of the girders or railings.

22. In a concrete or similar bridge, a roadway between girders reinforced with rods or bars embedded continuously through the regions of tension and of shear, and other rods or bars embedded in the compression regions.

23. A bridge having a roadway between spandrels or girders of concrete or similar material with tension members embedded near their lower surfaces, said tension members having a plurality of shear members extending upwardly and inclined toward the ends of the spandrels or girders, and tension members embedded near the upper surfaces of the spandrels or girders and over the abutment or pier.

Signed by me at Indianapolis, county of Marion, State of Indiana, in the presence of two witnesses.

DANIEL B. LUTEN.

Witnesses:
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A. C. BROWN.