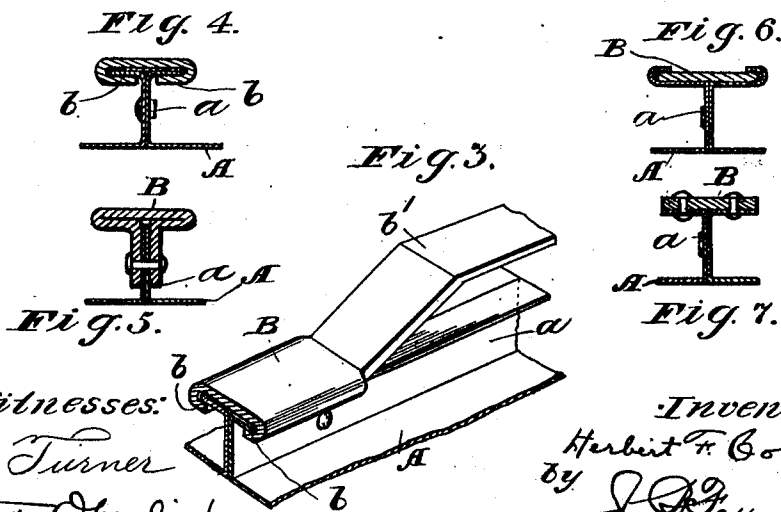
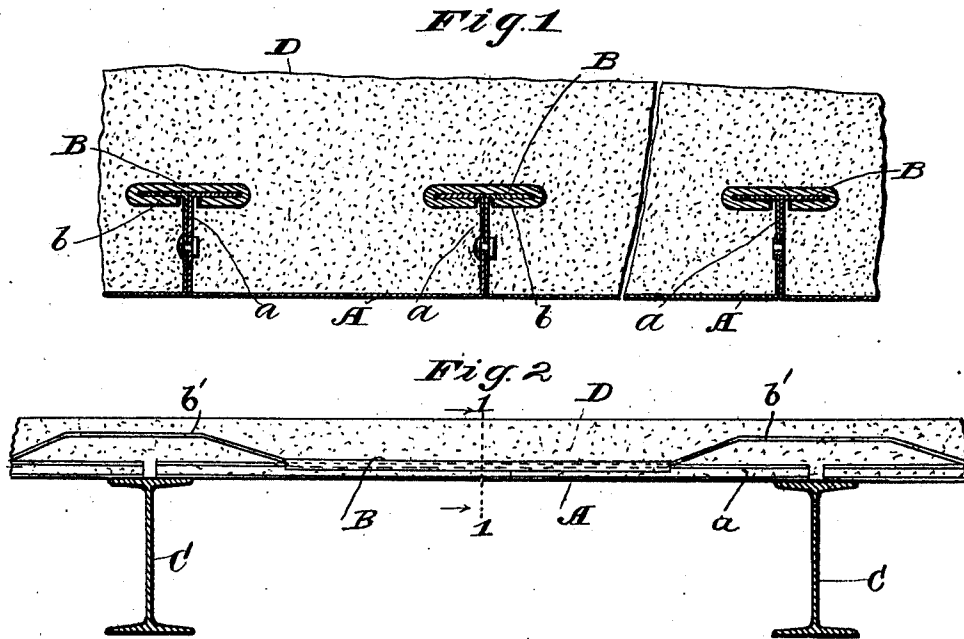


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 REINFORCEMENT FOR STRUCTURES OF CONCRETE.
 APPLICATION FILED AUG. 15, 1907.

989,120.

Patented Apr. 11, 1911.



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UNITED STATES PATENT OFFICE.

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REINFORCEMENT FOR STRUCTURES OF CONCRETE.

989,120.

Specification of Letters Patent.

Patented Apr. 11, 1911.

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To all whom it may concern:

Be it known that I, HERBERT F. COBB, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Reinforcements for Structures of Concrete, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention relates to structures of concrete, particularly to the construction of concrete roofs, floors, stairways, side-walks, and the like.

The object of the invention is the provision, for use in combination with the cement filling entering into such construction, of an improved type of combined centering and reinforcement.

