No. 803,852. PATENTED NOV. 7, 1905.

C. L. RAYMOND.

METAL AND CONCRETE CONSTRUCTION.

APPLICATION FILED JUNE 3, 1904.

2 SHEETS—SHEET 1.

FIG. 1.

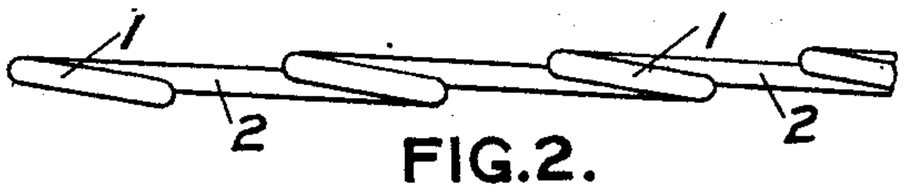


FIG. 2.

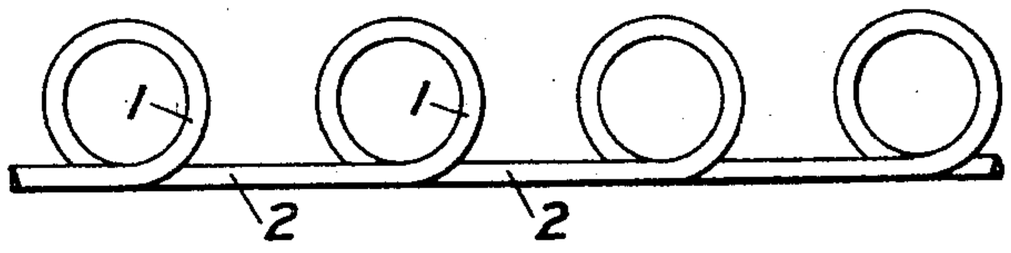


FIG. 3.

FIG. 4.

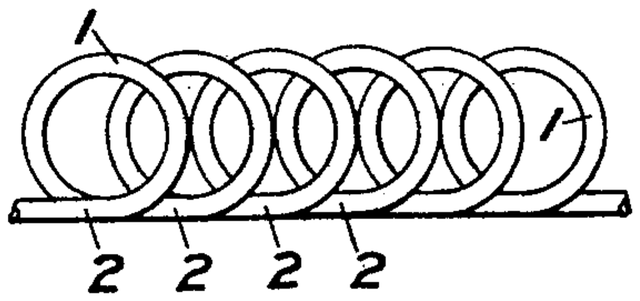


FIG. 5.

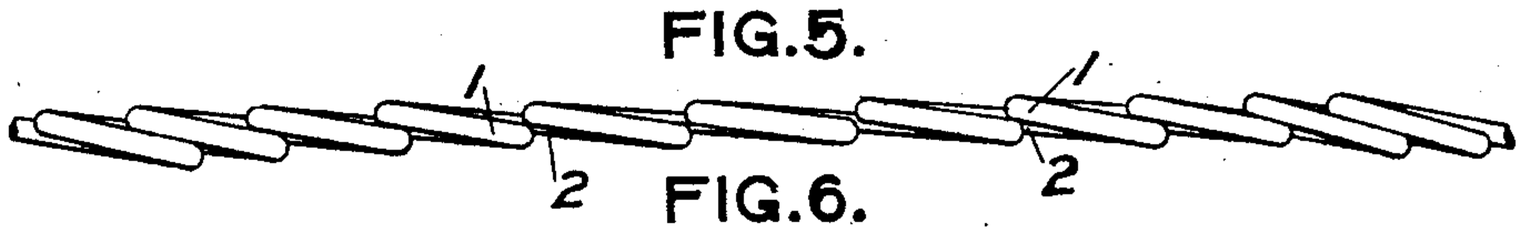


FIG. 6.

