D. B. LUTEN.

PROCESS OF BUILDING REINFORCED CONCRETE ARCHES.

APPLICATION FILED JULY 27, 1911

1,089,488.

Patented Mar. 10, 1914.

Fig. 1.

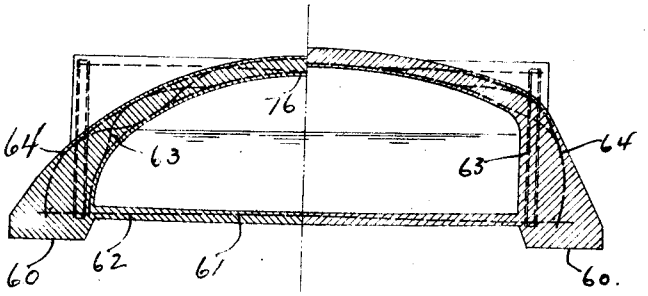


Fig. 2.

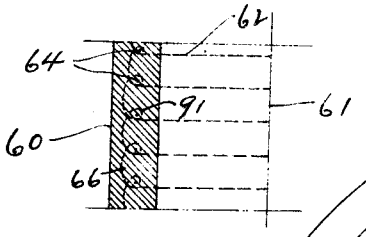


Fig. 3.

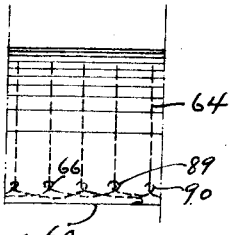
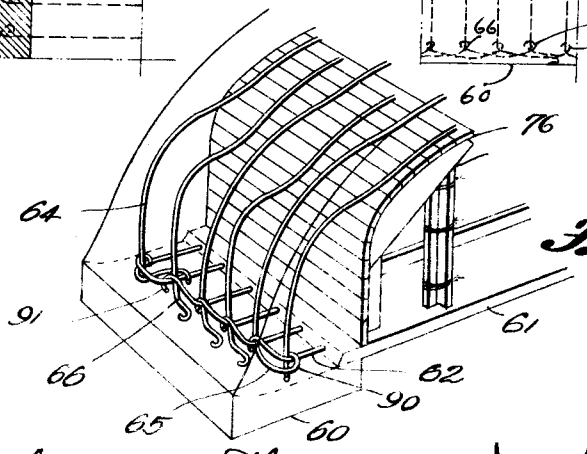


Fig. 4.



WITNESSES:

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PROCESS OF BUILDING REINFORCED-CONCRETE ARCHES.

1,089,488. Specification of Letters Patent. Patented Mar. 10, 1914.

Original application filed May 17, 1902, Serial No. 107,812. Divided and this application filed July 27, 1911. Serial No. 640,834.

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 a new and useful Process of Building Reinforced-Concrete Arches, of which the following is a specification.

My invention relates to a process of building reinforced concrete arches and has for its purpose to provide a method of placing the reinforcing members for arch structures, resulting in greater ease of erection, accuracy of placing and security of anchorage.

The present application constitutes a division of an application filed by me May 17, 1902, Serial No. 107,812.

The invention is illustrated in the accompanying drawings in which the same reference characters describe like parts throughout the several views.

Figure 1 is a longitudinal section of an arch, the two halves being on different section lines, Fig. 2 is a sectional half plan of the footings of the arch, Fig. 3 is a detail section of the connection between members, and Fig. 4 is a phantom perspective of one end of an arch, showing the embedded tension members, the centering, and the different stages in the process of building.

The process consists in erecting a reinforced concrete arch by first laying foundations 60, then placing a concrete pavement 61 with longitudinal reinforcing members 62 embedded therein and projecting beyond the ends of the pavement and lying above the foundations. The ends of these reinforcing members are formed into spirals 66 for anchorage as shown in Figs. 2, 3, and 4, the spirals being tangential to the members and of decreasing radii from the point of tangency. Such a spiral serves to anchor the member securely with minimum extension, it being possible to develop the full strength of the member by such a spiral anchor in concrete with less than one half the length required for a straight extension. Sufficient straight extension cannot usually be secured because of the thinness of the abutment. Reinforcing members 63 and 64 to be later embedded in the arch are then anchored to the projecting spirals 66 of the pavement members 62 by similar spirals 65 passing through the above mentioned spirals 66. The ends of the vertical reinforcing members 63 and 64, as seen in Figs. 3 and 4, are bent around the corresponding horizontal pavement members 62 and the end hooked over one of the adjacent horizontal pavement members. The ends of the members 64 may be hooked around the second distant rod, as shown at 89, or around the adjacent rod, as shown at 90, but of course in either case the principle remains the same and any arrangement in this respect is still within the scope of the invention. Figs. 2 and 4 show the ends 91 of the horizontal pavement members 62 looped about in the same manner, the said ends being hooked about the adjacent vertical members 64; or the rods may be extended at an angle into the concrete and anchored, thus bonding in transverse direction. This arrangement of the ends has the advantage of providing a construction in which the ends of the rods cannot pull out and also furnishes the abutment with a transverse bonding and strengthening member which tends to prevent unequal settlement. The centers on which the arch is to be formed are erected on the pavement 61 and the members 63 and 64 are embedded in the concrete or other material of the bench walls or abutments and the members 64 pass close to the intrados of the arch at the crown 76. The members 64 preferably sag a little so that the least weight upon the arch will produce tension in them. When brought to their proper curvature they may be temporarily attached to the centers at occasional intervals to hold them to place, the anchorage at the end of each member serving to secure it with the assistance of occasional attachment or bracing at infrequent intervals. The pavement on which the centers are erected, serves as a solid foundation for supporting the centers for the arch, as well as increasing the bearing area of the foundations of the structure. The pavement is strengthened by the embedded rods, enabling it to better stand the strains to which it is subjected in sustaining the centers for the arch in the course of its erection.

