No. 864,619. PATENTED AUG. 27, 1907.

A. DE MAN.

COMPOSITE STRUCTURE.

APPLICATION FILED FEB. 26, 1904.

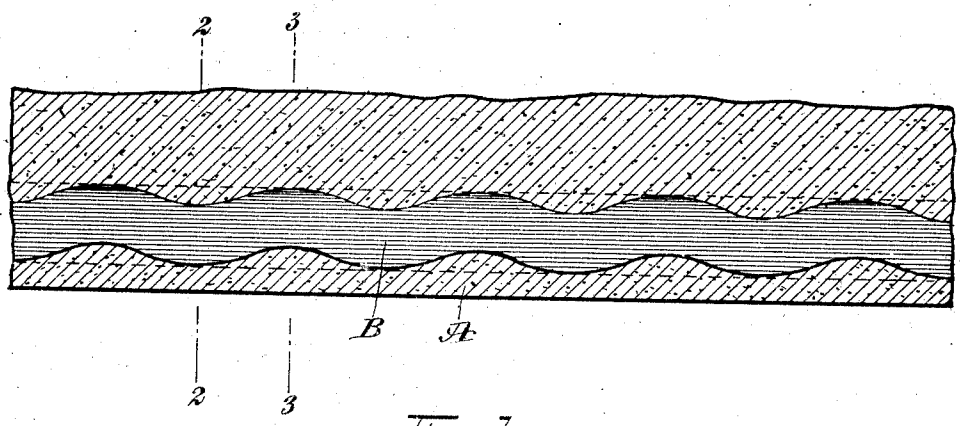

Fig. 1

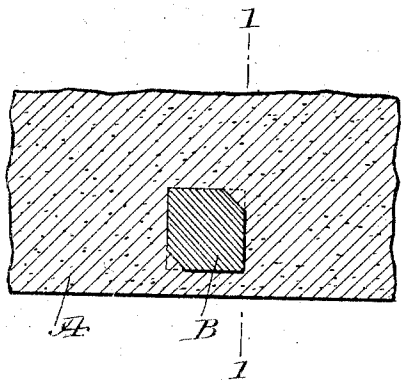

Fig. 2

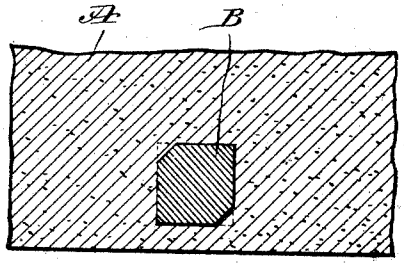

Fig. 3

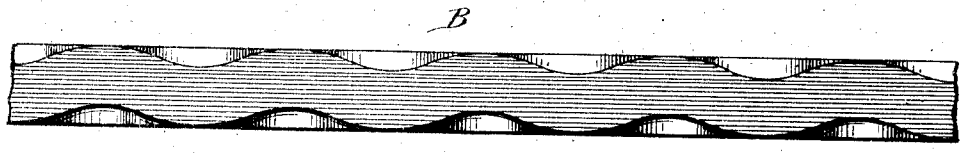

Fig. 4

WITNESSES:

Joshua Bergstrom

Rud. J. Hoster

INVENTOR

Alphonse De Man

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

ALPHONSE DE MAN, OF NEW YORK, N. Y., ASSIGNOR TO JULIE DE MAN, OF NEW YORK, N. Y.

COMPOSITE STRUCTURE.

No. 864,619. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed February 26, 1904. Serial No. 195,365.

To all whom it may concern:

Be it known that I, ALPHONSE DE MAN, a citizen of the United States, and a resident of the city of New York, (borough of Manhattan,) in the county and State of New York, have invented a new and Improved Composite Structure, of which the following is a full, clear, and exact description.

The invention relates to cementitious bodies reinforced by structural iron or steel members, and its object is to provide a new and improved composite structure in which the reinforcing members are held against movement in the cementitious body, to insure a total transmission of the stresses from the metal members to the surrounding concrete, it being understood that in order to obtain a perfect even transmission the anchoring device should be continuous and uniform in amount or effect throughout the entire length of the reinforcing member.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal sectional side elevation of the improvement, illustrating a reinforced beam, the section being on the line 1—1 of Fig. 2; Fig. 2 is a cross section of the same, on the line 2—2 of Fig. 1; Fig. 3 is a similar view of the same, on the line 3—3 of Fig. 1; and Fig. 4 is a side elevation of the reinforcing member.

In the cementitious body A is embedded the reinforcing member B, made of a structural iron or steel bar, approximately rectangular in cross section and having at least two or preferably all of its corners or edges indented or made undulating throughout the length of the bar, the dents or undulations being produced during the process of rolling or otherwise forming the bar, or by treating the bar subsequently for the purpose. The undulations of adjacent corners are alternately arranged, to give to the face of each side the appearance of a wavy band, as plainly indicated in Figs. 1 and 4. The undulating of the undulations on adjacent corners is an essential feature in the arrangement of the bar, as it is the means for obtaining varying cross sections of uniform area, the bar being used to resist tension stresses, and the uniform area of its cross sections throughout the entire length is essential, as the strength of the bar is only what it is in its smallest cross section, and all the metal taken up by enlargement over the smaller area is lost. By reference to the drawings it will be seen that the dents or undulations are of unbroken continuity, thereby avoiding all sharp points liable to cut the concrete, and besides the dents or undulations are uniform in shape, equal in length and depth, and the dents or undulations of adjacent edges are staggered or arranged alternately, so that the highest rise of a dent on one edge or corner is in transverse alinement with the greatets depth of the dent or undulation located directly opposite on the next adjacent edge or corner.