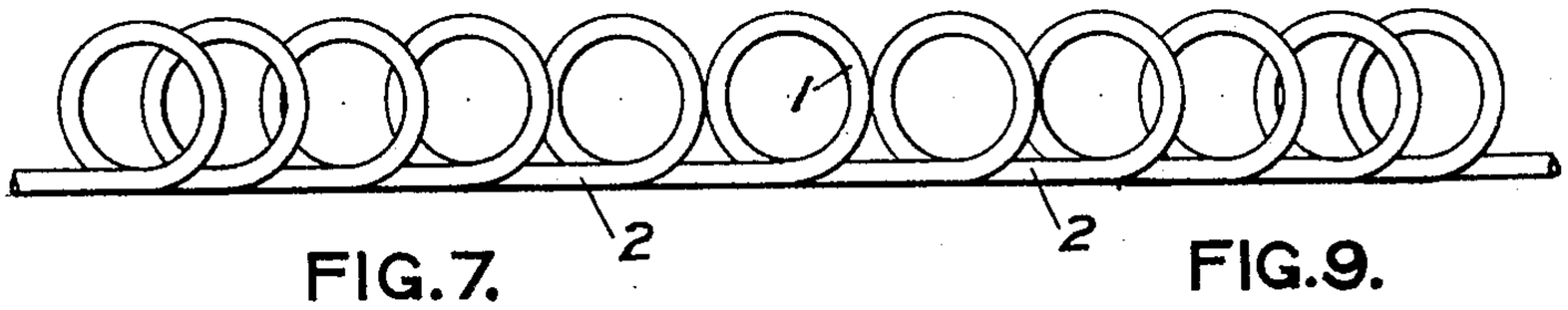


FIG. 7.

FIG. 9.

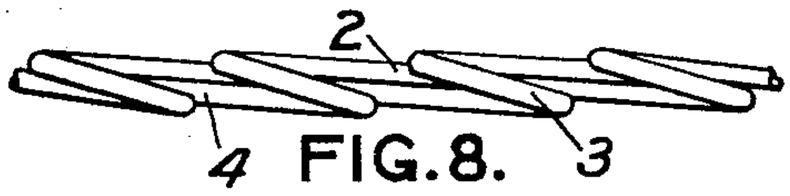


FIG. 8.

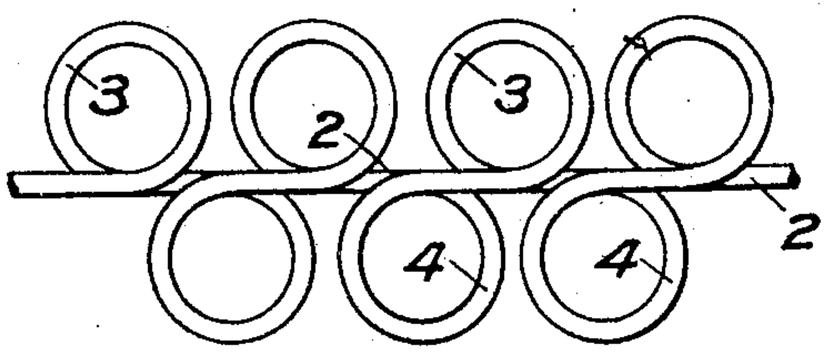
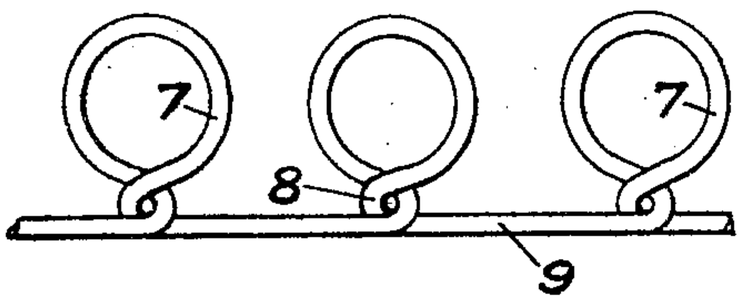


FIG. 11.

FIG. 12.



