Nov. 18, 1952 R. S. REED 2,618,148

PREFABRICATED REINFORCED BEAM

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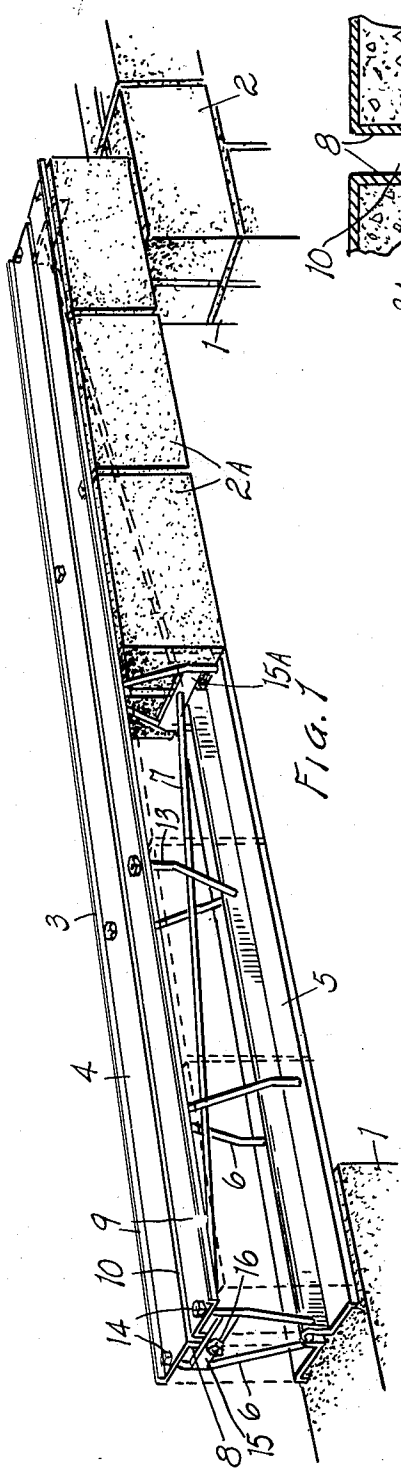


FIG. 1

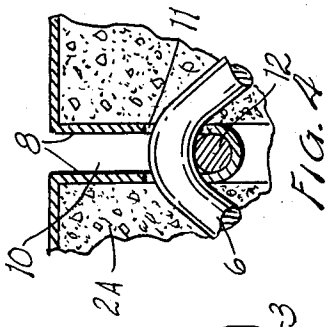


FIG. 4

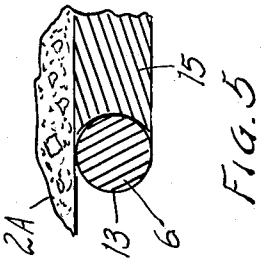


FIG. 5

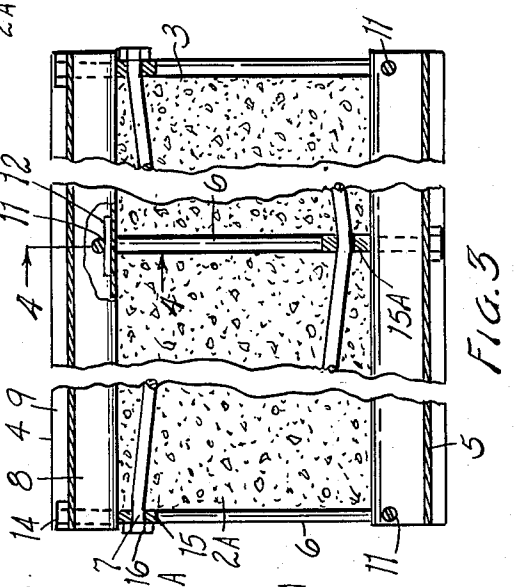


FIG. 3

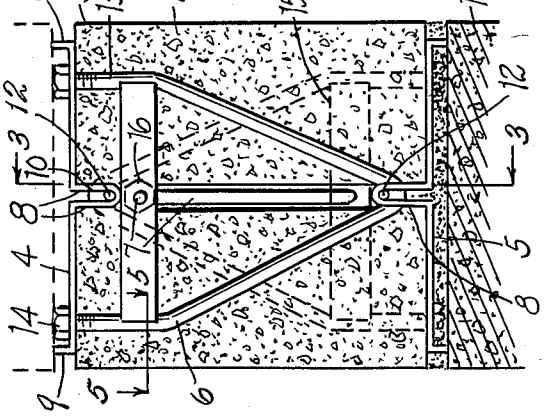


FIG. 2

INVENTOR.
Robert S. Reed
BY Otto A. Earl
Attorney.

