May 11, 1965 E. R. LAWRENCE 3,182,948

FORM FOR CONCRETE SLABS

Filed Aug. 2, 1962

Fig. 1

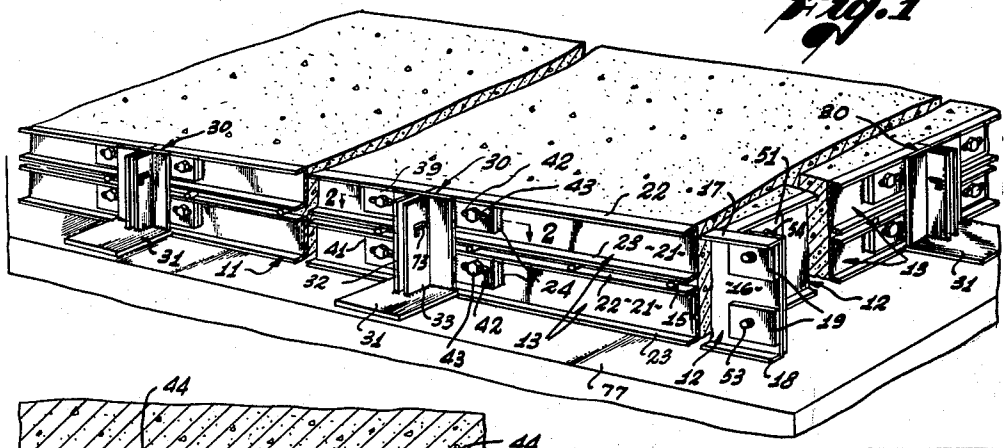


Fig. 2

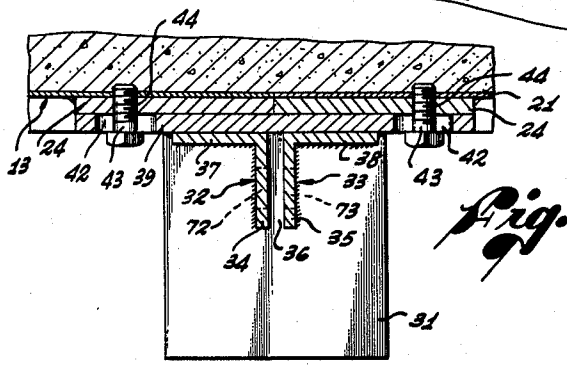


Fig. 3

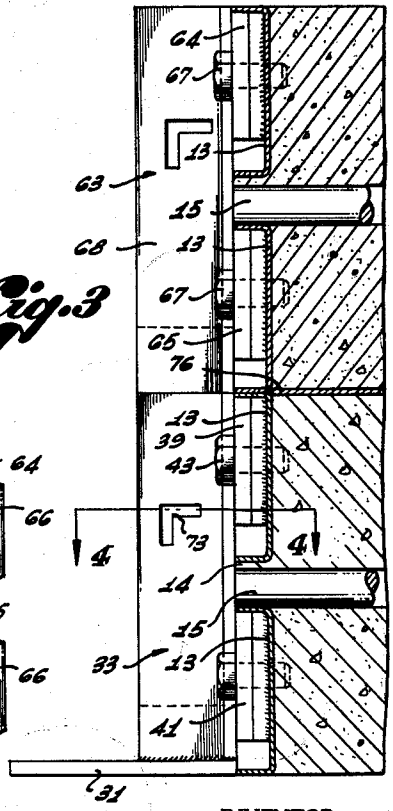


Fig. 4

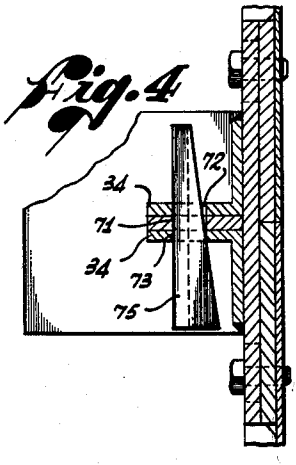


Fig. 5

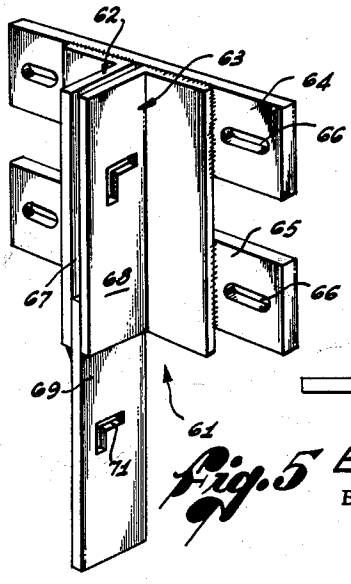


Fig. 6



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FORM FOR CONCRETE SLABS

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The present invention relates generally to sectional steel forms for the production of concrete slabs in a horizontal position, and more particularly to sectional forms for casting concrete structural walls in a horizontal position from which they may be tilted upwardly to form a walled structure.

In the formation of reinforced concrete walls for buildings, the tilt-up method of construction casts the walls horizontally where they are to be erected. Suitable hooks or other anchor means may be inserted and cast within the slab to enable a crane or other structural apparatus to lift the precast slab into position as a vertical wall after the concrete has solidified. In this method of construction it is apparent that the concrete slab may be precast with only side building forms whose vertical height need be equal only to the thickness of the slab. This results in a much more simplified form than would be required if the walls were cast in vertical position, and does away with the bracing which is required for a vertically cast wall.

It is, therefore, an object of the present invention to provide an improved building form construction for the casting of horizontal reinforced concrete slabs.

Another object of this invention is an improved building form for the casting of horizontal concrete slabs having provision for increasing the vertical height of the forms to increase the thickness of the cast slab.

A further object of the present invention is the provision of an improved building form construction for casting horizontal concrete slabs in which forms may be stacked vertically to provide for the casting of additional slabs upon the platform provided by the upper surface of a lower cast concrete slab.