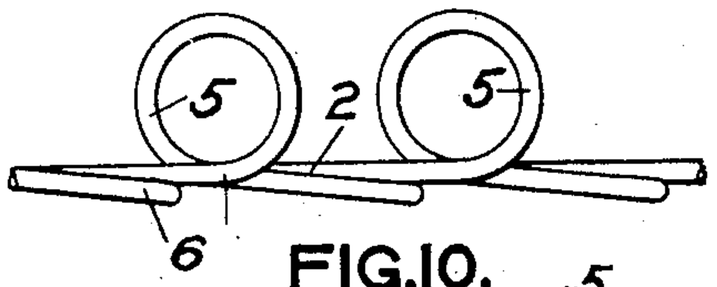


FIG. 10.

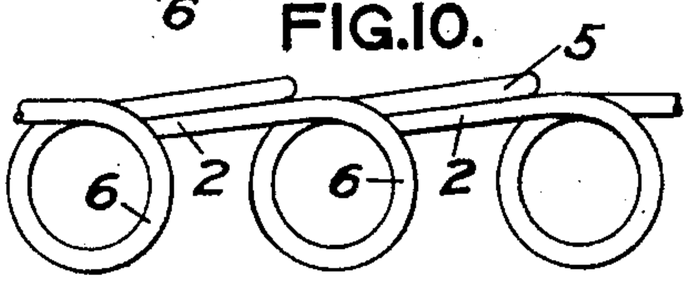


FIG. 13.

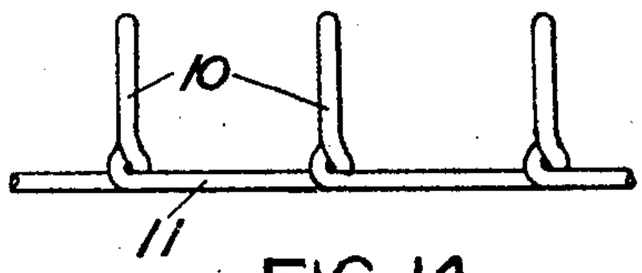
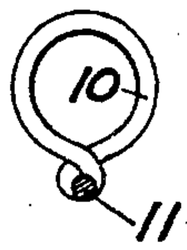


FIG. 14.



Witnesses:
Clarence W. Carroll.
L. Gurnee.

Inventor:
Charles L. Raymond
by Osgood & Davis
his attys

No. 803,852. PATENTED NOV. 7, 1905.

C. L. RAYMOND.

METAL AND CONCRETE CONSTRUCTION.

APPLICATION FILED JUNE 3, 1904.

2 SHEETS—SHEET 2.

FIG.15.

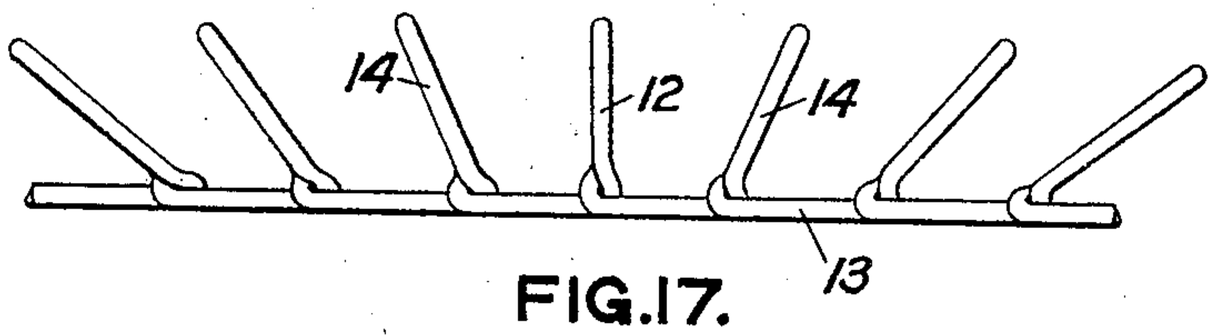


FIG.16.

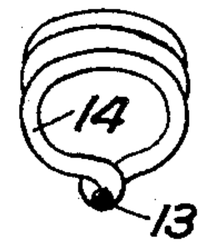


FIG.17.

FIG.18.

