To all whom it may concern:

Be it known that I, GEORGE M. CHENEY, 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 Concrete-Bridge Reinforcements, of which the following is a specification.

In the construction of concrete bridges and similar structures it is found that after a time there develop cracks, which while they do not necessarily or materially decrease the ultimate strength of the structure, yet are unsightly and objectionable.

The object of my present invention is to produce a reinforcing structure adapted to be embedded within the concrete, the construction and arrangement of said reinforcing structure being such as to eliminate or nearly eliminate the probability of cracking, but also being such that if there be cracking it will occur along predetermined lines, the concrete structure being so formed as to render less apparent any such cracks.

The accompanying drawings illustrate my invention.

Figure 1 is an elevation of a bridge structure, showing a pier upon one side of which is shown the concrete structure, while on the other side is shown the reinforcing structure to be embedded in the concrete, as indicated in dotted lines. Fig. 2 is a detail of the reinforcing tie-wires which connect the transverse floor-beams of the arch. Fig. 3 is an enlarged detail of said reinforcing means at an intermediate stage of application. Fig. 4 is a perspective detail of the adjacent ends of two of the arch panels. Figs. 5 and 6 illustrate a modified arrangement of the reinforcing-wirings shown in Figs. 2 and 3. Fig. 7 is a sectional view of the connection between the paneled arch and the floor-beams.

In the drawings, 10 10' 10'' indicate successive and independent panels of a reinforcing-arch. These panels may be formed in any desired manner—as, for instance, by means of angle-irons. Each panel consists of sides 12 12 and ends 13 13, which in the present case are arranged in pairs and connected by suitable gusset-plates 14, each panel being suitably braced by diagonals 15. The adjacent ends 13 of adjacent panels are perforated, as at 16, longitudinally of the arch, and the successive panels are then connected by passing pins 17 through the registering openings 16, the panels being thus free to be separated longitudinally of the arch, but held against twisting and transverse displacement. In order to form a reinforcement for the bridge-rail, I insert uprights 18 between the adjacent ends of the several panels, said uprights being perforated to register with the openings 16, so that the pins 17 pass therethrough. The upper ends of the uprights 18 are connected in a suitable manner, as by twisted wire 19, which by twisting may be used to bring the parts to proper relative position.

When the arch-panels are formed in duplicate, there remains between the upper and lower gusset-plates a space in which I insert a plate 20, perforated adjacent its vertical edges to receive wires 21, which extend either to the end of the arch structure or to an adjacent plate, the arrangement being such that the tension member formed by the several wires 21 and the plate 20 forms a tie between the two ends of the arch structure, so as to tie the several panels firmly but yieldingly together. The desired and necessary tension of this tension member may be produced by twisting the wires 21 together in pairs, as shown.

The floor-beams 30 may be formed in any suitable manner, as by two pairs of angle-irons forming the top and bottom flanges and connecting lattice-work or any other suitable manner, and each floor-beam is provided at each end with a plate 31, which is perforated near its vertical edge with holes to register with corresponding holes 16, the corresponding pins 17 passing therethrough, each floor-beam thus serving as a tie between adjacent reinforcing arch structures.

I believe it to be desirable to place a reinforcing tension member in the concrete close to the intrados and to follow the intrados with a reasonable degree of uniformity. For this purpose I place upon the false work 35, between each pair of floor-beams 30, a series of blocks 36, and then string a pair of wires 37 and 38 longitudinally of the arch, which wires pass alternately under and over the lower members of the floor-beams. These wires are then twisted together at an intermediate point between each pair of floor-beams, as illustrated in Fig. 2. This produces a tension which tends to straighten the wire 37 38 between each pair of floor-beams, and in order to cause the wire thus formed to...
conform more nearly with the desired curvature of the intrados I string over the tops of the floor-beams and under the tension member 37 38 a desirable number of wires 39, which may be twisted together in pairs to form suspension members 39', which serve to draw the tension member 37 38 upward so as to conform quite closely to the curvature of the false work, and when this is done the spacing-blocks 36 may be readily removed.

In operation the reinforcing structure will be erected in the ordinary manner and the concrete applied thereto, said concrete being weakened, as by a V or other desirably-shaped groove 40, along the line of separation between the arch-panels 10, 10', and 10'. Under these circumstances if the structure be strained from any cause it will be seen that the panels of the reinforcing-arch are free to separate longitudinally of the arch against the tension of the tension member 20 21, and any cracking will take place along the weakened lines 40, and therefore will not be readily apparent, being hidden by the ornamental effect of the groove 40. Any longitudinal separation of the arch-panels which may take place will of course be slight, and the pins 17 are of such length as to prevent the possibility of twisting the several panels relatively, and the floor-beams will remain firmly pinned to the arch as a whole.

In order to preserve the line of demarcation between the panels of the arch up through the bridge-rail, the posts 18 are duplicated between each pair of panels, and the posts then connected in pairs by the tension members 19, so that the tension members do not cross the line of demarcation between the panels.

I claim as my invention—

1. In a concrete bridge, an arch composed of a plurality of longitudinally-separable panels embedded therein.

2. In a concrete bridge, an arch embedded therein, said arch consisting of a plurality of separate panels pinned together to prevent transverse displacement and to permit longitudinal separation.

3. In a concrete bridge, an arch composed of a plurality of longitudinally-separable panels embedded therein, and a tension member connecting the ends of the arch along the line of the panels.

4. In a concrete bridge, an arch embedded therein, said arch consisting of a plurality of separate panels pinned together to prevent transverse displacement and to permit longitudinal separation, and a tension member connecting the ends of the arch along the line of the panels.

5. In a concrete bridge, an arch embedded therein, said arch composed of a plurality of separate panels with interengaging portions to permit longitudinal displacement but preventing transverse displacement, a tension member connecting the end panels along the line of panels, and rail-posts tied together in sets preserving the lines of separation between the arch-panels.

6. In a concrete bridge, an arch embedded therein, said arch composed of a plurality of separate panels, interengaging members permitting longitudinal displacement, plates 20 passing through the adjacent ends of the several panels, and tension members connecting the several plates and the end panels.

7. In a concrete bridge, a reinforcing structure embedded therein, said structure comprising a pair of arches each consisting of a plurality of separate panels with interengaging members permitting longitudinal displacement but preventing transverse displacement, and floor-beams connecting the two arches, said interengaging members of the arches passing freely through the floor-beams in such manner as to hold the floor-beams lengthwise.

8. In a concrete bridge, the combination with a plurality of transverse reinforcing members, of a tension member connecting said reinforcing members on a line adjacent and approximating the intrados, and other tension members suspended from the transverse reinforcing members and engaging the first-mentioned tension member at points between the transverse reinforcing members under tension whereby the first-mentioned tension member is held between the transverse reinforcing members in a curve approximating the curvature of the intrados.

9. In a concrete bridge, the combination with transverse reinforcing members embedded therein, of a tension member extending between the several transverse members longitudinally of the arch and placed in tension tending to straighten the same between the transverse members, and suspension members suspended from the transverse members and engaging the first-mentioned tension member, said suspension members being placed in tension after their suspension to displace the first-mentioned tension member between the transverse members and hold the said first-mentioned tension member in a curve approximating the curvature of the adjacent portion of the intrados.

10. In a concrete bridge, an arch composed of a plurality of longitudinally-separable panels embedded therein, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

11. In a concrete bridge, an arch embedded therein, said arch consisting of a plurality of separate panels pinned together to prevent transverse displacement and to permit longitudinal separation, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of...
12. In a concrete bridge, an arch composed of a plurality of longitudinally-separable panels embedded therein, a tension member connecting the ends of the arch along the line of the panels, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

13. In a concrete bridge, an arch embedded therein, said arch consisting of a plurality of separate panels pinned together to prevent transverse displacement and to permit longitudinal separation, a tension member connecting the ends of the arch along the line of the panels, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

14. In a concrete bridge, an arch embedded therein, said arch composed of a plurality of separate panels with interengaging portions to permit longitudinal displacement but preventing transverse displacement, a tension member connecting the end panels along the line of panels. rail-posts tied together in sets preserving the lines of separation between the arch-panels, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

15. In a concrete bridge, an arch embedded therein, said arch composed of a plurality of separate panels, interengaging members permitting longitudinal displacement, plates passing through the adjacent ends of the several panels, tension members connecting the several plates and the end panels, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

16. In a concrete bridge, a reinforcing structure embedded therein, said structure comprising a pair of arches each consisting of a plurality of separate panels with interengaging members permitting longitudinal displacement but preventing transverse displacement, and floor-beams connecting the two arches, said interengaging members of the arches passing freely through the floor-beams in such manner as to hold the floor-beams lengthwise, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

17. In a concrete bridge, the combination with a plurality of transverse reinforcing members, of a tension member connecting said reinforcing members on a line adjacent and approximating the intrados, and other tension members suspended from the transverse reinforcing members and engaging the first-mentioned tension member at the points between the transverse reinforcing members under tension whereby the first-mentioned tension member is held between the transverse reinforcing members in a curve approximating the curvature of the intrados, and weakening-grooves formed in the face of the concrete adjacent and substantially parallel with the lines of separation between the panels of the reinforcing-arch.

In witness whereof I have hereunto set my hand and seal at Indianapolis, Indiana, this 24th day of February, A. D. 1906.

GEORGE M. CHENEY. [L. s.]

Witnesses:
ARThUR M. HOOD,
THOMAS W. McMEANS.