Concrete roofs, floors, ceilings, etc., are commonly constructed by supporting the concrete on a temporary wooden centering that may be torn down after the concrete has set. Recently, in place of such wooden centering, ribbed sheet metal centerings have been more or less generally employed, such centerings being left permanently in place to act as reinforcement for the concrete. In some of these both the sheet metal and the ribs are supposed to act together as the reinforcement, while in another form the ribs alone furnish the reinforcement, the sheet being used only to support the concrete while wet. The first form obviously requires a protective coating, usually a layer of plastering, on the under side to prevent destruction of the reinforcement by corrosion or fire. It may be added that experience has proven the protection thus afforded by the plastering to be inadequate to resist fire, such plastering cracking and peeling off. In the latter of the two types, to which reference has been made, this difficulty has been overcome by making the ribs or corrugations, as the case may be, of such form that they enter as thoroughly and permanently into the concrete mass as do the usual independent reinforcing members. At the same time by virtue of their connection with the sheet centering they are adapted to assist the latter in initially supporting the concrete while setting. This type of sheet forms the subject matter of my two pending appli-

cations Serial Nos. 357,799 and 357,800 both filed February 18, 1907.

Obviously, varying loads, varying lengths of span, and other changing conditions, demand corresponding changes in the amount of reinforcing material. Where, however, as above indicated, the reinforcement is provided by integral corrugations crimped out of the sheet of centering, there is obviously some difficulty to be apprehended in this respect, since the entire sheet will have to be of a thickness determined by the strength required in the reinforcing ribs while as a matter of fact it might just as well be made very thin were it not for this requirement.

In the type of sheet which forms the subject matter of my pending application, Serial No. 357,800, I attach to a thin metallic sheet a number of ribs of a strength corresponding with the length of span loading, etc. I am thereby enabled to use a sheet of minimum thickness while obtaining all the reinforcement necessary. This construction is well adapted for use in all places except where the fire exposure is unusually severe. In such places the fire underwriters and the city building laws require that the reinforcement of such structures be protected by an inch or more of concrete. Obviously, neither this reinforcement nor that of any other combination centering and reinforcement heretofore known is so protected.

I have now invented and herein described a reinforcement which has all of the reinforcement so located as to be protected by thicknesses of concrete which may be regulated to suit particular conditions while at the same time the amount or strength of this reinforcement can be varied to suit conditions without the thickness of the sheet itself being changed. Furthermore I have overcome the cracking of the concrete over the tops of the supports in the flat constructions and have greatly increased the strength of such constructions by the use of my continuous reinforcement.

Said invention, then, consists of means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail a certain construction embodying the invention, such disclosed construction, however, constituting but one of various forms in which the principle of the invention may be used.

In said annexed drawing: Figure 1 represents a transverse cross section in which my improved form of centering and reinforcement has been incorporated, such section being taken on the line 1—1 of Fig. 2; Fig. 2 represents a longitudinal cross section through such a structure, the structure represented being a flat one, such as a roof, floor or the like, the reinforcement being shown in side elevation; Fig. 3 represents in perspective a detail of the construction of one form of reinforcing rib; while Figs. 4, 5, 6 and 7 show in transverse cross-section various modified forms of rib construction.

Having reference to the drawing, in the first two figures, A will be seen to designate the sheet that forms the basis of the structure, such sheet being made up of a series of connected sections whose lateral edges are flanged so that when two are placed side by side a T-shaped rib *a* is formed. Successive sections of the sheet are thus assembled and preferably held together by means of riveting which may be of the ordinary type illustrated to the left of Fig. 1, or may be simply in the form of eyelets punched through the superposed layers and clenched over as illustrated to the right of said figure. Alined with the respective ribs thus provided are the reinforcing bars B, such bars being secured to the outer or T-shaped portion of the ribs. Here also various means for attaching the bars may be employed. In the case in hand such attachment is had by crimping the lateral edges *b* of the bars so as to inclose such T-shaped portion of the rib *a*. The bar, where designed for use in a flat structure, as illustrated in Fig. 2, is usually not thus attached throughout the whole of its length, but its ends *b'* are left free and bent upwardly at an angle to the rib and thence horizontally so as to extend above, across, and preferably beyond the supporting beam or wall C upon which the concrete structure rests. This feature of construction is brought out clearly in the detail view shown in Fig. 3 wherein appears a portion of a rib at the point where the reinforcing bar is thus bent upwardly therefrom. The concrete filling D, when applied to the sheet, is made of such a thickness as not only to embed the rib proper but also such raised portions of the bar, which latter it will thus be seen give continuity to the reinforcement, forming in effect a continuous girder structure, and at the same time prevent cracking of the concrete along the supporting beams or walls. Where the structure is in the nature of an arch such raised rib portions may usually be dispensed with.

Of the several modifications illustrated in Figs. 4, 5, 6 and 7, but little more need be said than to remark that if desired the

T-shaped rib may be crimped so as to be in the form of an integral corrugation, Fig. 4, the bar being attached in the same manner as before; or the rib may consist simply of an upright projection to which is attached the reinforcing element, Fig. 6; or instead of such reinforcing bar being crimped about the rib the latter may be crimped about the bar, Fig. 6; or the bar may be applied to the rib and the two riveted together as shown in Fig. 7.

In any application of this principle the reinforcing bar must be so exposed to the concrete that there will be sufficient adhesion between the two to prevent the sliding of the bar or else the bar must be so securely attached to the inclosing portions of the rib that the adhesion of these portions to the concrete will prevent the bar from sliding under the maximum loads or else a combination of these two conditions must hold the bar in place.

From the foregoing description it will be seen that I secure an exceptionally economical construction because the sheet metal can be made very thin while at the same time the structure is made very strong, ample reinforcement being secured by means of the attached bar which can be gaged to suit different conditions. In the previous combination of centering and reinforcement to which reference has been made the entire metallic sheet has to be made much thicker for increased spans and loading in order that the reinforcing corrugation or rib might be made of the proper strength. This evidently is costly. Furthermore by placing all of my reinforcement at the tops of the corrugations or ribs I give to all of it the protection from fire afforded by a layer of concrete equal to the height of the rib.

While broadly my invention can be applied to any form of ribbed sheet metal, in practice I prefer to use sheets with ribs or corrugations of a T-shape, as these are stronger than other ribs and the metallic bars can be more easily attached to them. It will furthermore be seen that by carrying the reinforcement up near the top of the structure where the same crosses a support, and by making the reinforcement continuous, as I do, by lapping the ends of adjacent bars, I greatly strengthen the structure and do away with the unsightly cracks in the same which so frequently appear in it over the support. I should also add that non-metallic sheets, such as weather-proofed straw-board, may be used instead of the metallic sheets, the reinforcing bars being rigidly attached to same at a proper distance above so that they will act in conjunction with same to support the wet concrete and also furnish all the reinforcement in the completed structure.

Other modes of applying the principle of

my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. As an article of manufacture, a combination centering and reinforcement for structures of concrete, comprising a sheet provided on its one side with stiffening ribs, and bars alined with said ribs and secured to the outer portions thereof, for a distance between the ends of the ribs, the terminal portions of said bars being free to be bent upwardly from said ribs, substantially as described.

2. As an article of manufacture, a combination centering and reinforcement for structures of concrete, comprising a metallic sheet provided on its one side with stiffening ribs formed out of the material of said sheet, and metal bars alined with said ribs and secured to the outer portions thereof, for a distance between the ends of the ribs, the terminal portions of said bars being free to be bent upwardly from said ribs, substantially as described.

3. As an article of manufacture, a combination centering and reinforcement for structures of concrete, comprising a sheet provided on its one face with T-shaped ribs formed out of the material of said sheet, and metal bars alined with said ribs and secured thereto for a distance between the ends of the ribs, said bars inclosing the outer T-portions of the ribs, the terminal portions of said bars being thus left free to be bent upwardly, substantially as described.

4. In concrete structures of the class described, the combination with supporting beams or walls; of a cement filling and a combination centering and reinforcement therefor comprising a metallic sheet provided on its upper face with stiffening ribs formed out of the material of such sheet and disposed transversely of said supporting beams or walls, and metal bars alined with

said ribs and secured thereto for a distance between the ends of the ribs, the ends of said bars being raised up at an angle with the ribs and thence carried over the tops of said beams or walls.

5. In concrete structures of the class described, the combination with supporting beams or walls; of a cement filling and a combination centering and reinforcement therefor comprising a metallic sheet provided on its upper face with stiffening ribs formed out of the material of said sheet and disposed transversely of said supporting beams or walls, and metal bars alined with said ribs and secured thereto for a distance between the ends of the ribs, the ends of said bars being raised up at an angle with the ribs and thence carried over the tops of said beams or walls, the strength of said bars being gaged to properly assist said sheet in initially sustaining the wet concrete and to serve as reinforcing members in the completed structure independently of said sheet.

6. In concrete structures of the class described, the combination with supporting beams or walls; of a cement filling and a combination centering and reinforcement therefor comprising a metallic sheet provided on its upper face with T-shaped stiffening ribs formed out of the material of said sheet and disposed transversely of said supporting beams or walls; and metal bars alined with said ribs and secured thereto for a distance between the ends of said ribs, said bars inclosing the outer T-portions of the same, the ends of said bars being raised up at an angle with the ribs and thence carried over the tops of said beams or walls, the strength of said bars being gaged to properly assist said sheet in initially sustaining the wet concrete and to serve as reinforcing members in the completed structure independently of said sheet.

Signed by me this 1st day of August, 1907.

HERBERT F. COBB.

Attested by—

E. R. RODD,

JNO. F. OBERLIN.