Dec. 20, 1932. K. E. W. JAGDMANN 1,891,597

BUILDING BLOCK AND THE CONSTRUCTION OF FLOORS AND THE LIKE

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Fig. 1.

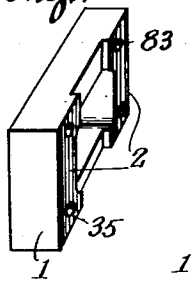


Fig. 2.

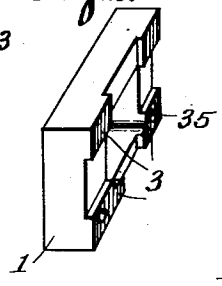


Fig. 3.

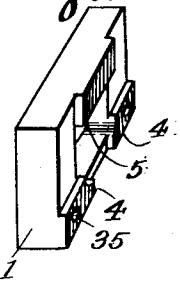


Fig. 4.

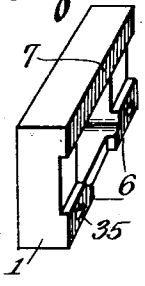


Fig. 5.

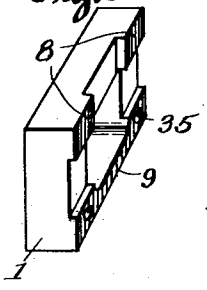


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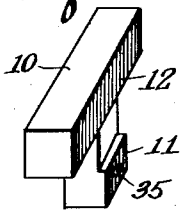


Fig. 7.

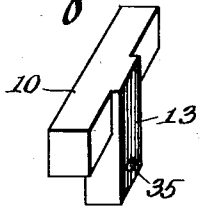


Fig. 8.

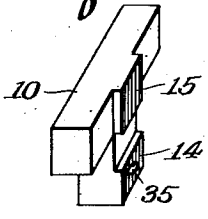


Fig. 9.

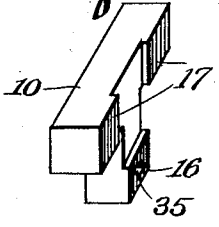


Fig. 10.

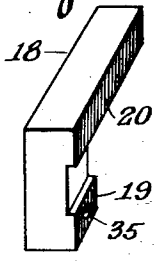


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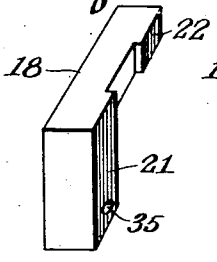


Fig. 12.

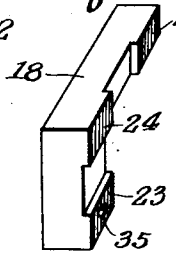


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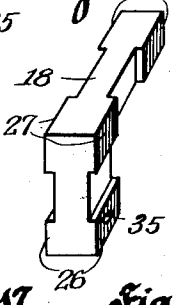


Fig. 14.

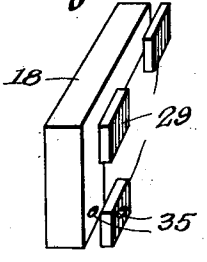


Fig. 15.

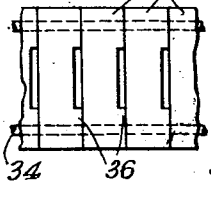


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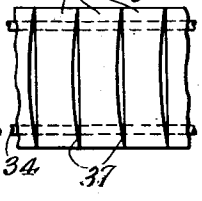


Fig. 17.

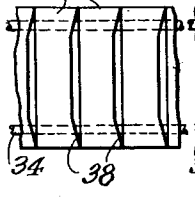


Fig. 18.

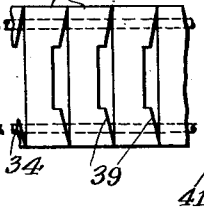
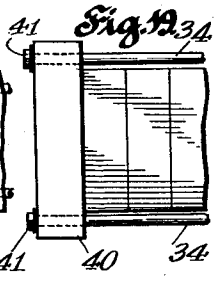


Fig. 19.



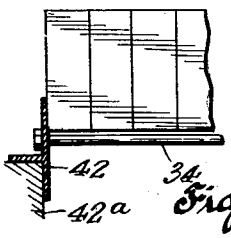


Fig. 20.

