D. B. LUTEN.

ARCH CONSTRUCTION.

APPLICATION FILED NOV. 8, 1915.

1,334,871.

Patented Mar. 23, 1920.

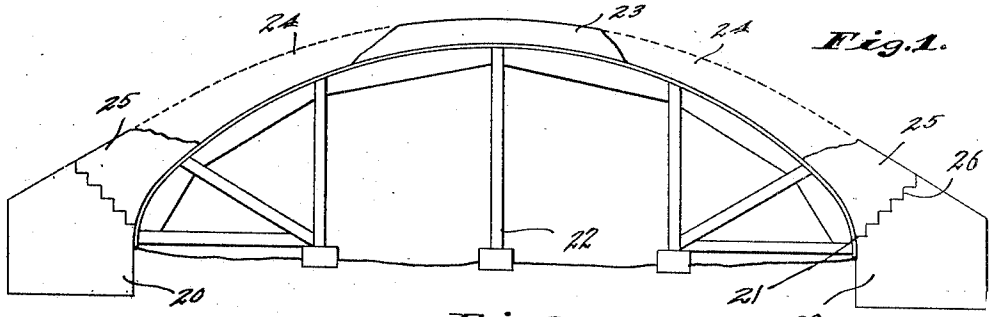


Fig. 1.

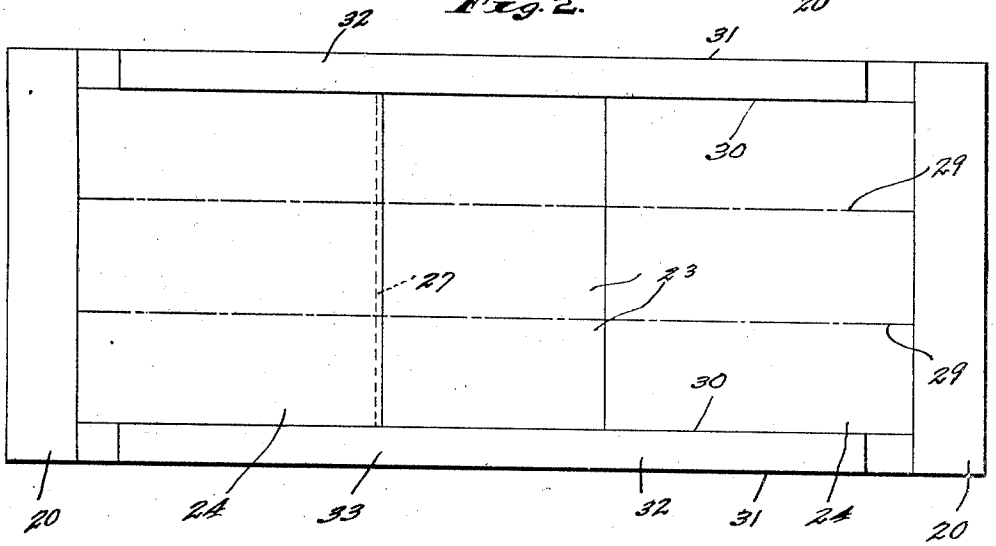


Fig. 2.

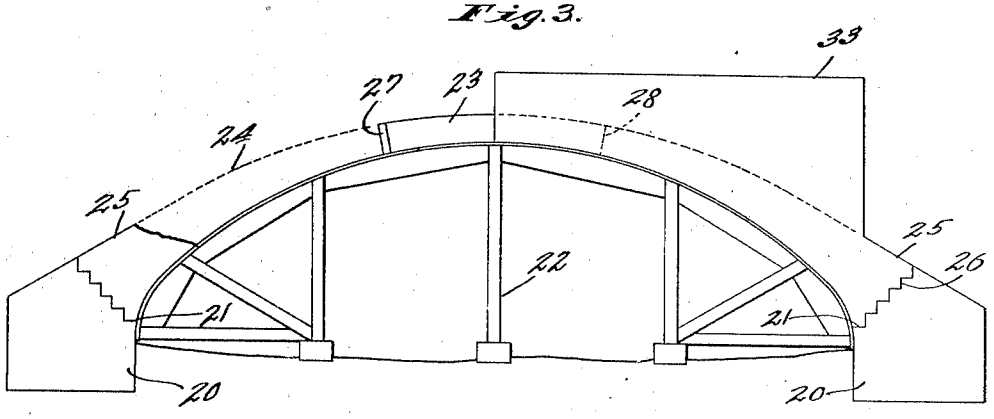


Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

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ARCH CONSTRUCTION.

1,334,871. Specification of Letters Patent. Patented Mar. 23, 1920.

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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 Arch Construction, of which the following is a specification.

It is the object of my invention to provide a method of arch bridge construction which will minimize distortion of the centering during construction and of the arch itself during construction and after completion, and which at the same time will eliminate joints in the exposed vertical face of the arch and superposed spandrel wall.

In carrying out my invention, I place the concrete for the crown of the arch before placing it for the intermediate parts between the crown and the haunches, and I may do this either by completing the crown portion first and then building up to it from the haunches or by starting simultaneously from the crown and haunches and working toward intermediate points from both crown and haunches. However, I preferably do not employ this method for the whole length of the arch from one spandrel face to the other, but instead stop short in the use of this method before reaching the spandrel face, and then form each end section of the arch and its superposed spandrel wall monolithic, so as to avoid all joints in the vertical faces.

