Jan. 8, 1957 L. E. STEWART 2,776,464

CONCRETE FORM CONSTRUCTION

Filed Aug. 12, 1953

Fig. 1

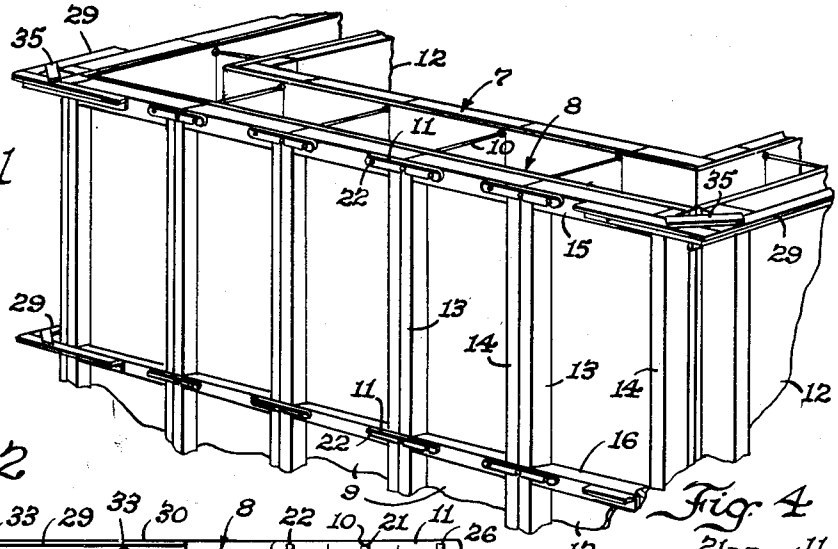


Fig. 2

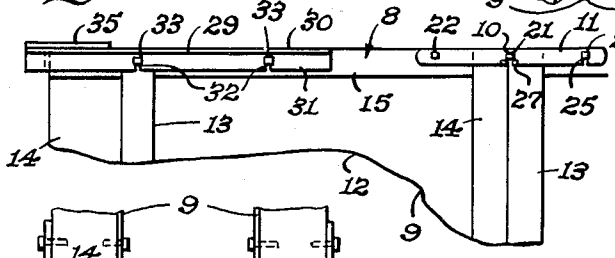


Fig. 4

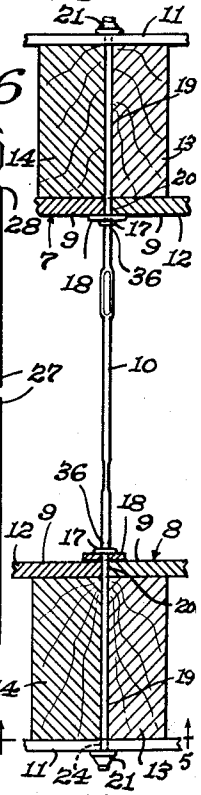


Fig. 6

Fig. 3

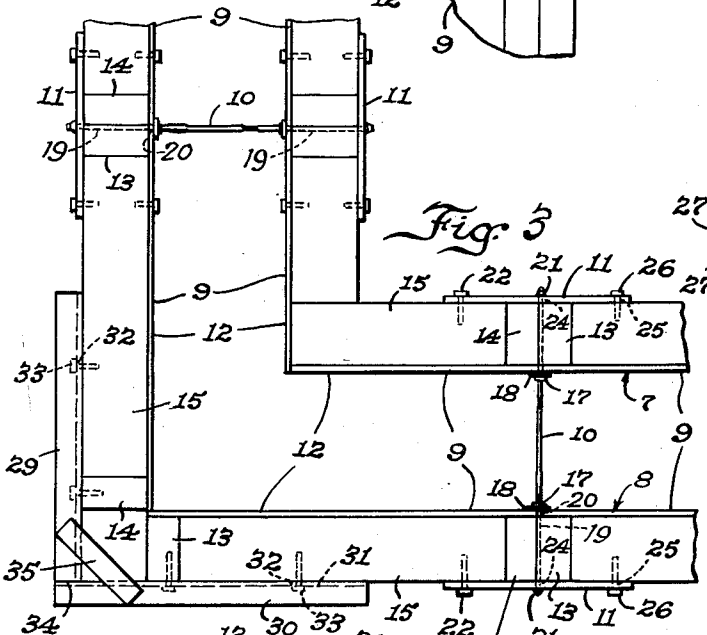
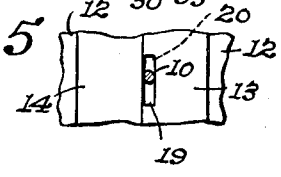


Fig. 5



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CONCRETE FORM CONSTRUCTION

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8 Claims. (Cl. 25—131)

This invention relates to a new and improved knock-down type of concrete form construction designed to enable speedier erection and stripping.

Concrete forms, in accordance with the latest and most improved practice, prior to my invention, were made up of sections bolted together at the abutting edges and fastened together along the top and bottom and near the middle by what were known as whalers, each of which consisted of two long boards fastened together in closely spaced relation by cross-pieces, so that the headed ends of tie pins extending between the inner and outer walls of the form and projecting between the abutting ends of sections and serving to space the inner and outer walls of the form by the abutment of washers on the pins with shouldered portions on the pins, could be secured to the whalers by means of wire clips shaped like hair-pins and disposed crosswise of the space between the longitudinally extending pieces of the whalers and straddling the headed ends of the tie pins. That kind of construction, even though it could be called a "knock-down" type of construction, took far too much time in the setting up and taking down, and, as a result, with the present high labor costs, it meant too much of an increase in the ultimate cost of the concrete foundation. It is, therefore, the principal object of my invention to provide a simpler concrete form construction that requires only a small fraction of the time (and, hence, labor cost) previously figured necessary both in the setting up and taking down of the forms, to the end that concrete foundations may be completed at much lower cost.

A salient feature of my improved construction consists in the use of rigid tie bars or levers that are permanently pivotally mounted on the one end of the inner and outer form sections for swinging movement in planes parallel to the outer faces of said form sections and at right angles to the projecting headed ends of the tie pins, whereby to tie together the inner and outer walls of the form in rigidly spaced relationship, the tie bars serving at the same time to tie together and firmly brace in coplanar relationship and tight abutment neighboring sections of the inner and outer walls of the form, so that the setting up and taking down operations take only a fraction of the time required with the old construction and with a minimum amount of wear and tear on the form sections, a further advantage being that the tie pins used are of substantially the same design as heretofore, only a little shorter and hence a little cheaper.

The invention is illustrated in the accompanying drawing, in which—

Fig. 1 is a perspective view of a concrete form structure made in accordance with my invention;

Fig. 2 is a side view of one corner of Fig. 1;

Fig. 3 is a plan view of the same corner;

Fig. 4 is an enlargement of a portion of Fig. 3 to better illustrate the use of the tie pins;

Fig. 5 is a detail on line 5—5 of Fig. 4, and

Fig. 6 shows two views of a tie bar.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawing, the reference numerals 7 and 8 designate the inner and outer walls, respectively, of a concrete form structure made in accordance with my invention. Each of these walls is made up of a number of fairly small and light rectangular sections 9 of vertically elongated shape. Each section may, for example, be about two feet wide and about eight feet long, the length being equivalent to the depth of the basement whose walls are to be made from poured concrete. The sections 9 are disposed in edge to edge abutting relation to define vertical joints and secured together by rigid pins 10 and bars or levers 11, with the inner and outer walls 7 and 8 held in uniformly spaced relation and the sections 9 in each of these walls secured together firmly in coplanar relationship and tight abutment. Each section 9 is preferably of wooden construction for lightness and cheapness, and preferably includes a wall forming panel 12 secured to a reinforcing frame consisting of side frame members 13 and 14, top and bottom cross-pieces 15, and one or more intermediate cross-pieces 16, all secured together and to the outer side of the panel 12. Hence, in the construction of each of the walls 7 and 8, the side member 13 on each form section is disposed in side to side abutment with the side member 14 on a neighboring form section, excepting at the corners of the structure where a little variation in this arrangement becomes necessary, as will soon appear. The tie pins 10 have annular shoulders 17 formed thereon spaced inwardly from both ends at a predetermined distance from each other, and loose washers 18 are provided on the end portions of the pin for abutment with these shoulders to provide abutments for the panels 12 to space the abutting ends of sections of the inner wall 7 a predetermined distance from abutting ends of sections of the outer wall 8, as more clearly appears in Figs. 3 and 4. The vertical joints defined between the abutting sections in the outer wall are in coplanar relation with the joints defined between the abutting sections of the inner wall, and the tie pins 10 extend through these joints, as most clearly appears in Fig. 3. The side member 13 on each form section is notched out, as indicated at 19 in Fig. 5, and a corresponding notch 20 is provided in the edge of the panel 12 to accommodate the outer end portions of the tie pins 10 when the form sections are set up in abutting relationship to form the inner and outer walls 7 and 8 of the form structure. The notches 19 and 20 are purposely elongated vertically so that there will be no problem of registration of the opposite end portions of a pin in the notches 19 and 20 in the inner and outer walls, and also to avoid the necessity for close registration of the upper ends of neighboring abutting sections in each of these walls. In other words, allowance must be made for about an inch misalignment one way or the other so that the notches 19 and 20 in the form section in the inner wall 7 may be a little higher or a little lower than the notches 19 and 20 in the form section in the outer wall 8, and the same run-out is permissible between neighboring form sections in the inner and outer walls and yet the tieup for which the tie bars 11 are intended, may be effected to tie together the inner and outer walls 7 and 8 in rigidly spaced relationship, and at the same time tie together and firmly brace in coplanar relationship and tight abutment neighboring form sections of the inner and outer walls so that these walls will not be apt to buckle at the joints between sections. The pins 10 have on their outer ends for cooperation with the tie bars 11 the upset heads 21, and the tie bars 11 are permanently pivotally secured near one end of each form section 9 by means of lag screws 22 entered through a hole 23 in one end of the tie bars 11 and into the cross-pieces 15 and 16

near the side members 14, so that the tie bars 11 may be swung in planes parallel to the outer faces of the form sections at right angles to the headed ends 21 of the pins and engage the shanks of these headed ends in a slot 24 provided intermediate the ends of the tie bars, and also engage in another slot 25 in the free end portion of the bars 11 lag screws 26 that are permanently mounted in the cross-pieces 15 and 16 near the side members 13, thereby accomplishing the double tieup action mentioned, namely, the tieing together in rigidly spaced relation of the inner and outer walls 7 and 8, and at the same time the tieing together in coplanar relationship and tight abutment the neighboring form sections of these inner and outer walls. The rigid tie bars 11 engage the outside of the form sections substantial distances both ways from the joints between neighboring form sections, thus giving the desired rigidity in the structure without necessitating the application of the whaler strips so commonly used by others. In Fig. 6 I have indicated at 27 the bevelling of the edge portion of the tie bar 11 on opposite sides of the slot 24 on the outer side. This bevelling is to facilitate the interlocking engagement of the headed ends 21 of the pins 10 in the slots 24, the abutting form sections being wedged tightly between the tie bars 11 and the washers 18 as the tie bars 11 are forced downwardly into the tieing and bracing position. It will also be observed in Fig. 6 that the outer ends of the slots 25 in the tie bars 11 are flared, as indicated at 28, to facilitate interlocking engagement of shanks of the lag screws 26 in the slots 25 as the tie bars are forced down into tieing position. The slots 24 and 25 are sufficiently oversize in width in relation to the shanks of the pins 10 and screws 26 to avoid difficulty in the interlocking engagement of the tie bars 11 with the pins 10 and screws 26 and thereby speed up the setting up of the form structure. Generally, the tie bars 11 are needed only at three elevations, namely, at the bottom and top and somewhat below the middle elevation, but, of course, more may be used on form structures for deeper basements to insure adequate strength and rigidity.

At the corners of the form structure, L-shaped corner tie brackets 29 are employed to tie together the adjoining ends of the form sections of the outer wall 8, as most clearly appears in Figs. 2 and 3. Each bracket 29 is of angle iron construction providing a horizontal outwardly projecting flange 30 and downwardly projecting vertical flange 31 on each arm thereof. The vertical downwardly projecting flange 31 of each arm of the bracket has two vertical slots 32 provided therein in longitudinally spaced parallel relation to receive with a tight fit lag screws 33 that are permanently secured in the same spaced relation to the cross-pieces 15 and 16 and side members 13 and 14, form sections 9 specially equipped with these lag screws being reserved for use on the corners of the form structure, so that only a small percentage of the form sections need be so equipped. It is obviously a simple matter to enter the shanks of the screws 33 in the slots 32 and then force the brackets 29 downwardly into tieing position, and when the adjoining ends of form sections are secured together in that manner, there is ample strength and rigidity in the structure. Also, it takes very little time to loosen and remove the brackets later when the form sections are to be stripped from the foundation. Inasmuch as two pieces of angle iron are preferably employed in the makeup of a single bracket 29, the two pieces being welded together along the joint line indicated at 34 in Fig. 3, I prefer to provide a diagonally extending brace 35 near the juncture, welded at its opposite ends to the top of the flange 30. The disposition of the side members 13 and 14 of adjoining ends of the form sections at the corners of the form structure at right angles to one another, as shown in Fig. 3, provides ample space for these braces 35 on the three or more corner tie brackets 29 employed at each corner of the form structure. At each corner of the form structure the inner wall 7 has the adjoining form sections made of a width to fit and they need only be disposed in the interfitting relationship indicated in Fig. 3, that is, with the end of one panel 12 overlapping the end of the other panel 12 and with the ends of the cross-pieces 15 and 16 on one form section in abutting right angle relationship to the ends of the corresponding cross-pieces on the other adjoining form sections. Of course, if there is any looseness evident, that may be remedied easily enough by driving in a few nails to temporarily tie together the cross-piece 15 and the abutting cross-piece 16, leaving the headed ends of the nails projecting for easy withdrawal later when the forms are being removed.

In operation, the concrete form structure is set up usually by starting from a corner and setting up the form sections 9 two at a time, one for the inner wall 7 and the other for the outer wall 8. Two men generally work as a team, although it is possible for one man to do the work, once he has acquired the know-how. The pins 10 are placed in the notches 19—20 when the next form sections 9 to be fastened in place are in proximity to the form sections already set up and secured, and then when the loose form sections are moved into abutment with the fastened form sections there remains only the matter of interlocking the tie bars 11 with the headed ends 21 of the pins 10 and the projecting ends of the lag screws 26 to secure the heretofore loose form sections to the ones already set up to form rigid continuations of the inner and outer walls 7 and 8. The appreciable length of the tie bars 11 is of advantage because the pivot 22 and coupling point 26 are thereby spaced far enough in both directions from the pin 10 to provide a good bracing action to resist buckling of the abutting form sections at the joints. When the next corner is neared a special corner section 9 equipped with lag screws 33 is used to form the outer wall 8 at the corner. It is tied to the end of the outer wall 8 and a mating corner section 9 equipped with lag screws is placed at right angles to it to start the new outer wall of the form structure. Then the tie brackets 29 are applied to the projecting ends of the lag screws 33. The corner forms are then in rigid relationship to one another and to the rest of the outer wall of the structure. There remains only the matter of setting up the special form sections 9 for the corner portion of the inner wall 7, as appears in Fig. 3. Then the process of continuing the erection of the walls 7 and 8 from there on proceeds as described before until the next corner is approached when, of course, the same procedure is followed as described for the last mentioned corner. After the form structure has been erected and the concrete has been poured and has set and dried sufficiently so that it is safe to remove the form structure, one man can easily do this work, because it is only necessary to loosen the tie bars 11 and disconnect them from the headed ends 21 of the pins 10 and from the lag screws 26, when, of course, the form sections can easily be pried loose from the foundation and removed. What little concrete finds its way into the pin receiving and supporting notches 19 in the pouring of the foundation I have found cracks loose and falls out when the form sections are pried loose and removed, so that there is very little cleaning and scraping necessary to make the form sections ready for use again. The corner tie brackets 29 also are easily loosened and removed to permit loosening and removing the form sections at the corners of the foundation. The erection of the form structure takes a small fraction of the time required with the ones using whalers and having the form sections bolted together, and it goes without saying that the removal of the form sections with the present construction also takes only a small fraction of the time required with the old construction. As a result, just as good or even better foundations can be made using this improved concrete form construction, and a considerable saving in labor cost is realized. The protruding end portions of

the pins 10 are generally broken off by bending the ends back and forth a few times until the metal crystallizes sufficiently for the end portions to break off at the weakening notches 36 indicated in Fig. 4 next to the shoulders 17.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. A concrete form structure for construction of a pour concrete wall, as in a building foundation, said structure being formed of spaced parallel inner and outer walls, each made up of a plurality of wall heighth sections of vertically elongated form disposed in coplanar relation with their side edges in abutment and adapted to be secured together detachably to define vertical joints between the abutting sections, the joints in the outer wall being in coplanar relation with joints in the inner wall, means for rigidly spacing said inner and outer walls comprising pins extending therebetween in right angle relationship thereto and protruding through the joints between abutting sections of both walls, the outer extremities of said pins having heads provided thereon, and means for rigidly connecting abutting sections in both walls comprising horizontal elongated rigid tie bars pivotally secured at one end to one of two abutting sections at each joint in said inner and outer walls, said tie bars each having a vertical slot provided in the outer end opening from a longitudinal edge and having another vertical slot provided intermediate the ends thereof in substantially parallel relation to the first slot and opening from the same longitudinal edge, said tie bars being swingable in a plane parallel to said sections to tying position in which the slots intermediate the ends lockingly receive the protruding headed outer ends of the pins so as to hold the inner and outer walls in rigidly spaced relation, the slots in the outer ends then lockingly receiving projections provided on the other of said two abutting sections at each joint in said inner and outer walls so that the abutting sections in the inner and outer walls respectively are also tied together in rigid coplanar relationship, said tie bars being of appreciable length so as to space the pivot at one end and the slot at the other end appreciably on opposite sides of the joints between the abutting sections and provide bearing engagement of the tie bars with the outside of said form sections a substantial portion of the width of the latter on both sides of the joints to insure the desired rigidity of the form structure.

2. A concrete form structure as set forth in claim 1 wherein each tie bar at both sides of the entrance of the slot intermediate the ends of the tie bar is tapered toward the longitudinal edge for a wedging action on the headed end of the pin to aid in forcing the inner and outer walls toward one another into final position.

3. A concrete form structure for construction of a poured concrete wall, as in a building foundation, said structure being formed of spaced parallel inner and outer walls, each made up of a plurality of wall heighth sections of vertically elongated form disposed in coplanar relation with their side edges in abutment and adapted to be secured together detachably to define vertical joints between the abutting sections, the joints in the outer wall being in coplanar relation with joints in the inner wall, means for rigidly spacing said inner and outer walls comprising pins extending therebetween in right angle relationship thereto and protruding through the joints between abutting sections of both walls, the outer extremities of said pins having heads provided thereon, and means for rigidly connecting abutting sections in both walls comprising horizontal elongated rigid tie bars disposed in planes parallel to said sections at the inner and outer ends of said pins which in tying position have the protruding headed outer ends of said pins lockingly engaged in vertical slots provided substantially in the middle of said bars opening from a longitudinal edge thereof so as to hold said inner and outer walls in rigidly spaced relation, and means whereby said bars when disposed in tying position have the opposite ends thereof also connected to the abutting sections in the inner and outer walls so that these abutting sections in the inner and outer walls respectively are also tied together in rigid coplanar relationship, said tie bars being of appreciable length so as to space the ends that are connected to the abutting sections appreciably on opposite sides of the joints between the abutting sections and provide bearing engagement of the tie bars with the outside of said form sections a substantial portion of the width of the latter on both sides of the joints to insure the desired rigidity of the form structure.

4. A concrete form structure for construction of a poured concrete wall, as in a building foundation, said structure being formed of spaced parallel inner and outer walls, each made up of a plurality of wall heighth sections of vertically elongated form disposed in coplanar relation with their side edges in abutment and adapted to be secured together detachably to define vertical joints between the abutting sections, the joints in the outer wall being in coplanar relation with joints in the inner wall, means for rigidly spacing said inner and outer walls comprising pins extending therebetween in right angle relationship thereto and protruding through the joints between abutting sections of both walls, the outer extremities of said pins having heads provided thereon, and means for rigidly connecting abutting sections in both walls comprising horizontal elongated rigid tie bars disposed in planes parallel to said sections at the inner and outer ends of said pins, said tie bars being pivotally secured at one end to one of the abutting sections at each joint in said inner and outer walls for swinging movement to and from tying position and being detachably connectible by their free end portion in the tying position to the headed outer ends of said pins and to the other of said two abutting sections so as to hold said inner and outer walls in rigidly spaced relation through said pins and so that the abutting sections in the inner and outer walls respectively are also tied together in rigid coplanar relationship, said tie bars being of appreciable length so as to provide bearing engagement of the tie bars with the outside of said form sections a substantial portion of the width of the latter to insure the desired rigidity in the form structure even though said pins and tie bars cooperating as described constitute the sole means for holding the form structure assembled as described.

5. A concrete form structure as set forth in claim 3 wherein each tie bar at both sides of the entrance of the slot in the middle of the tie bar is tapered toward the longitudinal edge for a wedging action on the headed end of the pin to aid in forcing the inner and outer walls toward one another into final position.

6. A concrete form structure for construction of a poured concrete wall, as in a building foundation, said structure being formed of spaced parallel inner and outer walls, each made up of a plurality of wall heighth sections of vertically elongated form disposed in coplanar relation with their side edges in abutment and adapted to be secured together detachably to define vertical joints between the abutting sections, the joints in the outer wall being in coplanar relation with joints in the inner wall, means for rigidly spacing said inner and outer walls comprising pins extending therebetween in right angle relationship thereto and protruding through the joints between abutting sections of both walls, the outer extremities of said pins having heads provided thereon, and means for rigidly connecting abutting sections in both walls comprising horizontal elongated rigid tie bars disposed in planes parallel to said sections at the inner and outer ends of said pins, said tie bars being pivotally secured at one end to one of the abutting

sections at each joint in said inner and outer walls for swinging movement to and from tying position, and said bars being detachably connectible by their free end portion in the tying position to the headed outer ends of said pins by means of a slot in the bars opening from one longitudinal edge while said bars have abutment with the outside of the other of said two abutting sections in the inner and outer walls respectively next to the joint to hold the abutting sections in coplanar relationship, said pins when so connected with said tie bars holding the inner and outer walls in rigidly spaced relation, said tie bars being of appreciable length so as to provide bearing engagement of the tie bars with the outside of said abutting form sections a substantial portion of the width of the latter transversely of the joints therebetween to insure the desired rigidity in the form structure even though said pins and tie bars cooperating as described constitute the sole means for holding the form structure assembled as described.

7. A concrete form structure for construction of a poured concrete wall, as in a building foundation, said structure being formed of spaced parallel inner and outer walls, each made up of a plurality of sections of rectangular form disposed in coplanar relation with their side edges in abutment and adapted to be secured together detachably to define joints between the abutting sections, the joints in the outer wall being in coplanar relation with joints in the inner wall, means for rigidly spacing said inner and outer walls comprising pins extending therebetween in right angle relationship thereto and protruding through the joints between abutting sections of both walls, the outer extremities of said pins having heads provided thereon, and means for rigidly connecting abutting sections in both walls comprising elongated rigid tie bars disposed in transverse relation to said joints and in planes parallel to said sections at the inner and outer ends of said pins, said tie bars being pivotally secured at one end to one of the abutting sections at each joint in said inner and outer walls for swinging movement to and from tying position and being detachably connectible by their free end portion in the tying position to the headed outer ends of said pins and to the other of said two abutting sections so as to hold said inner and outer walls in rigidly spaced relation through said pins and so that the abutting sections in the inner and outer walls respectively are also tied together in rigid coplanar relationship, said tie bars being of appreciable length so as to provide bearing engagement of the tie bars with the outside of said form sections a substantial portion of the width of the latter to insure the desired rigidity in the form structure.

8. A concrete form structure for construction of a poured concrete wall, as in a building foundation, said structure being formed of spaced parallel inner and outer walls, each made up of a plurality of sections of rectangular form disposed in coplanar relation with their side edges in abutment and adapted to be secured together detachably to define joints between the abutting sections, the joints in the outer wall being in coplanar relation with joints in the inner wall, means for rigidly spacing said inner and outer walls comprising pins extending therebetween in right angle relationship thereto and protruding through the joints between abutting sections of both walls, the outer extremities of said pins having heads provided thereon, and means for rigidly connecting abutting sections in both walls comprising elongated rigid tie bars disposed in transverse relation to said joints and in planes parallel to said sections at the inner and outer ends of said pins, said tie bars being pivotally secured at one end to one of the abutting sections at each joint in said inner and outer walls for swinging movement to and from tying position, and said bars being detachably connectible by their free end portion in the tying position to the headed outer ends of said pins by means of a slot in the bars opening from one longitudinal edge while said bars have abutment with the outside of the other of said two abutting sections in the inner and outer walls respectively next to the joint to hold the abutting sections in coplanar relationship, said pins when so connected with said tie bars holding the inner and outer walls in rigidly spaced relation, said tie bars being of appreciable length so as to provide bearing engagement of the tie bars with the outside of said abutting form sections a substantial portion of the width of the latter transversely of the joints therebetween to insure the desired rigidity in the form structure.

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