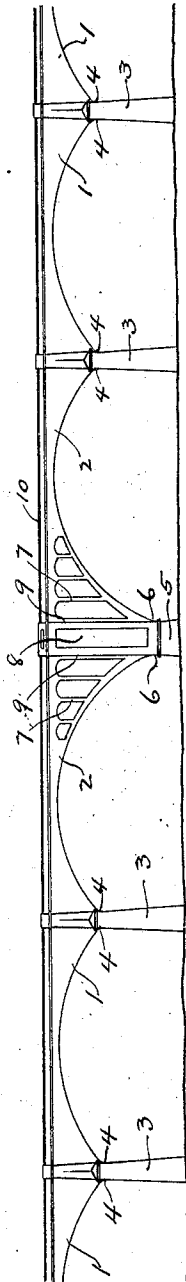


D. B. LUTEN.
ARCH VIADUCT.
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1,027,742.

Patented May 28, 1912



Witnesses

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ARCH-VIADUCT.

1,027,742.

Specification of Letters Patent.

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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 Improvement in Arch-Viaducts, of which the following is a specification.

My invention relates to improvements in arch viaducts whereby the arches composing the viaduct may be erected on light piers with high springings to provide maximum waterway, but in sections ending at a pier having low springings so that failure of any section will not wreck the entire structure.

This invention is illustrated in the accompanying drawing which is an elevation of a viaduct embodying my improvement.

A viaduct composed of arches in series usually requires narrow piers and flat arches with elevated springings to provide sufficient waterway without excessive elevation of the roadway supported on the arches. Since the thrust of one arch balances that of its neighbor on a pier, the pier need be made thick enough to carry only the vertical loads of the arches. But this requires that the two arches thrust against each other on the pier at all times, in order that the thrust of one may be balanced by that of the other. If one of such arches be destroyed the thrust of the other will overturn the pier and cause failure of that arch and in turn each succeeding pier and arch will fail. When such a viaduct comprises a great number of arches, it is desirable to divide the viaduct into sections comprising a limited number of arches, so that if one arch or one pier should collapse the failure would not extend beyond that section in which the arch or pier is included. Such sections ordinarily may include six or seven arches all of which may be wrecked by failure of any one of them, but the failure cannot extend to adjoining sections. The number of arches desirable in such sections depends upon the amount of obstruction and added cost occasioned by the method employed of isolating each section from its neighbor. It usually happens also that the building of a long viaduct must extend over such a period of time as to be menaced by severe floods. The arches are built successively from one end to economize in lumber for centers, which thus may be used repeatedly, and also because the building of the entire series on centers at the

same time would obstruct the waterway to a dangerous extent in the event of a flood. After five or six arches of a series have been completed the centers may be removed from the first arch and re-erected for a succeeding arch. Thus there would be five or six arches under construction at the head of the series with completed arches free of centers behind them. Now if a flood should occur sufficient to wreck the centers of some of the arches under construction, the collapse of the entire structure so far erected would follow. Whereas if built in sections the arches of the section under actual construction alone would fail.

In the drawing the flat arches 1 are supported on high narrow piers 3 abundantly able to sustain the weight of the arches as long as they balance one another on a pier. The springings 4 are elevated to provide maximum waterway. At an intermediate pier 5 which I propose to make the end of a section as referred to above, the springings 6 of the two supported arches are depressed to such an extent that if one of the arches were removed from the pier, the pier would still support the thrust of the other without overturning. This depressing of the springings is accomplished by distorting the arches 2, and if desired also increasing their spans, so that the arches may retain their symmetrical arrangement with respect to each pier to maintain the balance on that pier. By employing columnar supports 7 for the roadway 10 adjacent this abutment-pier, so-called because like an abutment it is capable of resisting horizontal thrust, the roadway construction may be maintained complete up to the pier regardless of failure of the adjacent section. Whereas if the arches were covered with earth filling to support the roadway as would ordinarily be employed for the arches 1, the filling would run out of the arch at the pier on failure of the adjacent section, permitting collapse of the roadway for part of the span. The columnar supports moreover produce lighter loading, acting with less severity on the abutment-pier, and the openings between columns increase the waterway. In addition to which they enhance the appearance of the structure.

The upper part 8 of the abutment-pier may be made a solid mass of masonry, thus producing great weight on the base to resist overturning. An expansion joint 9 is essen-

tial at each side of the upper part of the pier to eliminate temperature stresses. If now the section to the right of the abutment-pier 5 should collapse, the section to the left and including the upper part 8 of the pier 5 would remain standing; and similarly for the other section.

A means is thus provided by my invention of effectively localizing a collapse in any part of an arch-viaduct.

I claim:—

1. A series of earth-filled arches with elevated springings and balanced on slender piers, combined with an intermediate abutment-pier supporting the ends of two arches with depressed springings at the abutment-pier, and with the roadway over the arches adjacent the abutment-pier supported by columns resting upon the arches.

2. A series of arches with elevated springings on piers, combined with an intermediate abutment-pier supporting the depressed ends of two of the aforesaid arches, and with

columnar supports resting on the arches adjacent the abutment-pier.

3. A series of arches with elevated springings on piers combined with an intermediate abutment-pier supporting the depressed ends of two of the aforesaid arches.

4. An abutment-pier supporting the depressed ends of a plurality of arches, combined with other adjacent piers supporting the opposite elevated ends of the aforesaid arches.

5. An abutment-pier supporting the depressed ends of a plurality of arches, and intermediate to other piers supporting the elevated ends of the arches.

In witness whereof, I, have hereunto set my hand and seal at Indianapolis, Indiana, this 13th day of December, A. D. one thousand nine hundred and ten.

DANIEL B. LUTEN. [L. S.]

Witnesses:

ARTHUR M. HOOD,

THOMAS W. McMEANS.