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PREFABRICATED REINFORCED BEAM

Robert S. Reed, Three Rivers, Mich., assignor of one-half to George H. Zerfas, Three Rivers, Mich.

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6 Claims. (Cl. 72—61)

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This invention relates to improvements in composite beam structure of preformed concrete blocks and metal retaining members.

The principal objects of this invention are:

First, to provide a composite beam structure for carrying vertical loads which will require substantially less steel than an all metal beam for carrying comparable loads.

Second, to provide a beam structure in which the compressive stresses are carried primarily by preformed standard concrete building stocks.

Third, to provide a beam structure which is relatively easy to erect in that the elements of the beam can be erected separately without the use of heavy lifting equipment.

Fourth, to provide a composite beam structure which will fit into a wall without interrupting the regular spacing of the block elements in the wall and without requiring the cutting or shaping of any of the block elements.

Fifth, to provide a beam structure, the metal elements of which may be preformed and shipped and which will require a minimum of shipping space.

Sixth, to provide a composite beam structure particularly for use as a lintel in a concrete block wall, which beam is substantially unnoticeable in the wall and has the appearance of a section of the wall.

Other objects and advantages relating to details of my beam structure will be apparent from a consideration of the following description and claims.

The drawings, of which there is one sheet, illustrate a preferred form of the beam structure.

Fig. 1 is a fragmentary perspective view illustrating a partially completed beam in erected position on portions of a wall.

Fig. 2 is an end elevational view of the beam with portions of the supporting wall illustrated in cross section.

Fig. 3 is a fragmentary vertical longitudinal cross sectional view through the beam taken along the plane of the line 3—3 in Fig. 2.

Fig. 4 is a fragmentary enlarged transverse cross sectional view taken along the plane of the line 4—4 in Fig. 3.

Fig. 5 is a fragmentary horizontal cross sectional view taken along the plane of the line 5—5 in Fig. 2.

My beam is designed primarily for use in concrete block or brick wall construction and is preferably proportioned to cooperate with concrete building blocks, the sizes of which have

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been more or less standardized in the building industry. In the drawings I have illustrated portions of a block wall 1, 1 built up of standard concrete building blocks 2 to form the sides of a door or window opening. The top of the opening is bridged by my beam, generally indicated at 3, with the ends of the beam resting upon the walls as abutments. The beam thus forms a lintel for the opening and a support for superimposed courses of blocks as will be readily appreciated.

The beam consists generally of an upper plate 4 and a lower plate 5 tied together with vertical tie rods 6 and further connected from end to end by the longitudinal rod 7. The spaces between the plates 4 and 5 and the vertical rod 6 are filled with a series of building blocks 2A which may if desired be identical with the blocks 2 used in the wall 1 but are usually smaller.

More specifically, the plates 4 and 5 are preferably identical in shape and size and are formed by folding relatively thin gauge sheet steel to provide a return bend double wall tongue 8 longitudinally along the center of the plate. The edges of the plate are turned oppositely from the tongue 8 to provide edge flanges 9. Preferably the sides of the tongue 8 are spaced apart laterally to provide a groove 10 and to fix the outside thickness of the tongue at a figure approximately equal to the thickness of a standard mortar joint in concrete block construction. This thickness is approximately ⅜". The height of the flange 9 is also preferably ⅜" to correspond to the thickness of the mortar joint. I find that 16 gauge sheet steel is well suited to the formation of the plates.

The plates 4 and 5 are pierced to provide pairs of holes spaced longitudinally along the plates by a distance equal to twice the length of the building blocks 2 with the holes of each pair located near the side edges of the plates and just within the flanges 9. The holes thus formed serve to receive the spaced ends of part of the vertical rods 6 which are U-shaped in character in a manner to be described presently. Midway between the pairs of holes in the plate, the tongue 8 is transversely pierced as at 11 to receive the U-shaped bends of the rest of the vertical rods 6. The holes 11 are spaced from the bottom of the groove 10 sufficiently to permit a short length of reinforcing rod 12 to be positioned between the bend of the vertical rod and the bottom of the groove 10.

It will be noted that the upper and lower plates 4 and 5, which are otherwise identical in con-

struction, are cut in staggered fashion so that the apertures 11 in the tongue of one beam are positioned opposite pairs of holes in the opposite beam.