Finally the concrete of the arch ring is placed on the centers to completely embed all reinforcing members. After allowing sufficient time to elapse to permit the concrete to harden properly the centers are removed.

I claim:—

1. That improvement in the art of building a reinforced concrete arch comprising placing concrete foundations, then placing tension members having spiral ends projecting into the space over said foundations, then erecting the centers for the arch, then placing arch reinforcing members having spiral ends and interlocking such spiral ends with the spiral ends of the first named tension members, then bending the arch reinforcing members so that they are supported by the centers, and then placing the concrete of the arch to embed the arch reinforcing members and the projecting spiral ends.

2. That improvement in the art of building a reinforced concrete arch comprising placing concrete foundations, then placing tension members having bent ends projecting into the space over said foundations, then erecting the centers for the arch, then placing arch reinforcing members having bent ends, then bending the arch reinforcing members so that they are supported by the centers, and then placing the concrete of the arch to embed the arch reinforcing members and the projecting bent ends.

3. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations, then laying between the foundations a pavement having anchor ends projecting from the pavement into the space over the foundations, then erecting on the pavement the centers for the arch, then placing arch reinforcing members and interlocking them with the projecting anchor ends, then bending the arch reinforcing members into position where they are supported at the crown by the centers, and finally embedding the arch reinforcing members and the projecting anchor ends in concrete.

4. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations, then laying between the foundations a pavement having anchor ends projecting from the pavement into the space over the foundations, then erecting on the pavement the centers for the arch, then placing arch reinforcing members and interlocking them with the projecting anchor ends, and finally embedding the arch reinforcing members and the projecting anchor ends in concrete.

5. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations, then laying between the foundations a pavement having anchor ends projecting from the pavement into the space over the foundations, then erecting on the pavement the center for the arch, then placing arch reinforcing members, then bending the arch reinforcing members into position where they are supported at the crown by the centers, and finally embedding the arch reinforcing members and the projecting anchor ends in concrete.

6. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations, then laying between the foundations a pavement having anchor ends projecting from the pavement into the space over the foundations, then erecting on the pavement the centers for the arch, then placing arch reinforcing members, and finally embedding the arch reinforcing members and the projecting anchor ends in concrete.

7. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations, then laying between the foundations a pavement having anchor ends projecting from the pavement into the space over the foundations, then erecting on the pavement the centers for the arch, then placing arch reinforcing members and supporting them on the centers, and finally embedding the arch reinforcing members and the projecting anchor ends in the concrete.

8. That improvement in the art of building a reinforced concrete arch comprising placing concrete foundations and tension members, the latter having bent ends projecting into the space over said foundations, then erecting the centers for the arch, then placing arch reinforcing members having bent ends and interlocking them with the bent ends of the first named tension members, and then placing the concrete of the arch to embed the arch reinforcing members and the projecting bent ends.

9. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations and a pavement between the foundations and embedding in the pavement tension members having anchor ends projecting into the space over the foundations, then erecting on the pavement the centers for the arch, then placing arch reinforcing members and interlocking them with the projecting anchor ends, and finally embedding the arch reinforcing members and the projecting anchor ends in concrete.

10. That improvement in the art of building a reinforced concrete bridge comprising placing the foundations and a pavement between the foundations and embedding in the pavement tension members having an-

chor ends projecting into the space over the foundations, then erecting on the pavement the centers for the arch, then placing arch reinforcing members, and finally embedding the arch reinforcing members and the projecting anchor ends in concrete.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 24th day of July, A. D. one thousand nine hundred and eleven.

DANIEL B. LUTEN. [L. S.]

Witnesses:
MAY LAYDEN,
FRANK A. FAHLE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."