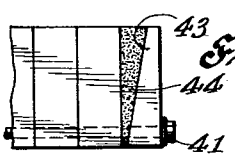


Fig. 21.

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Fig.22.

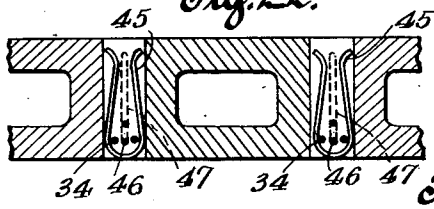


Fig.23.

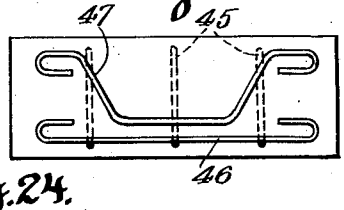


Fig.24.

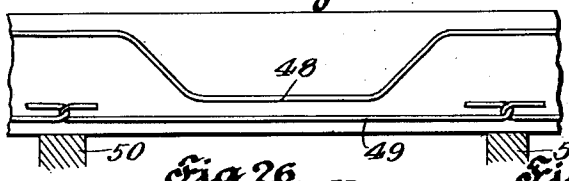


Fig.25.

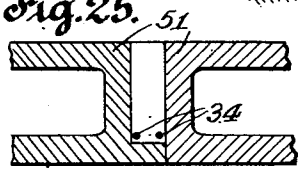


Fig.26.

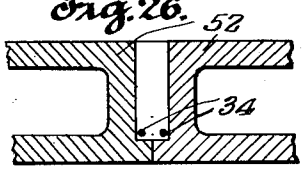


Fig.27.

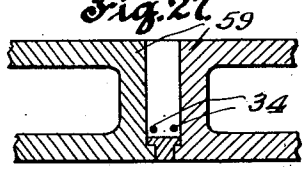


Fig.28.

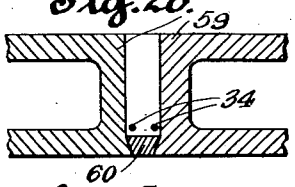


Fig.29.

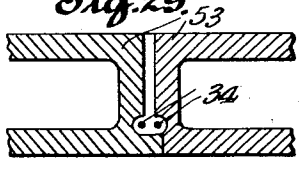


Fig.30.

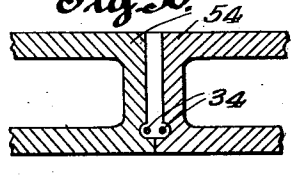


Fig.31.

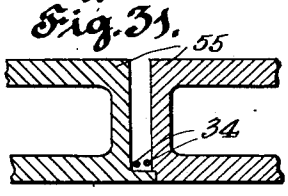


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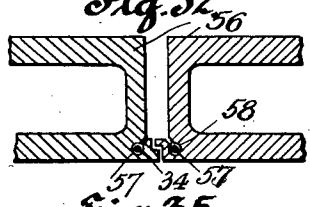


Fig.33.

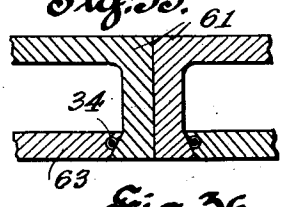


Fig.34.

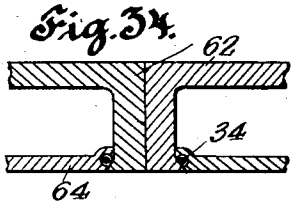


Fig.35.

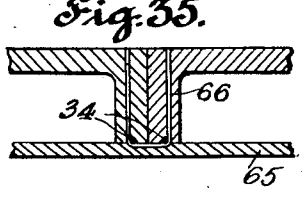
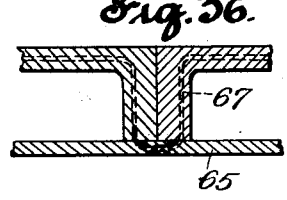


Fig.36.



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Fig. 37.

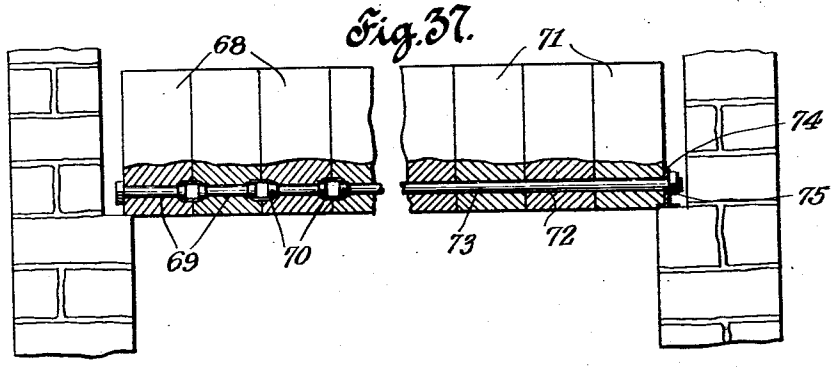


Fig. 38.

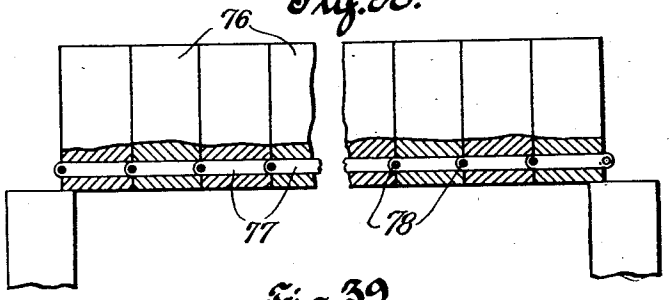


Fig. 39.

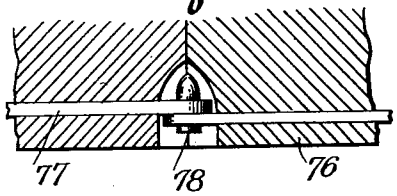


Fig. 42.

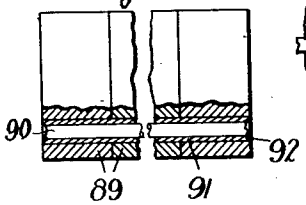


Fig. 40.

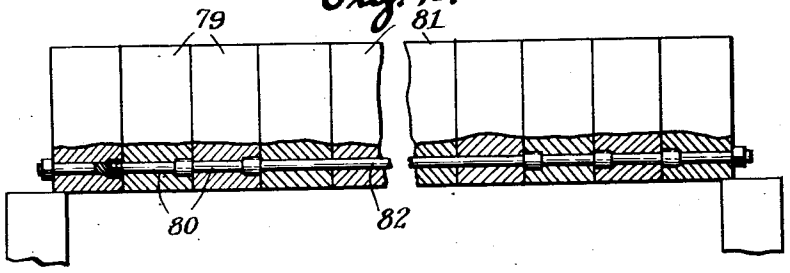
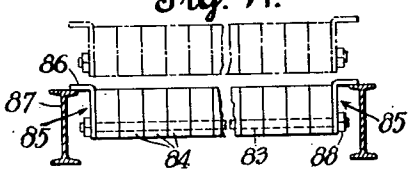


Fig. 41.



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Patented Dec. 20, 1932 1,891,597

UNITED STATES PATENT OFFICE

KARL E. W. JAGDMANN, OF CAMBRIDGE SPRINGS, PENNSYLVANIA

BUILDING BLOCK AND THE CONSTRUCTION OF FLOORS AND THE LIKE

Application filed November 5, 1926. Serial No. 146,322.

This invention relates to improved floor and ceiling construction of the kind built up of successive rows of blocks of concrete or the like, the blocks in each row being secured together to produce in use the general effect of a beam. Construction of a similar nature was disclosed in my Reissue Patent No. 15,237, dated November 29, 1921.

According to one form of carrying out the invention, the blocks in each row are pressed together and clamped near their lower edge by suitable means, which may include one or more reinforcing members extending longitudinally of the row, to produce an arching or beaming effect and render the row of blocks capable of sustaining the desired load. The blocks in such a row may also be clamped together near their upper edges to resist negative or upward bending stresses.

The pressure necessary to render each row of blocks sufficiently strong as a support is very great and in case the contacting faces of certain blocks are not true, parts of such blocks may be subjected to greater stresses than they are able to sustain and consequently may be broken.

It is an object of the present invention to eliminate such causes of breakage. This object may be attained by the provision of heels or spacing members to hold the blocks separated except at points where the pressure is to be sustained. Obviously it is easier to obtain accurate positioning of a few pressure sustaining contact portions of a surface and each of relatively small area than to make all portions of the surface meet such requirements. The spacing of the contact portions or projections also permits distribution of breaking stresses over greater lengths or areas, thereby enabling advantage to be taken of the resiliency of such blocks.

The heels or spacing members may be separated from the blocks or secured thereto. In the latter case each block may be provided with heels on one side thereof and in forming a section of the floor or weight sustaining structure, the blocks of each row are preferably arranged with their heels extending in the same direction. Use may also be made of blocks having heels or spacers on opposite sides thereof, such blocks being used exclusively in forming a row or beam or alternately between blocks having no such heels at their lateral faces.

Another object of the present invention is to provide a floor or the like in which the blocks and reinforcing tension members associated therewith are so related that material such as mortar or concrete may be used to advantage in protecting the reinforcing tension members to protect them from deterioration and to combine the parts together by adhesion of such material both to the reinforcing members and to the blocks. This object may be attained by the provision of blocks and reinforcing or tension members so constructed and so related when arranged in rows that in filling the space between successive rows of blocks with material such as mortar or concrete, such material will be caused to surround the tension members. The same results might be obtained for individual rows by applying the mortar or concrete directly to the tension members which usually lie in channels in the blocks. Obviously the protection of the reinforcing members or rods may be obtained in other ways.

Another object of the invention is to provide improved means for clamping the blocks of a row near their lower edges or upper edges if negative bending movements are to be resisted. In attaining such object, use may be made of different arrangements such as one involving the use of built-up tension devices in which a plurality of devices extending through one or a plurality of blocks may be combined to take the place of a single tension member extending the whole length of a row of blocks. There may be one or more pre-embedded tension members in each block so constructed at their ends that successive blocks may be attached by suitable fastening devices co-operating with the ends of the pre-embedded tension members.

A further object of the invention is to provide improved means of securing together a row of blocks for the purpose specified. According to one form of attaining this object, one or more reinforcing devices such as tension rods are assembled with the blocks of

a row and the reinforcing devices are secured to the blocks by use of quick-setting or hardening cement. For example, a tension rod is placed in openings or recesses in the blocks and the quick-setting cement forced into said openings or recesses. When the cement hardens, the tension rod will be connected securely with all or the necessary number of blocks. Under certain conditions it might be necessary to secure only the end blocks to the rod.

Other objects of the invention are to provide a method of forming floors of the character specified, which include the steps of uniting in a convenient location blocks into a beam-like structure and then shifting such structure into its final position; and to provide block-securing means particularly adapted for use in the method just referred to.

Other features and advantages will hereinafter appear.

In the drawings:

Figs. 1 to 12 are perspective views of blocks having heels or spacers on one side only and formed integral therewith;

Fig. 13 is a perspective view of a block similar to that shown in Fig. 12 but having heels or spacers on both sides thereof;

Fig. 14 is a perspective view showing a block similar to that shown in Fig. 12 and separate heels or spacers to be used therewith instead of heels or spacers forming part of the block;

Figs. 15 to 18 are top views showing different forms of blocks in assembled relation;

Fig. 19 is a view of one end of a row of blocks illustrating the manner of attaching the tension rods when the same lie outside of the blocks;

Fig. 20 is a side elevation of a portion of a row of blocks showing the means for securing the tension members;

Fig. 21 is a side elevation of one end of a row of blocks illustrating a different arrangement for subjecting the blocks of a row to pressure at their lower ends;

Fig. 22 is a vertical section across the rows of blocks;

Fig. 23 is a vertical section taken along the line 23—23 of Fig. 22;

Fig. 24 is a view similar to Fig. 23 but showing a different arrangement of the reinforcing members for use in connection with intermediate supports;

Figs. 25, 26, 27, 28, 29, 30 and 31 are views showing different arrangements for closing the bottoms of the spaces between successive rows of blocks.

Fig. 32 is a view illustrating blocks in which the tension members are enclosed and which are provided with shallow channels in their ends to permit mortar or the like forced into the space between successive rows to be forced around the tension members;

Figs. 33, 34, 35 and 36 illustrate other arrangements for protecting the tension members;

Fig. 37 is a sectional view of a row of blocks showing a modified form of tension device;

Fig. 38 is a sectional view of a row of blocks showing pre-embedded metal pieces attached at their ends to form complete tension devices extending the length of the row;

Fig. 39 is a view partly in section showing one means for connecting the individual tension members shown in Fig. 37;

Fig. 40 is a view illustrating another arrangement of tension devices in a row of blocks;

Fig. 41 illustrates an arrangement particularly adapted for use when the beam-like structure is to be formed in one position and then shifted to another; and

Fig. 42 illustrates a construction in which the blocks of a row are secured together without the use of clamping devices at the ends of the reinforcing means.

Referring to Figs. 1 to 21 of the drawings, the floor or like structure may be built up of rows of rectangular blocks 1 of suitable material such as cement or concrete provided at one face with two lateral heels or spacers 2 as in Fig. 1; heels of spacers 3 at all four corners as in Fig. 2; heels 4 at the lower corners and heel 5 at the upper center as in Fig. 3; heels 6 at the lower corners and a heel 7 extending the full length of the block at its upper edge, as in Fig. 4; and heels 8 at the upper corners and a heel 9 extending the full length of the lower edge, as in Fig. 5.

Use may be also made of T-shaped blocks 10 each having a heel or spacer 11 at its lower end and a spacer 12 extending the full length of its top, as in Fig. 6; a heel 13 extending the full length of the upright, as in Fig. 7; a heel 14 at the bottom of the upright and a heel 15 at the top thereof, as in Fig. 8; and a heel 16 at the lower end of the upright and heels 17 at the opposite ends of its top, as in Fig. 9.

In Figs. 10, 11, 12 and 13 are shown blocks 18, in the form of inverted L's and respectively provided integral therewith with a heel 19 at the bottom of the upright and a heel 20 extending the full length of the horizontal arm; a heel 21 extending the full length of the upright arm and a heel 22 at the free end of the horizontal arm; a heel 23 at the lower end of the upright arm, a heel 24 at the junction of the two arms and a heel 25 at the free end of the horizontal arm; and heels 26 at opposite faces of the lower end of the upright, heels 27 at opposite faces of the junction of the two arms and heels 28 at opposite faces of the free end of the horizontal arm.

In Figs. 14, heels 29 are arranged similarly to those in Fig. 12 but are separate from the blocks;

Figs. 15, 16, 17 and 18 show assemblages of blocks 30, 31, 32 and 33 respectively, held

together by means of tension members 34 passing through openings 35 near the lower edges of the blocks. It should be understood that such members cooperate at their ends with suitable means, not shown, such, for example, as nuts threaded on the members 34 and engaging washers or the like at the outer faces of the end blocks. The blocks 30, 31, 32 and 33 are provided at their edges with differently shaped heels or spacers indicated respectively by 36, 37, 38 and 39. It is not necessary to use cement or mortar between successive blocks of a row but it may be found desirable in certain cases to use such material.

The blocks, shown in Figs. 1 to 14, are also provided with openings 35 at their lower ends to receive reinforcing members co-operating at their ends with suitable devices such as the nuts and washers referred to in connection with Figs. 15 to 18. It will be seen that the separate heel or spacer 29 shown in Fig. 14 at the lower end of the upright is also provided with an opening 35.

In Fig. 19 disclosure is made of an arrangement in which blocks such as shown in Fig. 1 are held together by tension members 34 at opposite sides of the blocks and passing through members or washers 40 each to receive the pressure resulting from tightening nuts 41 on the members 34. In Fig. 20 the tension members 34 are beneath the blocks and in this case it is necessary to provide a special form or end member 41 to co-operate with an end support 42. It should be understood that the member 41 must be so shaped that the tension exerted by the rod 34 will not cause the member 41 to be tilted around the lower edge of the end block. The compression of the blocks at their lower ends may be obtained in other ways than in tightening nuts 41 on the tension members 34. For example, such effects may be obtained as illustrated in Fig. 21 in which use is made of a wedge shaped block 43 adjacent one of the usual blocks with parallel faces. The blocks including the special block 43 may be assembled in the usual manner with tension rods 34 passing there through and supplied at their ends with nuts 41. At this stage in the operation, the blocks are not subjected to any considerable pressure at their lower ends but such pressure is obtained by placing material 44, such as concrete, in the preferably wedge shaped opening between the special block 43 and the adjacent block having parallel sides. It would be apparent that a very considerable degree of compression can be obtained by sufficient tamping of the material 44 or by exerting sufficient pressure on the material 44 by other means. This would be true even if block 43 had parallel sides.

As hereinbefore stated, it is an object of the invention to so construct and arrange the blocks as to facilitate the placing of material such as concrete between the rows of blocks so as to enclose the tension members to prevent deterioration thereof and also to bind the tension members and blocks together as a result of the adherence of the concrete to the blocks and to the tension members to produce a beaming effect after an arching effect has been produced by the tension members.

As shown in Fig. 22 the rows of blocks are spaced apart to receive in each of said spaces two of said tension rods 34. It should be understood that in this arrangement the blocks of each row are subjected to pressure at their lower ends by tension rods 34 at each side of the row of blocks and co-operating at their ends with members 40 and nuts 41 as illustrated in Fig. 19. When a number of rows of blocks of this kind have been assembled as shown in Fig. 22, the openings between the rows of blocks are closed at their bottoms by temporary or permanent forms and the spaces between the rows are filled with concrete or other like material thus covering the tension members 34 to prevent deterioration thereof and binding the tension rods 34 and blocks together. As shown in Figs. 22 and 23 the concrete between the rows of blocks may be reinforced by stirrup members 45 and longitudinal reinforcing members 46 and 47. In Fig. 24 disclosure is made of a different arrangement of longitudinal reinforcement comprising rods 48 and 49, the arrangement of such rods being especially adapted for use in case the concrete block structure is used with intermediate supports 50. It will be evident by an inspection of Fig. 24 that the longitudinal reinforcement by rods of members 48 and 49 gives a cantilever effect. In Figs. 25, 26, 29, 30 and 31 are shown blocks 51, 52, 53, 54 and 55 respectively, the blocks in each case being so shaped that when successive rows of blocks are placed together, there will be space enough between the blocks for the tension members 34 and at the same time such spaces between the blocks will be closed at the bottom so as to facilitate the filling of such spaces by concrete or the like placed in such spaces.

In Fig. 32 disclosure is made of blocks 56 having provisions for closing the bottoms of the spaces between the successive rows and also having closed passages 57 to receive the reinforcing members 34 to enable them to be surrounded by concrete or the like. In this case provision is made at each end of each block 56 of shallow channels 58 connecting the passages 57 with the spaces between the rows. When the concrete is forced down between the rows of blocks certain parts of the concrete will be forced through the grooves 58 into the passages 57 to surround the tension rods 34 therein.

In Figs. 27 and 28 are shown blocks 59 so shaped as to hold in position correspondingly shaped false bottoms 60 to close the lower

parts of the spaces between the successive rows of blocks. In Figs. 33, 34, 35 and 36 are shown blocks open at the bottom and adapted to be held together by tension members 34 inside of and adjacent the side walls of such blocks. In Figs. 33 and 34 the blocks 61 and 62 respectively, have bevelled portions at the inner surfaces of their side walls and near the lower edges of said side walls so that the bottoms of the openings may be closed by false bottoms such as 63 for use with blocks 61 and 64 for use with block 62.

In Figs. 35 and 36 the blocks are closed at their bottoms by false bottoms 65. As shown in Fig. 35 the false bottoms may be supported by stirrups 66 inserted from below in openings in the block 65 and secured near the upper ends of the block by suitable means such as nuts not shown. Fig. 36 illustrates the supporting means for the false bottoms as comprised of pre-embedded tension members 67 having their free ends knotted or secured together in any suitable manner beneath the tension members 34.

In Fig. 37 disclosure is made of a modified means for compressing the blocks of a row at their lower ends. At the left of this figure are shown special blocks 68 having therein pre-embedded members 69 which may be connected with each other by turnbuckles 70 in assembling the same, the blocks 71 to the right of the block 68 being of usual form provided with passages 72 each to accommodate a single tension member 73 secured at the right to a washer member 74 by means of a nut 75.

Another arrangement of tension devices is shown in Fig. 38 in which each block 76 contains a pre-embedded flat metal piece 77 having openings at each end so that when two blocks are assembled such members 77 may be secured together by driving into the openings therein tapered pins 78 as illustrated in Fig. 39.

Figure 40 shows another arrangement of blocks and tension members in which certain of the blocks are assembled by means of individual tension members inserted through said blocks and secured in a suitable manner to adjacent individual tension members. As shown in this figure, blocks 79 with individual tension members 80 are used at the ends of the row and blocks 81, which may be of usual form, are used in the central portion in co-operation with a single tension member 82 in each passage formed by aligned openings.

Figure 41 illustrates an arrangement particularly adapted for use where the beam-like rows of blocks are assembled in one position, preferably above the final position thereof and then lowered into position. In this operation, the blocks are placed in a row on a support, preferably at a higher level than that of their final position; the reinforcing bars or rods are placed in position and preferably tightened; and the beam-like row of blocks lowered into its final position. In this operation it is possible to insert the reinforcing bars or rods above the supports, such as girders, thus obviating the provision of openings for rod insertion, in the supports or girders. As disclosed in this figure, a rod 83 extends from end to end of the row of blocks 84 and passes through an upright part of each of two angle members 85 having outward projections or flanges 86 adapted to rest on the top of supports 87 here shown as steel beams. To clamp the blocks together use is made of suitable means such as nuts 88 on opposite ends of the rod 83. Other clamping means may be used in place of nuts 88 and, as pointed out hereinafter, the blocks 84 may be secured together and to the rod 83 with the use of clamping means at the end of the rod.

Figure 42 illustrates a beam-like row of blocks 89 in which the blocks are secured together by holding means including a rod 90 passing through openings 91 in the blocks and secured to the blocks, preferably by quick-setting cement indicated by 92. Although the rod 90 is illustrated as being of uniform size throughout its length, it may be made of any shape as desired or required to give a strong binding effect.

It should be understood that the particular forms of blocks, block securing means, and methods of construction disclosed are merely illustrative of my invention and that various changes may be made therein without departing from the spirit of my invention.

It should also be understood that the feature of building up the tension members of separate parts would facilitate the erection or construction of floors between two previously erected walls or under conditions where it would be impossible to subject the tension members to tension by tightening means at the ends of the rows. It will be found also that construction of floors under the conditions just referred to may be effected by subjecting the blocks to pressure in the manner shown in Figure 21, that is by tamping the concrete into a wedged shaped opening between two successive blocks. While a better effect is obtained by tamping the concrete into a wedge-shaped opening, it should be understood that a sufficient degree of compression may be obtained by tamping the concrete between blocks having parallel sides.

Although the tension members are ordinarily used only at the lower portions of the blocks as shown in Figs. 20 and 21, it should be understood that such tension members may be used adjacent any face of a row of blocks to prevent outward deflection at that face. For example, blocks 1 such as shown in Fig. 1 may be provided with openings 83 through which may be passed tension members 34 for

resisting upward deflection of the beam formed of such row of blocks.

The blocks may also be reinforced against shear by vertical or inclined metal members. In blocks having pre-embedded longitudinal reinforcing members to resist the tensile stresses, provision may be made of vertical shear resisting members and a shear resisting member might be made in one piece with a tensile-stress-resisting member. Such combined members may be L-shaped or T-shaped.

It should also be understood that where turnbuckles are used as illustrated in Fig. 37, the blocks must be so formed as to give access to the turnbuckles.

I claim:—

1. A building block having projections to space it from other blocks and an opening through one of such projections at the lower edge of the block so that, when a plurality of such blocks are assembled in a beam, a tension member may be inserted through such openings and the blocks clamped to produce an arching effect and form a structural beam.

2. A building block adapted for use with similar blocks and shaped to contact therewith through projections at certain predetermined points and of relatively small surface area and so spaced from each other and so arranged as to avoid undue stresses when the blocks are subjected to pressure and having through one of said projections at the lower edge of said block an opening for the admission of a tension member for clamping a plurality of such blocks together at their lower edges to produce an arching effect.

3. A structural supporting member comprising building blocks in a row, spacers between said blocks at separate points as to avoid excessive breaking stresses on the blocks when placed together, and having an opening through one of said spacers at the lower edge of the block; and means including a member passing through said opening for causing said blocks to be pressed together at their lower edges to produce a suitable arching effect.

4. The method of constructing floors or the like from blocks and tension members including setting up rows of blocks, placing reinforcement members at the sides of said rows of blocks to lie therebetween, pressing the blocks of each row together, tensioning the reinforcement members at the sides of each row and rendering each row self-supporting by filling the spaces between the rows of blocks with material such as mortar, thereby connecting the pressed-together blocks in each row with the corresponding tension members and producing a beaming effect.

5. The method of constructing floors or the like from blocks and tension members, including setting up the blocks in rows with material, such as mortar, between the blocks of each row, placing tension members in operative relation with respect to said rows, pressing the blocks of said rows together to cause an arching effect and render said rows self-supporting, tensioning the tension members associated with each row of blocks and securing the blocks in each row to the associated tension members with material, such as mortar, placed between the blocks to produce a beaming effect.

6. The method of constructing floors or the like from blocks, consisting in setting up the blocks in rows, placing reinforcing members in operative relation with respect to said rows, pressing the blocks of said rows together by means of said reinforcing members to cause an arching effect and render said rows self-supporting, placing shear reinforcing material in certain joints or in the spaces between certain rows of blocks, and surrounding the reinforcing members or materials with material, such as mortar, in order to connect them to certain of the blocks.

7. The method of constructing floors or the like from blocks, certain of which may be reinforced against shear, consisting in setting up the blocks in rows with mortar or the like for insertion between the blocks where desired, placing reinforcing members in operative relation with respect to said rows, pressing the blocks of said rows together by means including said reinforcing members to cause an arching effect and render said rows self-supporting, placing shear reinforcing material in the joints or in the spaces between the rows of blocks where desired, and placing reinforcing members to extend in opposite directions along the rows of blocks, rendering said reinforcing members effective to press the blocks together at their lower edges, surrounding the reinforcing members or materials with material, such as mortar, in order to cause them to adhere to certain of the blocks.

8. The method of constructing floors or the like from blocks, certain of which may be reinforced against shear, consisting in setting up the blocks in rows with mortar or the like inserted between the blocks where desired, placing reinforcing members in operative relation with respect to said rows, pressing the blocks of said rows together by means of said reinforcing members to cause a beaming effect and render said rows self-supporting, placing shear reinforcing material in the joints or in the spaces between the rows of blocks where desired, and placing reinforcing members to extend in opposite directions along the rows of blocks where desired, stretching certain of said reinforcing members where desired, and placing in certain directions at the upper part of the blocks reinforcing members which may be continued in other parts of the building construction,

such as the opposite rows of blocks, and may be stretched, and surrounding the reinforcing members or materials with material, such as mortar, in order to cause them to adhere to certain of the blocks.

9. The method of constructing floors or the like from blocks, certain of which may be reinforced against tensile stresses by means including reinforcing metals pre-embedded in the longitudinal direction of the rows, consisting in setting up the blocks in rows with material, such as mortar, inserted between the blocks where desired, placing shear reinforcing material in the joints or between the rows of blocks where desired, joining and tightening said pre-embedded reinforcing metals to cause a beaming effect in the row of blocks and render said rows self-supporting, and filling the space between the rows with material, such as mortar, thereby surrounding the free parts of the reinforcing materials and locking devices.

10. The method of constructing floors, which includes setting up in a row blocks of concrete or the like, having aligned openings and pressing the same together; inserting a tension rod in said openings; tensioning said rod and securing said rod to the end blocks by applying cementitious material at such points.

11. A structural supporting member comprising building blocks in a row, spacers between said blocks at such points as to avoid excessive breaking stresses on the blocks when placed together, and means for causing said blocks to be pressed together adjacent the lower face of the beam to produce a suitable arching effect and adjacent another face to prevent outward deflection at such face.

12. The method of constructing floors or the like of blocks, short reinforcing members and long reinforcing members, including setting up rows of blocks, placing sheer resisting material and mortar between the blocks of each row, placing long reinforcing members between the rows of blocks, pressing together the blocks of each row to cause an arching effect, tensioning the long reinforcing members associated with said rows, and securing the pressed together blocks of each row together in such arch relation by mortar between said rows and adhering both to the blocks and to the long reinforcing members.

13. The method of constructing floors or the like from blocks and tension members, including setting up the blocks in rows with material, such as mortar, between the blocks, placing tension members in operative relation to said rows, pressing the blocks of said rows together by means of said tension members to cause an arching effect and thereby render said rows self-supporting, and securing the blocks in said rows to the associated tension members with material such as mortar.

In testimony whereof I affix my signature.

KARL E. W. JAGDMANN.