Yet another object of this invention is the provision of improved building forms for the casting of horizontal reinforced concrete slabs in which the forms may be stacked vertically to provide any desired form height and in which the stacked forms have improved means for holding and pulling the forms together to give the stack greater vertical and horizontal stability.

A still further object of this invention is the provision of a building form construction for casting horizontal concrete slabs having improved arrangements for sectionalizing and supporting the forms and for supporting reinforcing bars thereon.

These and other objects and features of the invention will be readily apparent to those skilled in the art from the following specification and the appended drawing illustrating a presently preferred embodiment thereof, in which:

FIGURE 1 is a broken perspective view of a building form construction according to the present invention with a concrete slab cast therein;

FIGURE 2 is a horizontal sectional view of a joint between sections of the building form;

FIGURE 3 is a vertical sectional view through vertically stacked building forms according to the present invention;

FIGURE 4 is a detail horizontal sectional view on the line 4—4 of FIGURE 3;

FIGURE 5 is a perspective view showing the connecting and supporting means for the sections of the upper level of the stacked building forms of FIGURE 3; and

FIGURE 6 is a perspective view of a key for tying and pulling the stacked forms together.

The precast concrete slab form according to the present invention is indicated generally at 11, and is sectional in construction, being built up of corner end sections 12 and intermediate section 13. The end sections 12 extend for the the full vertical height of the form, while the intermediate sections 13 extend for less than one-half the vertical height of the form and are spaced apart at the mid horizontal plane to provide a slot 14 therebetween. Reinforcing bars 15 extend transversely across the opening between the sides of the form and have their ends received in the slot 14 in supported relation.

The end sections 12 are formed of sheet metal and have vertical walls 16 extending the height of the form with integral, outwardly extending horizontal flanges 17 and 18 at the top and bottom thereof, respectively. Rigid attachment plates 19 are rigidly secured, as by welding, to the outside surfaces of the vertical walls 16 adjacent the opposite ends thereof.