The vertical rods 6 are made of steel stock of no larger diameter than the thickness of the mortar joints and in the present instance are slightly less than 3/8" in diameter. The rods are bent generally into U or V-shape as illustrated with parallel end portions 13 arranged to pass through the pairs of holes in the plates and be secured thereto by nuts 14. The nuts also are limited to less than 3/8" thickness so as to lie wholly within the trough formed by the edge flanges 9 on the plates. The vertical rods 6, which are alternately positioned in upwardly and downwardly opening position, thus serve to clamp the upper and lower plates together and to clamp the blocks 2A between the plates.

The vertical rods 6 at each end of the beam open inwardly and have a strut or brace plate 15 positioned between the parallel ends 13 thereof. As is most clearly shown in Fig. 5, the ends of the strut 15 are grooved to fit snugly against the ends of the rod. The center portion of the struts 15 is pierced to pass the end of the longitudinal tie rod 7 and nuts 16 are provided for drawing the longitudinal tie rod tight.

The U-shaped vertical rod 6 in the center of the beam is in downwardly opening position and is provided with a similar strut 15A pierced in the center to pass the longitudinal rod 7. The rod 7 is bent downwardly from each end to pass through the center strut 15A and when the nuts 16 on the ends of the longitudinal rod are tightened the rod tends to straighten and draw the center strut 15A upwardly into the converging legs of the center vertical rod. Should the length of the beam be equal to an uneven number of blocks 2A, the lower portion of the longitudinal rod 7 may be extended between two adjacent downwardly opening vertical rods to provide a symmetrical beam structure.

In erecting the beam, the vertical and longitudinal rods 6 and 7 are loosely connected to the plates 4 and 5 in the manner described and the necessary number of concrete blocks 2A are then fitted into the proper places. It will be noted that the several blocks are thus positioned in abutting relation against the opposite sides of interior vertical rods 6 and the inner sides of the end rods. The vertical rods being disposed as they are in vertical transverse planes have portions disposed in horizontally transversely spaced portions of the transverse planes to abut against blocks positioned on each transverse side of the vertical longitudinal center plane of the beam. The nuts 14 are then tightened to clamp the plates tightly against the top and bottom surfaces of the blocks. The nuts 16 on the ends of the longitudinal rod 7 are then tightened, which action tends to spread the converging legs of the vertical rods with which the longitudinal rod is engaged and further draw the plates 4 and 5 vertically together. The beam may be entirely completed on the ground and erected as a unit or the metal portions of the beam may be placed on the wall and the blocks 2A then inserted into the steel framework. In any case, the lower plate 5 is set on a layer of mortar 17 positioned between the ends of the flanges 9 on the lower plate so that the load on the beam is transmitted to the supporting wall 1. Note that all of the nuts 14 and 16 are accessible for tightening if the bearing of the beam on the wall abutments is not longer than the length of one of the building blocks.

The beam thus erected is complete so far as its load carrying properties are concerned and the spaces between the blocks 2A may be later filled or pointed with mortar as desired. The downwardly opening slot in the tongue of the bottom plate opens inwardly to the opening formed by the wall abutments and the lintel and is well adapted to receive and anchor a flange projecting outwardly from a window or door frame positioned in the wall opening. The beam is easily erected and shipped and requires only approximately 30% of the steel used in standard steel beams for bridging comparable openings thus reducing the shipping weight of the beam. The concrete blocks which form the body of the beam may be acquired locally and when the beam is erected it is substantially unnoticeable in the wall.

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

1. A composite beam structure comprising spaced upper and lower longitudinally extending plates, said plates having U-shaped tongues extending longitudinally in the centers thereof and projecting toward each other, outwardly turned flanges on the edges of said plates, vertical tie rods connecting said plates at regularly spaced intervals therealong, said vertical tie rods being U-shaped and having their closed ends engaged through holes in said tongues and their open ends engaged through holes along the sides of said plates, said vertical tie rods alternating along said beam between upwardly and downwardly opening position with the end tie rods opening upwardly, reinforcing rods positioned between the closed ends of said vertical tie rods and the closed folds in said tongues, struts positioned between the arms of the end tie rods and near the upper ends thereof, a third strut positioned between the arms of an interior downwardly opening tie rod of said beam and near the bottom thereof, a longitudinally extending tie rod extending through said struts and bent downwardly in the middle to pass through said third strut, nuts on the ends of said vertical and longitudinal tie rods for tensioning said rods, and preformed concrete building blocks positioned between said plates and said vertical tie rods and on each side of said tongues on said plates, said blocks projecting beyond said flanges on the edges of said plates.

2. A composite beam structure comprising spaced upper and lower longitudinally extending plates, said plates having U-shaped tongues extending longitudinally in the centers thereof and projecting toward each other, vertical tie rods connecting said plates at regularly spaced intervals therealong, said vertical tie rods being U-shaped and having their closed ends extending through openings in said tongues with their open ends engaged through holes along the sides of said plates, part of said vertical tie rods alternating along said beam between upwardly and downwardly opening position with the end tie rods opening upwardly, reinforcing rods positioned in the closed folds in said tongues and within the closed ends of the vertical tie rods extending therethrough, struts positioned between the arms of the end tie rods and near the upper ends thereof, a third strut positioned between the arms of an interior downwardly opening tie rod

of said beam and near the bottom thereof, said end and said interior vertical tie rods having arms converging toward their closed ends and inwardly of said beam from said struts to prevent inward displacement thereof, a longitudinally extending tie rod extending through said struts and bent downwardly in the middle to pass through said third strut, nuts on the ends of said vertical and longitudinal tie rods for tensioning said rods, and preformed concrete building blocks positioned between said plates and said vertical tie rods and on each side of said tongues on said plates.

3. A composite beam structure comprising spaced upper and lower longitudinally extending plates, said plates having tongues extending longitudinally thereof and projecting inwardly of said beam, vertical tie rods connecting said plates at spaced intervals therealong, said vertical tie rods being U-shaped and having their closed ends extending through openings in said tongues with their open ends engaged through holes along the sides of said plates, part of said vertical tie rods alternating along said beam between upwardly and downwardly opening position, struts positioned between the arms of the end tie rods and near the tops thereof, a third strut positioned between the arms of an interior downwardly opening tie rod of said beam and near the bottom thereof, said end and said interior vertical tie rods having vertically outwardly facing engagement with said struts to prevent movement thereof inwardly of said beam, a longitudinally extending tie rod extending through said struts and bent downwardly in the middle to pass through said third strut, nuts on the ends of said vertical and longitudinal tie rods for tensioning said rods, and preformed concrete building blocks positioned between said plates and said vertical tie rods and on each side of said tongues on said plates.

4. A composite beam structure comprising spaced upper and lower longitudinally extending plates, vertical projections on said plates disposed longitudinally therealong and near the transverse centers thereof and extending inwardly of the beam, vertical tie rods connecting said plates at regularly spaced intervals therealong, said vertical tie rods being U-shaped and having their closed ends engaged through a projection on one plate and having their open ends engaged through holes along the sides of the other of said plates, said vertical tie rods alternating along said beam between upwardly and downwardly opening positions, a longitudinally extending tie rod connected to and extending between vertical tie rods near the ends of said beam and near the top thereof and bent downwardly in the middle and connected to said lower plate, nuts on the ends of said vertical and longitudinal tie rods for tensioning said rods, and

preformed concrete building blocks positioned between said plates and said vertical tie rods and on each side of said longitudinal tie rod.

5. A composite beam structure comprising vertically spaced longitudinally extending plates, transverse tie rods connecting said plates at regularly spaced intervals therealong, said transverse tie rods lying in planes extending transversely of the beam and being disposed in horizontally transversely spaced portions of said planes, a longitudinally extending tie rod extending between transverse tie rods near the ends of said beam and near the top thereof and bent downwardly in the middle and connected to said lower plate, and preformed concrete building blocks positioned between said plates and said transverse tie rods and on each side of said longitudinal tie rod, said blocks each engaging the inner surfaces of said plates and being in longitudinal load transmitting relation with said transverse tie rods.

6. A composite beam structure comprising elongated vertically spaced metal plate members, a plurality of preformed concrete blocks positioned in a horizontally double row between said plate members and each engaging the inner surfaces thereof, transverse tension members connecting said plates and positioned between longitudinally adjacent blocks and at the ends of said beam, said transverse tension members being disposed horizontally transversely of the beam and engaging the ends of adjacent blocks in each row of blocks, and a longitudinal tension member extending between said rows of blocks and having a tensioning connection with the ends of said upper plate, said longitudinal tension member being downwardly bowed and connected intermediate of its ends to said lower plate member, the thickness of said tension members being no greater than the thickness of the standard mortar joint used with said blocks.

ROBERT S. REED.

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