The present application is in part based on my prior co-pending application Ser. No. 341,605, filed November 1, 1906.

The accompanying drawing illustrates my invention.

Figure 1 is a side elevation of the centering for an arch, the abutments, and the concrete for the arch partly in place, the concrete being started from the crown and from both haunches; Fig. 2 is a plan of a bridge arch, in which the intermediate portion between the spandrels is constructed by placing the concrete at the crown before placing it at the haunches and between the crown and haunches, and the end sections and spandrel walls are formed monolithic; and Fig. 3 is an end view of the bridge arch and spandrel shown in plan in Fig. 2, showing the completed arch on the right and the arch in an intermediate stage of construction on the left, with the centering in place for the whole arch.

I have found that if the concrete for an arch is placed first at the haunches and the concrete extended from the haunches up to a meeting point at the crown, there is a very decided tendency to distort the centering, causing it to buckle upward at the crown, so that when later the concrete for the crown is placed and the centering is forced back to initial position the already set concrete at the haunches is distorted and caused to crack, thus weakening the arch. Therefore, after completing the abutments or piers 20 and the springing lines 21, and erecting the centering 22, I place the concrete 23 at the crown of the arch before placing the concrete for the intermediate portions 24 between the crown and haunches of the arch. In doing this, I may start placing the concrete at the haunches 25 on the skew backs 26 simultaneously with the placing of the concrete 23 at the crown, and work gradually from each haunch toward the crown and from the crown toward each haunch simultaneously until the intermediate portion 24 is completed. This forms a continuous monolithic ring from one skew back 26 to the other, and loads the centering at the crown and haunches simultaneously so that there is but slight tendency for the centering or for the concrete ring to become distorted. This process is illustrated in Fig. 1.

Instead of starting the placing of concrete simultaneously at crown and haunches, I may place the concrete 23 at the crown before placing it at the haunches, retaining the concrete at the crown within bulk heads 27. This is illustrated in Figs. 2 and 3. In such case, after placing the concrete 23 at the crown from one bulk head 27 to the other, I start the placing of the concrete 25 at the haunches and gradually work up through the intermediate portions 24 until the crown portion 23 is reached. This provides a loading of the centering at the crown of the arch, and effectually prevents distortion of the centering or of the completed arch ring; but unless the work is done so rapidly that the intermediate portions 24 are completed before any setting of the crown portion 23 has occurred, there is produced a joint 28 between the crown 23 and each intermediate portion 24, so that the ring is not continuous from skew back to skew back. However, the joint 28 is often not objectionable, and it is frequently advantageous not to place concrete at too

many places at once, so that very frequently this latter method is preferred.

In the carrying out of either of these methods, the arch may be divided into any number of longitudinal rings, as indicated by the dot and dash lines 29 in Fig. 2.

I preferably do not extend the methods just described completely to the faces of the arch and spandrel walls. Instead, I extend the methods only to the planes 30, which are removed from the faces 31 of the arch ring and spandrel wall by a short distance. The intermediate portion 32 between each plane 30 and the adjacent face 31 I form monolithic with the spandrel wall 33 which is superposed upon it, the portion 32 being sufficiently narrow so that it and the superposed spandrel wall may be poured as a single monolith. By doing this, there are no joints in the spandrel face, and seepage of moisture through to such face from the earth fill which is placed on the arch between the spandrel walls is thus prevented.

I claim as my invention:

1. That improvement in the art of building an arch bridge, which comprises placing on centering the concrete for a middle portion of the arch crown and for middle portions of the arch haunches, then filling in the corresponding intermediate portions between the crown and haunches, and then building monolithic end ring sections and spandrel walls monolithic therewith.

2. That improvement in the art of building an arch bridge, which comprises placing on the centering the concrete for a middle portion of the arch crown, then placing on the centering the concrete middle portions of the haunches and extending such concrete up to the crown portion, and then placing the concrete for the end sections of the arch ring and for spandrel walls monolithic with such end sections.

3. That improvement in the art of building an arch bridge, which comprises first placing the concrete for portions near the crown and near the springings of a middle section of the arch ring, subsequently placing the concrete for the other portions of the middle section of the arch, and then building monolithic end ring sections and spandrel walls monolithic therewith.

4. That improvement in the art of building an arch bridge, which comprises first placing the concrete for portions near the crown and near the springings of a middle section of the arch ring, subsequently placing the concrete for the other portions of the middle section of the arch, and then building monolithic end ring sections.

5. That improvement in the art of building an arch bridge, which comprises first placing the concrete for portions near the crown and near the springings of a middle section of the arch ring, before placing the concrete for the intermediate portions of said middle section, subsequently placing the concrete for such intermediate portions of said middle section between the portions for which concrete was first placed, and then building monolithic end ring sections and spandrel walls monolithic therewith.

6. That improvement in the art of building an arch bridge, which comprises first placing the concrete for portions near the crown and near the springings of a middle section of the arch ring, before placing the concrete for the intermediate portions of said middle section, subsequently placing the concrete for such intermediate portions of said middle section between the portions for which concrete was first placed, and then building monolithic end ring sections.

In witness whereof I have hereunto set my hand at Indianapolis, Indiana, this third day of November, A. D. one thousand nine hundred and fifteen.

DANIEL B. LUTEN.