The intermediate sections 13 are formed of sheet metal and have vertical walls 21 provided with integral, outwardly extending horizontal flanges 22 and 23 at the top and bottom thereof. The superposed intermediate sections 13 are spaced apart, as stated hereinbefore, to provide the slot 14 between the lower flange 23 on the upper section and the upper flange 22 on the lower section. Rigid attachment plates 24 are welded or otherwise secured to the outside surfaces of the vertical walls 21 adjacent the opposite ends of the sections 13.

Supports 30 for joining the intermediate form sections together and to the end sections and for bracing the assembled form may be seen more particularly in FIGURES 1 and 2. Each support 30 comprises a horizontal base plate 31 to which are welded a pair of vertically extending angles 32 and 33 having their opposed legs 34 and 35, respectively, spaced apart to provide a slot 36 therebetween. Vertically spaced straps 39 and 41 are rigidly mounted, as by welding, to the inwardly facing legs 37 and 38 of the angles 32 and 33. The ends of straps 39 and 41 form attachment ears and are provided with slots 42 therethrough. Studs 43 extend through the slots 42 and are screwed into threaded openings 44 in the plates 24 and in the adjacent plates 19. The straps 39 and 41 are suitably spaced apart, and the slots 42 and threaded openings 44 related so as to secure the proper spacing between the intermediate form sections 13 to provide the horizontally extending slot 14. By this means the intermediate sections 13 are rigidly secured together and to the connecting support which, in turn, by its base plate 31, holds the assembled form sections erect against the force exerted by the concrete poured therein. The adjacent ends of the end sections 12 are also connected to supports 30. The corner ends of the end sections 12 may be joined together by angles 51 to whose opposite legs the plates 19 are secured, as by studs 53 which pass through slots 54 in the legs of the angles and are screwed into threaded openings in the plates 19.

To increase the height of the building form, additional upper end sections 12 may be stacked on the lower end sections 12, and additional upper intermediate sections 13 may be stacked above the lower intermediate sections 13, the latter arrangement being shown in the vertical section of FIGURE 3. The upper end sections 12 may be connected together at the corners by means of angles 51. At points intermediate the corners, the form sections may be joined together by connections 61, FIGURE 5, which also serve to tie and draw together the upper and lower levels of the stacked forms.

Each connector 61 includes a pair of angles 62 and 63, which may be identical with the lower angles 32 and 33.

Across the angles 62 and 63 are mounted connecting straps 64 and 65, which may be identical with the straps 39 and 41 and which are likewise supplied with slots 66 through which extend studs 67 threaded into the plates 24 on the upper level section 13. Between the legs 67 and 68 of the angles 62 and 63 is rigidly secured a depending tongue 69 which extends into the slot 36 between the legs 34 and 35, as shown in FIGURES 3 and 4. The tongue 69 has an angle slot 71 therein in alignment with angle slots 72 and 73 in the legs 34 and 35 when the form sections are properly arranged in stacked relation. A locking wedge-shaped key 75 is shown in perspective in FIGURE 6, and in locking position in FIGURE 4, and has an angular cross section which conforms to the configuration of the slots 71, 72 and 73, so that as the wedge-shaped key is driven into position, as shown in FIGURE 4, it will draw the upper and lower levels of the form together to give greater vertical and horizontal stability to the stacked form sections.

Where the forms are stacked, as in FIGURE 3, they can, of course, be used in any desired number of levels, two only being shown in this figure. Also, the slabs may be cast as a single slab of increased thickness; or a bond-breaking agent at 76 may be applied between the levels so as to produce successive slabs of the same original height by casting an upper slab upon the upper surface of the lower slab used as a platform.

The lower concrete slab may be cast directly on the ground, or on a platform 77 which may be rigid or in the form of building paper or similar material spread upon the ground; similarly, the bond-breaking agent 76 can be building paper or a powdered or paste material spread on the upper surface of the lower slab.

The slot 14 between the ends of the reinforcing bars 15 may be filled, if desired, with any material to prevent the fluid concrete oozing therethrough; for example, a simple expedient is building paper on the inside surface, bridging the slot. Where the slot is narrow, no plugging means may be required if the poured concrete is sufficiently thick.