By the arrangement described, the material of the cementitious body follows and adheres to the surface of the undulations of the embedded reinforcing member B, and the slant of the undulated surface of the depressions at the angles prevents any longitudinal movement of the bar in the cementitious body A, and insures the total transmission of the stresses from the member to the surrounding concrete.

The cross section of the bar forming a reinforcing member can be varied without however deviating from my invention, it being understood that the bar has undulations along the meeting angles of the adjacent surfaces or sides of the bar, and the surfaces appear wavy or undulating. By the symmetrical alternate arrangement of the undulations, the cross sections of the bar are varying in form, but they have all equal areas, throughout the lengthe of the bar, and hence there are no weak spots in the bar and its strength is uniform throughout its full length.

It is understood that the simple adhesion of the cement and smooth surfaces of the metal reinforcing members having a uniform section throughout their entire length are not sufficient to transmit the stresses from the metal members to the surrounding concrete; besides, when the stresses are very great, it requires large reinforcing members which are more affected by vibration than small members, which consequently disturb seriously the adhesion. Rust and even some paint used to prevent it are apt to weaken the adhesion of cement to the surface of the reinforcing members, but by providing the undulated edges it is evident that an absolute bond between the reinforcing members and the concrete is obtained.

It is understood that in practice the reinforcing member is embedded in the fresh concrete, and after the latter is set the undulations, on account of being molded in hardened concrete, prevent longitudinal movement of the reinforcing members in the concrete.

The resistance of concrete to compression is usually sufficient, so that in practice it seldom requires reinforcing in the part where compression occurs, and this is especially the case in the top of beams and floor slabs. On the other hand concrete, on account of being very weak in tension, requires reinforcing in the parts of the structure where tension occurs. In beams and floor slabs, the concrete above the neutral line is in compression and below that line in tension. The part in tension is reinforced by one or more tension members

B, as described, until it can stand as much tension as the concrete above the neutral line can stand compression.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A metallic reinforcing member for composite structures, consisting of a bar, approximately rectangular in cross section and provided on at least two of its edges with undulations of unbroken continuity, the cross sections of the bar being of varying form and uniform area.

2. A metallic reinforcing member for composite structures, consisting of a bar, approximately rectangular in cross section and provided on at least two of its edges with undulations of unbroken continuity, the cross sections of the bar being of varying form and uniform area throughout the length of the bar.

3. A metallic reinforcing member for composite structures, consisting of a bar, approximately rectangular in cross section and provided on at least two of its edges with undulations, the undulations on adjacent edges being arranged alternately.

4. A metallic reinforcing member for composite structures, consisting of a bar, approximately rectangular in cross section and provided on at least two of its edges with undulations, the undulations on adjacent edges being arranged alternately and the cross sections of the bar being of varying form and uniform area throughout the length of the bar.

5. A metallic reinforcing member for composite structures, consisting of a bar, approximately rectangular in cross section and provided on at least two of its edges with undulations of unbroken continuity, the cross sections of the bar throughout the length thereof being symmetrical and the longitudinal sections through the axis of the bar being symmetrical.

6. A metallic reinforcing member for composite structures, consisting of a bar, approximately rectangular in cross section and provided on at least two of its edges with undulations, the undulations on adjacent edges being arranged alternately and the cross sections of the bar being of varying form and uniform area throughout the length of the bar, the cross sections, and the longitudinal sections through the axis of the bar being symmetrical.

7. A metallic reinforcing member for composite structures, consisting of an approximately rectangular bar having each edge formed with uniform undulations of unbroken continuity from one end of the bar to the other, the undulations of one edge being staggered relative to the undulations of an adjacent edge.

8. A metallic reinforcing member for composite structures, consisting of an approximately rectangular bar having each edge formed with uniform undulations of the same length and depth and of unbroken continuity from one end of the bar to the other, the undulations of one edge being staggered relative to the undulations of an adjacent edge.

9. A metallic re-inforcing bar for cementitious bodies formed with a plurality of flat surfaces extending longitudinally thereof and having a series of depressions formed at along each of the lines of intersection between said surfaces, the depressions of one series being arranged alternately to those of each adjacent series.

10. A metallic re-inforcing bar for cementitious bodies formed with a plurality of flat surfaces extending longitudinally thereof and being compressed at intervals along each of the lines of intersection between said surfaces to provide a plurality of series of depressions, the depressions of one series being arranged alternately to those of the adjacent series.

11. A composite structure, consisting of a cementitious body in combination with a metallic re-inforcing bar embedded therein, the said re-inforcing bar having a plurality of flat surfaces extending longitudinally thereof and being compressed at intervals along each of the lines of intersection between said surfaces to provide a plurality of series of depressions, the depressions of one series being arranged alternately to those of each adjacent series.

12. A tension bar for composite beams comprising a bar provided on both faces along its marginal edges with depressions the depressions along one marginal edge being staggered with respect to the depressions along the marginal edge on the same face of the bar, and the depressions along the marginal edges on one face of the bar being staggered with respect to the depressions along the corresponding marginal edges on the opposite face of the bar.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALPHONSE DE MAN.

Witnesses:

THEO. G. HOSTER.

EVERARD BOLTON MARSHALL.