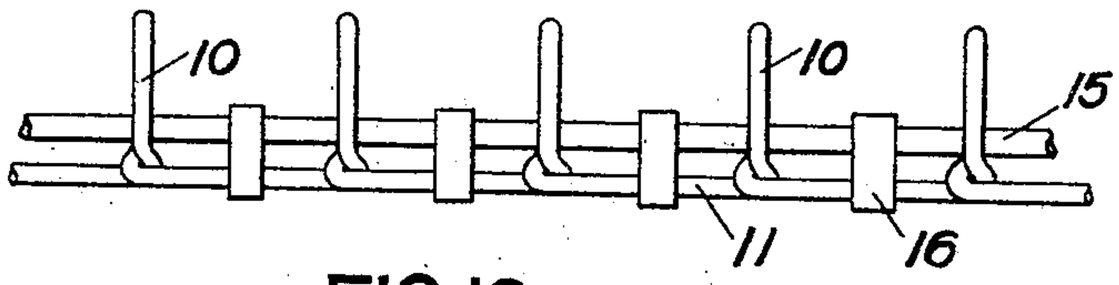


FIG.19.

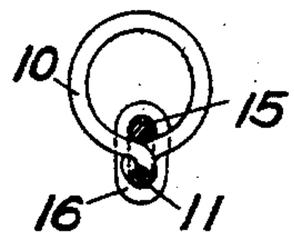


FIG.21.

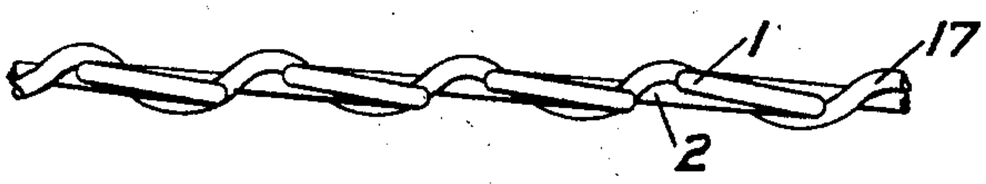


FIG.20.

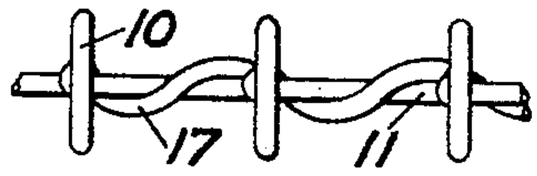


FIG.22.

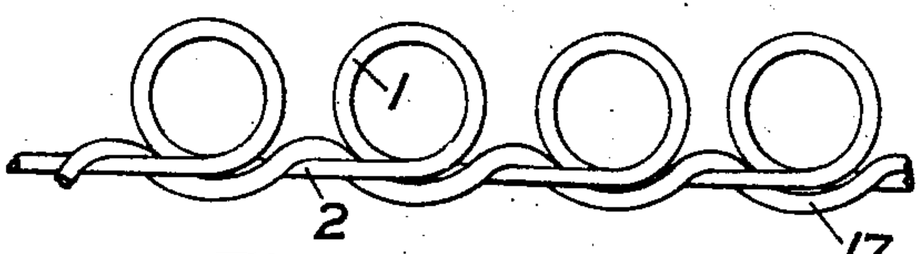


FIG.23.

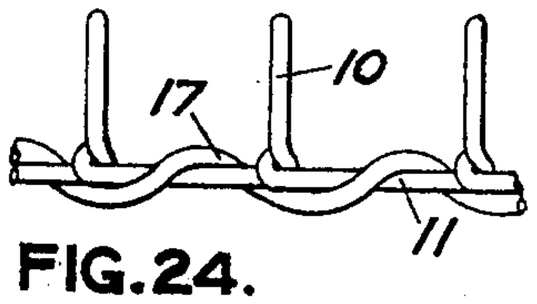
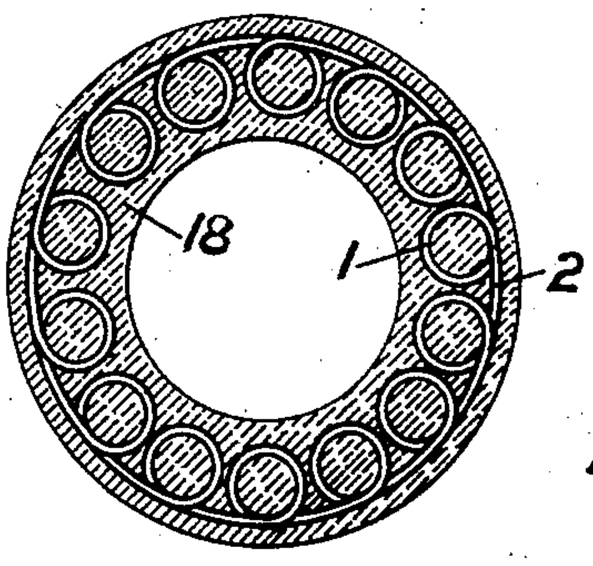