The manner of assembling the building form according to the present invention will be obvious from the above description, the intermediate sections being connected together and to one end of the end sections by means of the intermediate supports 30, while the end sections are connected together at the corners by means of the angles 51. The reinforcing rods 15 may be inserted through the slots 14, either after assembly or may be placed on the flanges 22 prior to mounting of the upper sections 13. Where the slab of precast reinforced concrete is to form a building wall, suitable hooks or anchor means may be inserted through the slot 14 at what is to be the top edge of the wall and, after the concrete has solidified and the forms 12 and 13 removed, a crane or other structural apparatus may be attached to these hooks and the slab tilted or raised into the vertical position and secured in place as a structural building wall. It will be understood, of course, that the form according to the present invention is not limited to the casting of building wall slabs, nor to walls used in a tilt-up method of building construction; but is usable for the casting of horizontal concrete slabs generally.

Where thicker slabs are desired, or where it is desired to cast a second slab upon a lower slab as a platform, the stacked construction of FIGURES 3 through 5 is utilized. Here the upper intermediate sections are connected together and to the adjacent ends of the end sections by the supports 61 of FIGURE 5, with the tongues 69 extending into the slots 36 between the legs 34 and 35 of the lower level connectors 30, and with the upper and lower levels pulled together and tied by the wedge-shaped key 75 extending through the aligned slots 71, 72 and 73. Where individual slabs are to be cast, with the lower slab used as the platform, a bond-breaking agent is used between the slabs as at 76.

After the concrete has solidified, the form sections are readily disassembled after first removing the bolts 43 and 53 and, where stacked levels are used, after removal of the keys 75 by driving them in reverse direction out of the slots 71–73.

While a certain preferred embodiment of the invention has been specifically illustrated and described, it will be understood that the invention is not limited thereto, as many variations will be apparent to those skilled in the art, and the invention is to be given its broadest interpretation within the terms of the following claims.

I claim:

1. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; and means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume of small height relative to its horizontal dimension corresponding to the slab to be cast therein, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots in substantially the mid horizontal plane of the form for receiving and supporting the ends of slab reinforcing rods extending in the plane of the slab between sections at opposite sides of the form.

2. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; and means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume of small height relative to its horizontal dimensions corresponding to the slab to be cast therein, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots in substantially the mid horizontal plane of the form for receiving and supporting the ends of slab reinforcing rods extending in the plane of the slab between sections at opposite sides of the form, said corner end sections being in the form of U-shaped channels providing outwardly extending horizontal flanges at the top and bottom thereof, and said intermediate secions having outwardly extending horizontal flanges at the top and bottom thereof and at opposite sides of said slot.

3. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; and means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume of small height relative to its horizontal dimensions corresponding to the slab to be cast therein, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots for receiving and supporting the ends of slab reinforcing rods extending in the plane of the slab between sections at opposite sides of the form, said corner end sections being in the form U-shaped channels providing outwardly extending horizontal flanges at the top and bottom thereof, said intermediate sections comprising superposed section portions spaced vertically to provide said horizontal slots, each section portion being a substantially U-shaped channel having outwardly extending horizontal flanges at the top and bottom of the portion.

4. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; and means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume of small height relative to its horizontal dimensions corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and permanently mounted thereon and having means adjacent their opposite ends for atachment to the adjacent ends of said sections, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots for receiving and supporting

the ends of slab reinforcing rods extending in the plane of the lab between sections at opposite sides of the form.

5. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; and means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said vertical supports each comprising a pair of vertically extending angles having oppositely extending, inwardly facing legs on which said attachment means are mounted and adjacent, outwardly extending legs spaced apart to provide a slot therebetween for the reception of an attachment tongue.

6. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; and means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said vertical supports each comprising a pair of vertically extending angles having oppositely extending, inwardly facing legs on which said attachment means are mounted and adjacent, outwardly extending legs spaced apart to provide a slot therebetween for the reception of an attachment tongue, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots for receiving and supporting the ends of reinforcing rods extending between sections at opposite sides of the form.

7. A form for casting a concrete slab in horizontal position comprising: a plurality of form sections; means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said form sections including corner end sections in the form U-shaped sheet metal channels providing outwardly extending horizontal flanges at the top and bottom thereof and intermediate sections comprising superposed section portions spaced vertically to provide horizontal slots therebetween, each section portion being a substantially U-shaped sheet metal channel providing outwardly extending flanges at the top and bottom of the portion; and heavy attachment plates rigidly secured to the outside surfaces of the sections and section portions adjacent the ends thereof and between said flanges, by which connections to the sections are made.

8. A multiple level form for casting a concrete slab in horizontal position comprising: a first level form including a plurality of form sections; means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said vertical supports each comprising a pair of vertically extending angles having oppositely extending, inwardly facing legs on which said attachment means are mounted and adjacent, outwardly extending legs spaced apart to provide a slot therebetween; a second level form mounted above said first level form and comprised of sections substantially duplicating the sections of said first level form, said second level sections being connected together in substantially end-to-end relation to define a second vertically enclosed volume a substantially duplicate of said first enclosed volume and located immediately above the same, the means connecting the second level sections together including a depending vertical tongue disposed within the slot between said outwardly extending angle legs; substantially aligned slots in said tongue and spaced angle legs; and a wedge-shaped key insertable through said slots to draw said upper level sections down to said lower sections and tie the two levels together.

9. A multiple level form for casting a concrete slab in horizontal position comprising: a first level form including a plurality of form sections; means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said vertical supports each comprising a pair of vertically extending angles having oppositely extending, inwardly facing legs on which said attachment means are mounted and adjacent, outwardly extending legs spaced apart to provide a slot therebetween, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots for receiving and supporting the ends of reinforcing rods extending between sections at opposite sides of the form; a second level form mounted above said first level form and comprised of sections substantially duplicating the sections of said first level form, said second level sections being connected together in substantially end-to-end relation to define a second vertically enclosed volume a substantially duplicate of said first enclosed volume and located immediately above the same, the means connecting the upper level sections together including a depending vertical tongue disposed within the slot between said outwardly extending angle legs; substantially aligned slots in said tongue and spaced angle legs; and a wedge-shaped key insertable through said slots to draw said upper level sections down to said lower sections and tie the two levels together.

10. A multiple level form for casting a concrete slab in horizontal position comprising: a first level form including a plurality of form sections; means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said vertical supports each comprising a pair of vertically extending angles having oppositely extending, inwardly facing legs on which said attachment means are mounted and adjacent, outwardly extending legs spaced apart to provide a slot therebetween, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots for receiving and supporting the ends of reinforcing rods extending between sections at opposite sides of the form; a second level form mounted above said first level form and comprised of sections substantially duplicating the sections of said first level form, said second level sections being connected together in substantially end-to-end relation to define a second vertically enclosed volume a

substantially duplicate of said first enclosed volume and located imediately above the same, the means connecting the upper level sections together including a depending vertical tongue disposed within the slot between said outwardly extending angle legs; substantially aligned slots in said tongue and spaced angle legs; and a wedge-shaped key insertable through said slots to draw said upper level sections down to said lower sections and tie the two levels together, said slots being shaped substantially as right angles and said wedge-shaped key having substantially a right angle cross section complementary to the shape of said slots.