FIG.24.



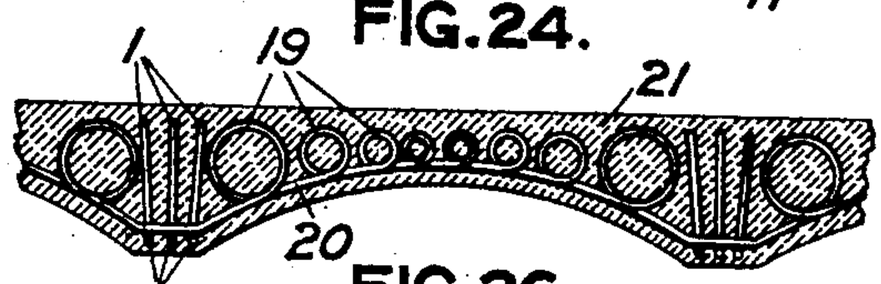


FIG.26.

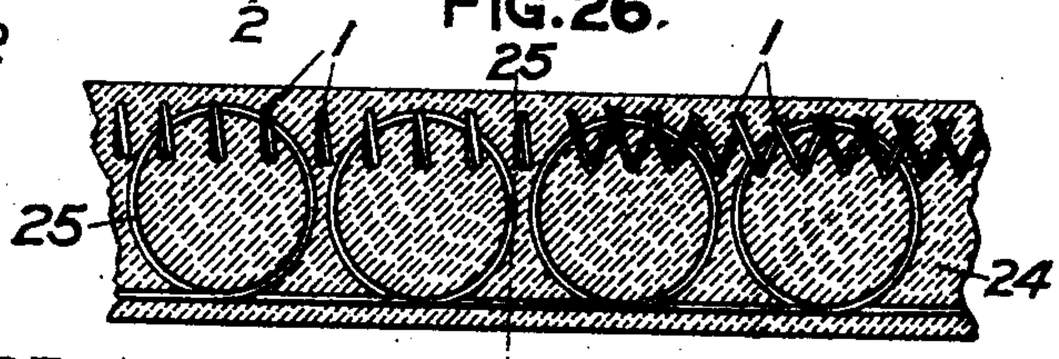
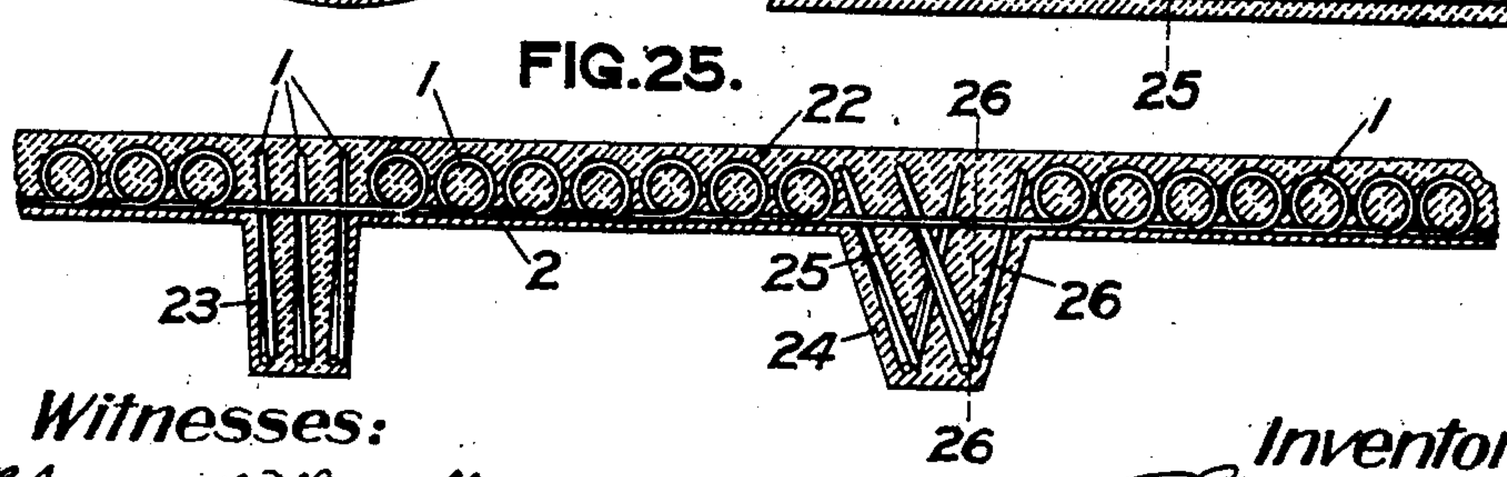


FIG.25.



Witnesses:
Clarence W. Carroll.
N. Gurnee.

Inventor:
Charles L. Raymond
by Osgood & Davis
his Attys

UNITED STATES PATENT OFFICE.

CHARLES L. RAYMOND, OF ROCHESTER, NEW YORK.

METAL-AND-CONCRETE CONSTRUCTION.

No. 803,852. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed June 3, 1904. Serial No. 210,972.

To all whom it may concern:

Be it known that I, CHARLES L. RAYMOND, a citizen of the United States, and a resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Metal-and-Concrete Construction, of which the following is a specification.

This invention relates to metal-and-concrete construction.

In the drawings, Figures 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, and 21 are top plan views of metallic members according to this invention. Figs. 2, 4, 6, 8, 10, 12, 20, and 22 are side elevations of certain of said members; and Figs. 23, 24, 25, and 26 show the same embedded, and Figs. 14, 16, and 18 are end elevations of certain of such members.

In the drawings, Figs. 1 and 2 show a reinforcement for a body of concrete consisting of a metallic member adapted to be embedded in and to strengthen a concrete construction, and particularly to increase the tensile strength thereof, formed by bending a single rod, bar, or wire into a series of connected loops 1, circular or otherwise, said loops being connected by straight or substantially straight portions 2. Figs. 3 and 4 show a similar construction in which the loops 1 overlap each other and in which the connecting members 2 are quite short. Figs. 5 and 6 show a series of similar loops formed of continuous rod, in which the connecting members 2 are of varying lengths and the loops approach or overlap one another to varying degrees. In the preceding figures the loops 1 are on the same side of the series of connecting members 2; but in Figs. 7 and 8 the loops are in two series, one of which, 3, is on one side of the connecting portions 2 and the other of which, 4, is on the other side of such connecting portions. The loops may be set at varying angles to each other and to the connecting portions.

In Figs. 9 and 10 one series of loops 5 is at right angles to the other series of loops 6, and both series are made from the same single rod or wire.

In Fig. 11 the loops 7 are twisted together, as at 8, and through one hundred and eighty degrees from the position shown in Figs. 1 and 2, so as to increase the rigidity of the reinforcement.

In Fig. 13 the loops 10 instead of being turned through one hundred and eighty degrees are turned through ninety degrees only and stand substantially at right angles to the connecting portions 11.

In Figs. 15 and 16 the loops after having been turned through ninety degrees, as in Figs. 13 and 14, are also bent at different angles to each other. In this instance the middle loop 12 is vertical to the line of the connecting portions 13, and the loops 14, on each side of the middle loop 12, are bent at angles to the plane of said middle loop, and succeeding loops are bent at still greater angles, so that the loops as they are farther away from the middle loop 12 are set at increased angles thereto.

In Figs. 17 and 18 is shown an additional strengthening-rod 15 inserted through the successive loops, and it is shown as applied to the form of metallic member shown in Figs. 13 and 14. In this case the strengthening-rod 15 runs inside of the loops 10 and may, if desired, be attached to the connecting portions 11 by connectors or hangers 16.

In Figs. 19 and 20 a strengthening bar or member 17 is attached to the metallic member by being twisted around the connecting members 2 of the form of metallic member shown in Fig. 1. In Figs. 21 and 22 the same strengthening member 17 is shown twisted around the connecting members 11 of the form of metallic member shown in Figs. 13 and 14.

In Fig. 23 the form of metallic member shown in Figs. 1 and 2 is shown as applied to a cylindrical, and in this instance hollow, concrete construction. In this case the whole member, consisting of the loops 1 and connecting portions 2, is bent around in the circle, so as to be wholly embedded in the concrete mass 18, and the ends of the metallic member are fastened together. In this case pressure in the interior of the concrete tube 18 is resisted by the metallic member, such pressure tending to elongate the connecting members 2 and to contract the loops 1; but any contraction of loops 1 necessitates compression of the concrete contained within the loops, and this concrete is particularly adapted for compression strains.

In Fig. 24 the metallic member is shown as applied to a concrete floor or ceiling construction having low arches. In this case the loops 19 are greater in size, and the connecting portions 20 are so curved as to follow the curve of the arch. The smaller loops are in the thinner portion of the concrete over the arch, and the larger loops are in the thicker portion of said concrete. Between the arches are a series of metallic members having the loops 1 and the connecting members 2 arranged transversely to the line of

metallic members just above described, so that while one member or series of members strengthens the concrete construction in one direction the other member strengthens said construction on lines transverse to the direction of the first-mentioned member.

In Fig. 25 is shown a concrete construction having a floor or top 22, in which the series of loops 1 and connecting members 2 is embedded, while in the supporting-beam 23 are several series of larger loops 1, preferably parallel to each other when the sides of the supporting portions 23 are substantially or nearly parallel; but in cases where the sides of the supporting portions are not parallel then each metallic member may consist of series of loops 25 and 26, in which some of the loops are bent at an angle to some of the other loops, and the loops of one series may set between loops of the other series.

In none of the above forms do the loops have common axes. The loops of the several series are non-helical. Helical loops do not give the effect produced by the arrangement and forms above described. Each loop is made by bending a rod in a curve, so that the ends of the loop cross and the ends of the rod extend in different directions for connecting with the next loop on each side of the first.

It will be clear that in each of the above forms the concrete is strengthened and tied together, as the loops by any strain less than sufficient to crush the concrete or to break the rod strengthen the concrete.

What I claim is—

1. The combination of a body of concrete, and, embedded therein, a continuous strengthening member consisting of a single rod bent into a series of non-helical loops whose ends cross.

2. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of similar non-helical loops whose ends cross.

3. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of non-helical loops whose ends cross and are turned through an angle with reference to the line of the connecting portions between the loops.

4. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of non-helical loops whose ends cross and a separate strengthening-wire attached to said rod.

5. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of similar non-helical loops whose ends cross and a separate strengthening-wire attached to said rod.

6. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of loops whose ends cross and are turned through an angle with reference to the line of the connecting portions between the loops and a separate strengthening-wire attached to said rod.

7. The combination of a body of concrete, and, embedded therein, a continuous strengthening member consisting of a single rod bent into a series of loops whose ends cross and a separate strengthening-wire adjacent to the connecting portions between said loops and attached to said connecting portions.

8. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of similar loops whose ends cross and a separate strengthening-wire adjacent to the connecting portions between said loops and attached to said connecting portions.

9. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of loops whose ends cross and are turned through an angle with reference to the line of the connecting portions between the loops and a separate strengthening-wire adjacent to the connecting portions between said loops and attached to said connecting portions.

10. The combination of a body of concrete, and, embedded therein, a single rod bent into a series of loops whose ends cross, certain of said loops being bent at an angle to others of said loops and a separate strengthening-wire adjacent to the connecting portions between said loops and attached to said connecting portions.

CHARLES L. RAYMOND.

Witnesses:

D. GURNEE,

L. THON.