11. A multiple level form for casting a concrete slab in horizontal position comprising: a first level form including a plurality of form sections; means connecting said sections together in substantially end-to-end relation to define a vertically enclosed volume corresponding to the slab to be cast therein, said connecting means comprising horizontal base plates, supports extending vertically from said base plates, and attachment means extending transversely of said vertical supports and having means adjacent their opposite ends for attachment to the adjacent ends of said sections, said vertical supports each comprising a pair of vertically extending angles having oppositely extending, inwardly facing legs on which said attachment means are mounted and adjacent, outwardly extending legs spaced apart to provide a slot therebetween, said form sections including corner end sections having substantially continuous vertical walls and intermediate sections having interrupted vertical walls providing horizontal slots for receiving and supporting the ends of reinforcing rods extending between sections at opposite sides of the form; a second level form mounted above said first level form and comprised of sections substantially duplicating the sections of said first level form, said second level sections being connected together in substantially end-to-end relation to define a second vertically enclosed volume a substantially duplicate of said first enclosed volume and located immediately above the same, the means connecting the upper level sections together including a depending vertical tongue disposed within the slot between said outwardly extending angle legs; substantially aligned slots in said tongue and spaced angle legs; a wedge-shaped key insertable through said slots to draw said upper level sections down to said lower sections and tie the two levels together, said upper level connecting means each comprising a pair of vertically extending angles having oppositely directed, inwardly facing legs and outwardly directed legs spaced apart to form a slot therebetween; and attachment means for the ends of said upper level sections secured to said upper level inwardly facing angle legs and having means at the opposite ends thereof for attachment to the section ends, said tongue being rigidly mounted in mounted in the lower portion of the slot between said upper level spaced angle legs.

12. Structural supporting means for the narrow vertical walls of a form for casting a concrete slab in horizontal position comprising: means for supporting a plurality of form sections to define a vertically enclosed volume corresponding to the slab to be cast therein, said supporting means comprising a plurality of supports spaced about the perimeter of the form, each support including a horizontal base, a pair of vertically extending angles on said base, said angles having oppositely directed legs parallel to the outer surfaces of the form sections and outwardly extending legs spaced apart to provide a vertically extending slot therebetween, and means permanently spanning said oppositely directed legs and secured thereto to maintain the spacing between said outwardly extending legs.

13. Structural supporting means for the narrow vertical walls of a form for casting a concrete slab in horizontal position comprising: means for supporting a plurality of form sections to define a vertically enclosed volume corresponding to the slab to be cast therein, said supporting means comprising a plurality of supports spaced about the perimeter of the form, each support including a horizontal base, a pair of vertically extending angles on said base, said angles having oppositely directed legs parallel to the outer surfaces of the form sections and outwardly extending legs spaced apart to means permanently spanning said oppositely directed legs and secured thereto to maintain the spacing between said outwardly extending legs; and means pulling said form sections against said spanning means in supported relation.

14. Structual supporting means for the narrow vertical walls of a form for casting concrete slab in horizontal position comprising: means for supporting a plurality of form sections to define a vertically enclosed volume corresponding to the slab to be cast therein, said supporting means comprising a plurality of supports spaced about the perimeter of the form, each supporting including a horizontal base, a pair of vertically extending angles on said based, said angles having oppositely directed legs parallel to the outer surfaces of the form sections and outwardly extending legs spaced apart to provide a vertically extending slot therebetween; means spanning said oppositely directed legs and secured thereto to maintain the spacing between said outwardly extending legs; means for supporting a plurality of second level from sections above said first mentioned form to define a second level vertically enclosed volume corresponding to a second level slab to be cast therein, said supporting means comprising a plurality of supports spaced about the perimeter of the second level form in positions vertically above the lower level supports, each of said upper level supports including a pair of vertically extending angles having oppositely directed legs disposed directly above the oppositely extending legs of the lower supports and outwardly extending legs disposed directly above the outwardly extending legs defining a vertically extending slot therebetween which is a continuation of the vertically extending slot between the lower outwardly extending legs; means connected to and spanning the oppositely directed legs of the upper supports; and tie bars disposed in the vertically extending slot between said outwardly extending legs and connected ot the outwardly extended legs of both the upper and lower supports to tie the upper and lower form together.

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MICHAEL V. BRINDISI, *Primary Examiner.*

ROBERT F. WHITE, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,182,948 May 11, 1965

Earnest Ralph Lawrence

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 2, for "lab" read -- slab --; column 8, line 13, after "to" insert -- provide a vertically extending slot therebetween, and --; line 25, for "supporting" read -- support --.

Signed and sealed this 19th day of October 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents