Aug. 22, 1939. J. LUNDIN 2,170,564

FORM APPARATUS FOR CONCRETE CONSTRUCTION

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Fig. 1

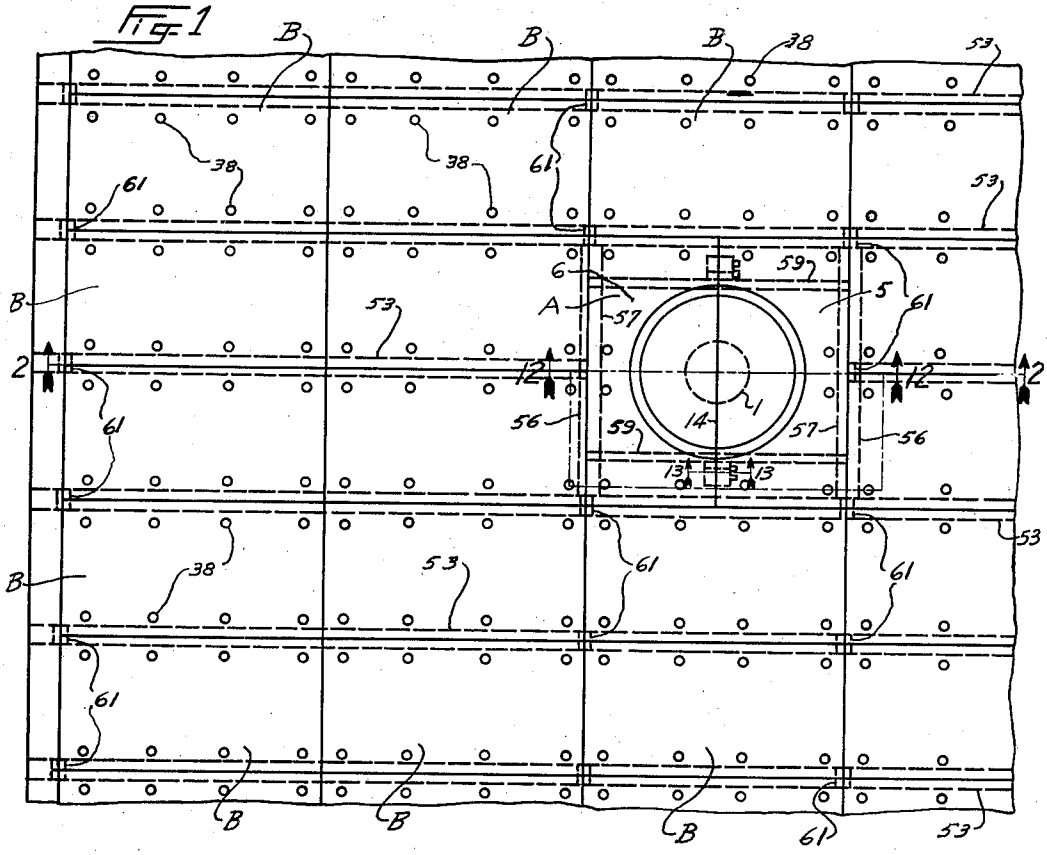


Fig. 2

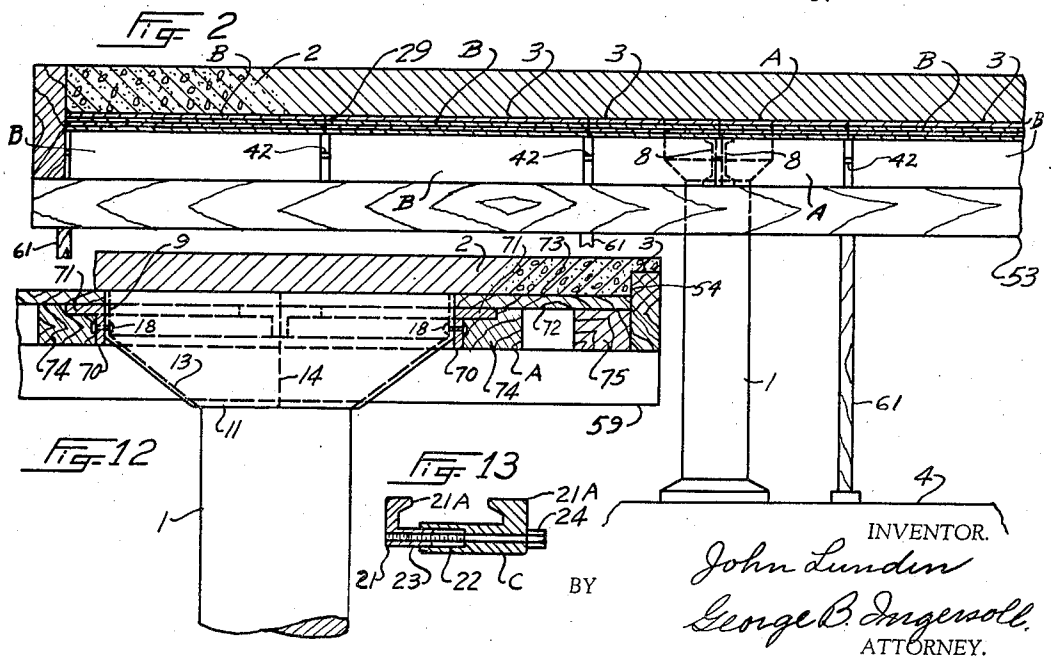


Fig. 12

Fig. 13

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Fig- 3

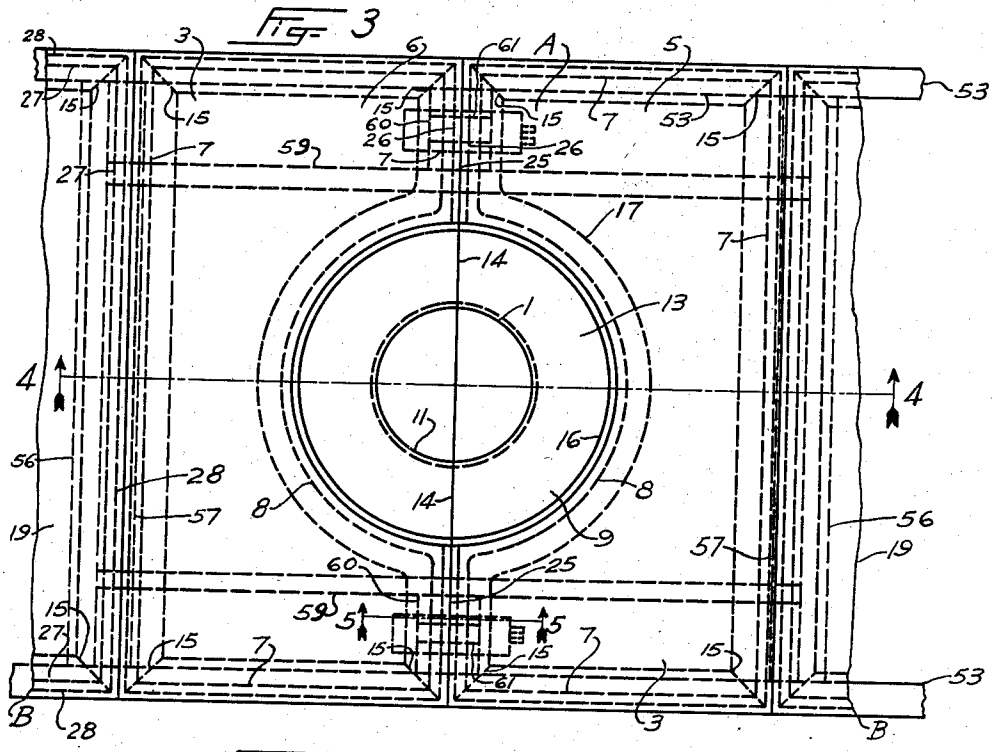


Fig- 4

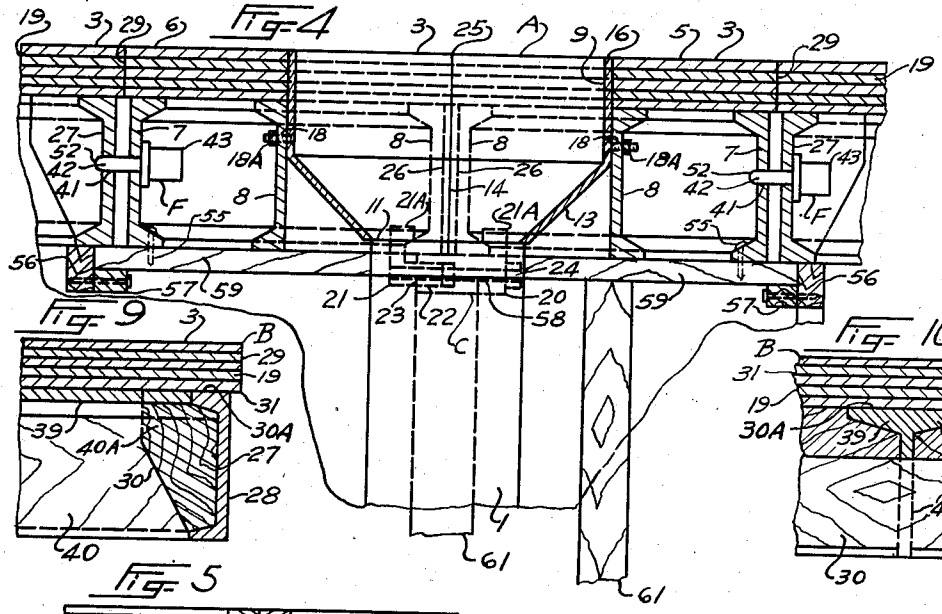
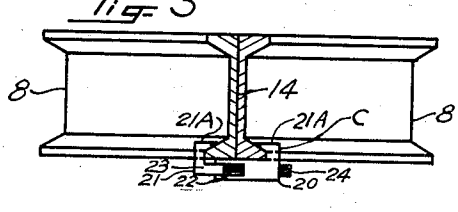


Fig- 9

Fig- 10

Fig- 5



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FIG 6

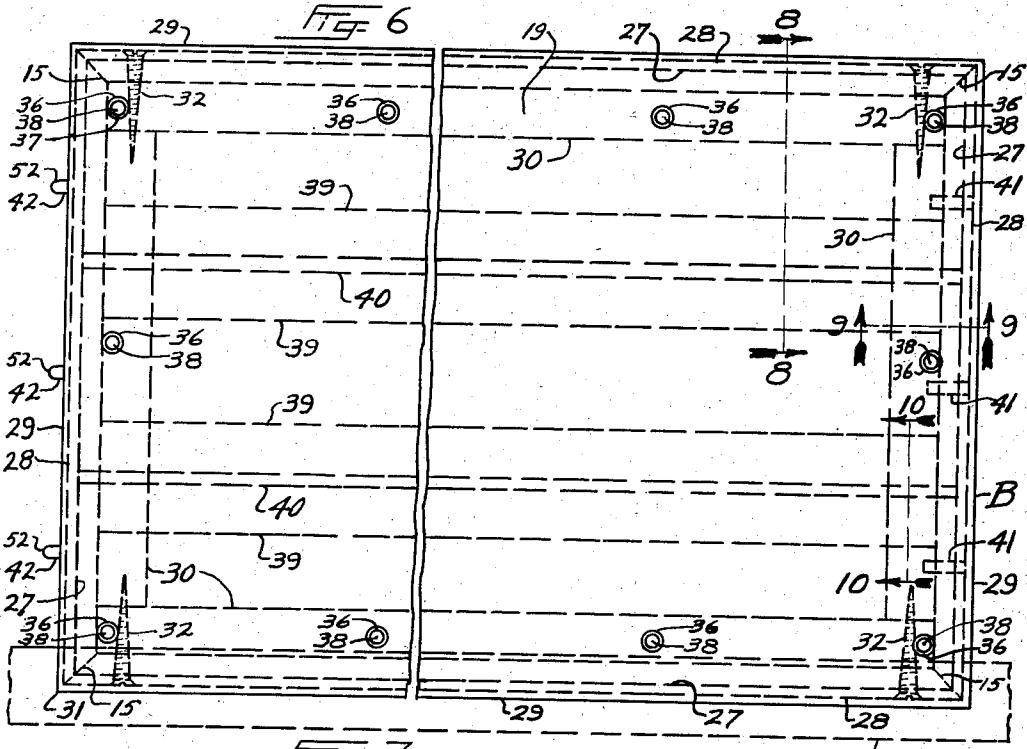


FIG 7

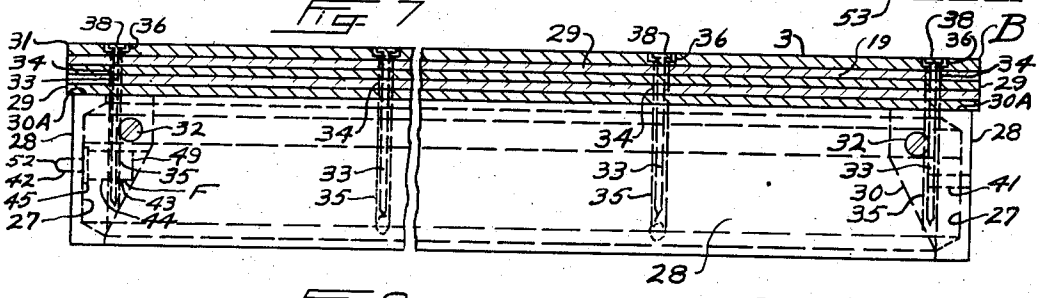


FIG 8

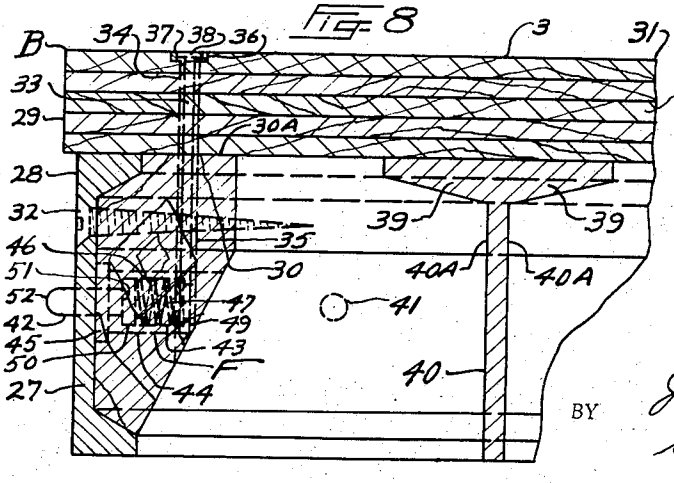
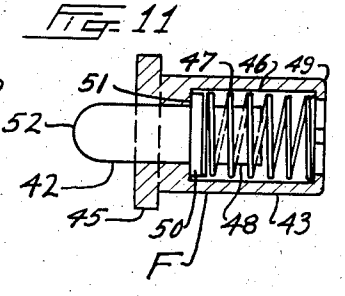


FIG 11



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UNITED STATES PATENT OFFICE

2,170,564

FORM APPARATUS FOR CONCRETE CONSTRUCTION

John Lundin, Detroit, Mich.

Application April 16, 1937, Serial No. 137,310

2 Claims. (Cl. 25—131.5)

My invention relates to form apparatus for use in concrete or similar construction, and the objects of my invention are, first, to provide a form apparatus for constructing flat concrete portions of a building structure; second, to provide a form apparatus for constructing flat concrete portions adjacent and connected with the end portion of a column of a building structure; third, to provide a form apparatus for constructing portions of a column of a building structure with means for separating oppositely disposed portions thereof to permit removal of the form apparatus from around the completed column portion; fourth, to provide a form apparatus adapted to form a flat concrete slab with split ring means for connecting with a column of a building structure; fifth, to povide a form apparatus with a facing member adapted for use over long periods of time and without the usual tendency to develop irregular formations therein, thus providing for more efficient concrete construction which is free of irregular appearance; sixth, to provide a form apparatus with an exceptionally tough facing member having minimum weight; seventh, to provide a form apparatus having a facing member of plywood or similar material with a nailing strip or member to facilitate securement of the facing member thereto; eighth, to provide a form apparatus having a facing member with means for facilitating the ready removal and replacement of the facing member to increase the life of the form apparatus; ninth, to provide form apparatus comprising a plurality of cooperating panel assemblies of different sizes to permit the formation of concrete slabs of various areas; tenth, to provide form apparatus having a plurality of panel assemblies with means for insuring tight engagement of adjacent surfaces of the panel assemblies to eliminate any resultant fins or lines on concrete formations constructed thereby; eleventh, to provide form apparatus for concrete and having a plurality of panel assemblies with means for insuring alignment of the panel assemblies to present their forming surfaces in a common plane to prevent uneveness in the surface of the concrete; twelfth, to provide form apparatus, utilizing panel assemblies provided with facing members, with bushing members for receiving members for securing the facing members in the panel assemblies to eliminate wear and destruction conventionally arising from repeated replacement of the facing members; thirteenth, to provide a form panel assembly having split portions with clamping means for facilitating ready assembly and disassembly of the split portions; fourteenth, to provide a form apparatus having a panel assembly with spring actuated pilot plungers to facilitate alignment of the panel assemblies; and fifteenth, to provide a form apparatus for concrete construction utilizing panel assemblies with an efficient supporting means comprising joists and jack members advantageously positioned for supporting the panel assemblies.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1 is a partial plan view of my form apparatus assembled for use in forming a floor or ceiling or similar support structure of a building or similar unit; Fig. 2, a sectional view of the form apparatus disclosed in Fig. 1, said sectional view being taken on the line 2—2, Fig. 1; Fig. 3, a partial plan view of my form apparatus assembled for use in forming a pillar and floor or ceiling structure; Fig. 4, a sectional view of the form apparatus disclosed in Fig. 3, said sectional view being taken on the line 4—4, Fig. 3; Fig. 5, a partial sectional view of the angle iron frame support disclosed in Fig. 3, said partial sectional view being taken on the line 5—5, Fig. 3; and disclosing a clamp means therewith; Fig. 6, a plan view of one of the panel assemblies utilized in my apparatus for use for flat slab form work; Fig. 7, a side elevation of the panel assembly disclosed in Fig. 6; Fig. 8, a partial sectional view of the panel assembly disclosed in Figs. 6 and 7, said partial sectional view being taken on the line 8—8, Fig. 6; Fig. 9, a partial sectional view of the panel assembly disclosed in Fig. 6 and taken on the line 9—9, Fig. 6; Fig. 10, a partial sectional view of the panel assembly disclosed in Fig. 6 and taken on the line 10—10, Fig. 6; Fig. 11, a vertical sectional view through a pilot plunger assembly utilized in the panel assembly disclosed in Fig. 6; Fig. 12, a partial sectional view of the form apparatus of modified design and floor or ceiling structure disclosed in Fig. 1 and taken on the line 12—12, Fig. 1; and Fig. 13, a sectional view of a clamp means taken on the line 13—13, Fig. 1.

My form apparatus is disclosed in Figs. 1, 2, 3 and 4 as being used for forming floors, ceilings, or wall structures together with the connecting portions of the pillars or columns which they support or are supported by. Although my apparatus is shown in Figs. 1–4 in connection with only one pillar, post, or column it will be understood that it may be utilized as well with any plural number of such pillars, posts or columns.

The panel assembly A is utilized for construct-

ing the column 1 and the portions of the floor, ceiling, or wall structure immediately adjacent and connecting with the column 1, the panel assemblies B being utilized for constructing the portions of the floor, ceiling or wall structure connected with the portions of the floor, ceiling or wall structure formed by the panel assembly A.

It is to be understood that the panel assemblies A and B are supported in desired positions in which the floor, ceiling or wall structure is formed by a layer of concrete or similar material 2 supported on the upper surfaces 3 of the panel assemblies until the concrete or similar material hardness to form the desired structure, said floor, ceiling or wall structure being supported in its solidified form by a desired number of columns 1 which are in turn supported by and connected with the floor 4 or similar portion of the building structure.

Thus my form apparatus is especially adapted to construct flat slab structures of concrete and to construct column connecting structures of concrete, said flat slab and said column connecting structures being connected in the concerete structure to form integral portions of a building structure.

The panel assembly A comprises the two panel portions or halves 5 and 6 which are constructed to fit around and contain the concrete material for forming the upper portion of the column 1.

The panel halves 5 and 6 are each provided with the channel iron, frame support or similar member 7 which extends therearound and is provided with the semi-circular portion 8, the two semi-circular portions 8 of the channel member 7 cooperating to support the ring 16 which forms a cylindrical chamber 9, the semi-circular portions of the ring 16 being provided with a cylindrical opening 11 at its lower end for retaining the concrete in a suitable shape and form for connecting with the upper end portion of the substantially straight cylindrical portion of the column 1, the cylindrical opening 11 being connected with the wall portions of the cylindrical chamber 9 by the frusto-conical portion 13, the straight cylindrical portion of the column 1 extending to the floor 4 to permit the concrete column structure to be supported on the floor 4 and to support, in turn, the layer of concrete 2 forming a second floor or ceiling structure.

The channel member 7 is constructed with flange portions extending substantially at right angles from its main web portion, said flange portions being located on the inside of said main web portion.

The two panel portions 5 and 6 and semi-circular portions 8 are provided with abutting surfaces 14 to permit the panel portions 5 and 6 together with the circular portions 8 to form a closed support around the upper end portion of the column 1 to provide a flat slab form for the layer of concrete 2.

The channel members 7 are extended around the peripheries of the panel halves 5 and 6 and are suitably cut away at their corner portions to permit them to be positioned in abutment and welded as at 15, the channel members 7 forming a V-shaped rail or hollow frame member extending around the panel assembly.

The side wall portions of the chamber 9 extend substantially flush with the upper surface of the panels 5 and 6 in forming the ring 16, the semi-circular portions of the ring 16 being supported by a plurality of bolts, screws, rivets or similar fastening members 18 extending through the side wall portions of the ring 16 and the semi-circular portions 8 of the channel members 7, the bolts, screws, rivets, or similar fastening members 18 preferably having their head portions flush with the inside surfaces of the ring 16 to provide a smooth and even surface on the outside of the column 1 after the concrete has been poured, formed and hardened, nuts 18A being utilized for locking the bolts, screws, rivets or similar fastening members, the bolts 18 however being utilized when desired as disclosed in Fig. 12, the number of bolts 18 being utilized as necessary, two only being disclosed in each figure.

The upper edge surfaces of the walls of the chamber 9 forming the ring 16 are positioned substantially flush with the upper surfaces of the facing members 19 which are constructed of plywood material in which a plurality of relatively thin layers of tough wood or similar fiber material are secured one upon another in cross grain or similar fashion to provide facing members 19 of relatively light weight and having tenacious and tough characteristics and at the same time providing sufficient resilient and cushioning characteristics to readily prevent denting and deforming and thus providing efficient surfaces for contacting and supporting the concrete or similar material and insuring smooth surfaces of the concrete after hardening.

This not only accomplishes facing construction with a maximum of efficiency but also very economical manufacture as my panel assemblies may be used again and again over long periods of time without refacing and without producing bumpy or irregular and rough surfaces on the concrete which is not possible of accomplishment with panel assemblies faced with metal or similar material and which are susceptible of easy denting and deformation, said dents and deforming being of permanent formation in metal or similar material.

The half panel assemblies 5 and 6 are secured together with a plurality of clamp assemblies C which comprise clamp members 20 and 21 which are U shaped and provided with lugs 21A adapted to fit over and around the lower flanges of the abutting channel members 7, one of the clamp members being provided with a groove 22 for receiving an extension or tongue 23 of the other clamp member therein, the clamp members 20 and 21 being engaged and adjustably tightened and secured in their clamping positions by the screws 24 extending through one of the clamp members to engage the other clamp member as by threading or similar means.

It is also to be noted that the abutting edge surfaces 25 of the facing members 19 of the panel assemblies C extend over the edges of the adjacent surfaces 26 of the inner portions of the channel members 7 to insure that the half panel assemblies 5 and 6 will always tightly engage at the edge surfaces 25 of the facing members 19 instead of at the surfaces 14 as disclosed in Figs. 3 and 4, thus preventing fins and sharp edge formations in the concrete structure which would be the case if any appreciable space or opening existed between the edge surfaces 25 of the facing members 19. However the side surfaces of the channel members 7 may be abutted as disclosed in Fig. 5 if desired.

It is thus to be noted that the half panel assemblies 6 and 5 may be readily secured together with the ring 16 to form an integral portion panel and ring assembly at the upper end of a partially

completed column 1 to enable the remainder of the column 1 to be completed in its concrete formation and to connect its concrete structure with adjacent portions of the layer 2 of concrete and at the same time to permit ready disassembly of the panel and ring assembly for removal and reassembly on another construction job or different portion of the same construction job, the support and connection of the panel and ring assembly with its adjacent panel assemblies being more fully disclosed hereinafter.

In Fig. 12, the ring 16 is secured, by bolts or similar fastening members 18, to angle irons 70 which are substantially less in heighth than the angle irons 8 of Figs. 3 and 4, the angle irons 70 each being provided with a single horizontal angle or flange 71 which support the panel members 72 which are thus located with their upper surfaces 73 substantially below the upper surfaces 3 of adjacent panel assemblies to provide a drop head construction for the upper portion of the column 1 where it joins the ceiling structure. The panel members 72 are supported by joists or similar members 74 and 75.

The panel assemblies B are constructed in suitable numbers and of suitable and different sizes, as for instance in rectangular sizes of 4 feet by 8 feet, 3 feet by 4 feet, 4 feet by 4 feet, 4 feet by 5 feet, etc., or multiples thereof, to form any desired expanse and shape of layer of concrete 2 as required by any wall or floor structure in a building, the rectangular sizes of the panel assemblies B supplementing and cooperating with the panel assemblies A, which preferably are of rectangular sizes of 4 feet by 8 feet or similar dimensions.

The panel assemblies B, one of which is disclosed in detail in Figs. 6, 7 and 8 are each provided with a channel 27 which is formed to extend around the periphery of the panel assembly and to have its edge surfaces 28 set back a relatively slight distance, as for instance approximately ⅛ of an inch, from the edge surfaces 29 of the facing members 19, thus insuring that the edge surfaces 29 will always tightly engage one another when the panel assemblies A are assembled as disclosed in Figs. 1 and 2, the abutment of the edge surfaces 29 being similar in operation to the abutting surfaces 25, Figs. 3 and 4.

The channel 27 is suitably cut away at its corner portions to permit them to be positioned in abutment as at the points 15, similar to the channel members 7 of the panel assemblies A.

The panel assembly B is provided with the nailing or securing strip or member 30, which is constructed of wood or similar material, and is formed to fit between the upper and lower flange portions of the channel iron 27 on its inside, the nailing strip 30 extending around the panel assembly B and having its upper surface 30A engaging and supporting the facing panel member 31, the nailing strip 30 being secured to the channel 27 by a plurality of screws 32 or similar securing members extending through the channel 27 from its outside to threadably or similarly engage the nailing strip 30, the screws 32 further extending through the nailing strip 30 to engage and secure the end portions of adjacent side portions of the nailing strip 30 together as disclosed in Figs. 6 and 8.

The facing member panel 31 is fastened to the nailing strip 30 by a plurality of pins or nails or similar fastening members 33 which snugly engage the bushings or sleeves 34 extending through the facing member panel 31 and the bushings or sleeves 35 extending through the nailing strip 30, the bushings 34 being provided with head portions 36 having their upper surfaces set substantially flush with the upper surfaces of the facing member panel 31, the head portions 36 being provided with counterbores or recesses 37 for receiving the head portions 38 of the pins or nails 33 substantially flush with the upper surfaces of the facing member panel 31 and the head portions 36 of the bushings 34, the bushings 34 and 35 permitting the removal of the pins or nails 33 and the reassembling of same without developing excessive wear and enabling the facing member panel 31 to be replaced when they do become worn out without necessitating making new openings in or replacing the nailing strips 30.

The facing member panel 31 is further supported by engaging the upper surfaces of the flange portions 39 at the upper sides of the T beam, braces, or T members 40 which extend across the panel assembly B and are suitably connected to oppositely disposed inner sides of the channel 27, the nailing strip 30 being interrupted sufficiently adjacent the ends of said T beam members 40, as at 40A in Figs. 8 and 9, to permit the end thereof to engage the channel 27.

The panel assemblies A and B are provided with a plurality of pilot plunger assemblies F at one of their sides and said panel assemblies A and B are provided with openings or recesses 41 in their opposite sides for receiving the pilot plungers 42 of adjacent panel assemblies therein for facilitating alignment of the panel assemblies to present their upper surfaces 3 in alignment in a common plane to provide the proper surfacing of the concrete material or slab of the building construction.

The plunger assemblies F and openings 41 are shown only on a pair of opposite sides of a panel assembly although they may be installed on all edge surfaces or adjacent sides of the panel assemblies if desired.

The pilot plungers 42 are slidably supported in the housings or bushings 43 which are adapted to assemble in suitable openings or recesses 44 in the nailing strips 30 and are each provided with a flange or shoulder portion 45 positioned adjacent the web portion of the channel members 7 or 27 at their inner sides. The housings 43 are each provided with a recess or chamber 46 in which the spring or resilient member 47 is assembled around the extension portion 48 of the pilot plunger 42, the spring 47 having one of its ends abutting the flange or shoulder portion 49, the other end of the spring 47 abutting the flange or shoulder portion 50 which is normally held in abutment with the surface 51 by the spring 47, the spring 47 allowing the pilot plunger 42 to be slidably moved against the tension of the spring 47 until its rounded end 52 is substantially flush with the edge surfaces 28 or where the pilot plunger 42 engages an edge surface 28 of an adjacent panel assembly which may not have an opening 41 located in alignment with the pilot plunger.

In the panel assemblies A when no nailing strip is used, the pilot plunger assemblies F may be suitably secured to the web portions of the channel members 7 by securing the flange or shoulder portions 45 to the web of the channel members by welding or similar means.

In supporting the panel assemblies A and B in their operative positions for forming the layer or slab 2 of concrete thereon, the joists or similar members 53 will be positioned underneath

and in engagement with the lower flanges 54 of the channel members 7 and 27 as disclosed in Figs. 2, 3 and 6, the joists 53 being of suitable cross section or size, such as 4 inches by 6 inches, and said joists 53 will be positioned with their longitudinal vertical centers substantially in alignment with adjacent edge surfaces of the panel assemblies to permit nails or similar securing members 30 to be driven through the joists 53 to engage the under side or portions of each of the nailing strips 30 in adjacent panel assemblies, as indicated by the dotted lines, in Fig. 1.

Also, where desired, the upper surfaces 3 of the panel assemblies A may be located slightly lower than the upper surfaces 3 of the panel assemblies B to provide an offset or crown in the upper portion of the column 3 where it joins the lower side of the layer 2 of concrete as disclosed at 54, Fig. 12.

Also the lower flanges of the channel members 7 may be provided with suitable openings therethrough to permit nails or similar members 55 to be secured through said lower flanges 54 and into the joists 59 or similar support members as desired, one of which is disclosed in Fig. 4.

Cross members or joists 59 may be now assembled to support the panel portions 5 and 6 as disclosed in Figs. 1, 2 and 4 and they may be supported on strip or shoulder members 57 suitably secured to the joists 56, as by nailing or similar means, the joists 56 extending adjacent edge portions of the panel assembly A at opposite sides thereof and between end portions of joists 53, the strip or shoulder members 57 supporting the cross members of joists 59 at sides of the ring 16 to engage the channel members 7 adjacent points where the straight portions thereof join the semi-cylindrical portions 8, thus positioning the cross members or joists 59 to extend transversely to the abutting surfaces 14 and 25.

A plurality of T jack or support members 61 are then interposed between the joists 53 and 59 as indicated in Figs. 2 and 4, and the floor 4 to support and retain the panel assemblies and their joists support structure while the concrete is poured to form the slab and column structure.

In operation, the panel assemblies A together with their rings 16 are located above the columns 1 which will be in unfinished condition and then the panel assemblies B are placed adjacent one another with the pilot plungers 42 of one panel assembly engaging an opening 41 of another panel assembly.

Then the joists 53 are secured to the various panel assemblies adjacent their engaged edge surfaces, the joists 56 and 59 together with a portion of the joists 53 being positioned and secured to under portions of the panel assembly A, the joists 59 being supported by the joists 56 and their strip or shoulder members 57, after which T jack or similar support members 61 are adjustably assembled under the various joists on the floor 4 below, thus supporting the panel assemblies with the upper surfaces 3 of the facing members 19 and 31 located in a common plane to provide a support for the layer of concrete 2 which also extends into and fills the ring 16 to form the upper portion of the columns 1.

After the layer 2 of concrete, together with the two upper posts of the column 1, has been formed, the T jacks and various joists are removed after which the panel assemblies B may be removed. Then the bolts 24 of the clamp assemblies C are removed and with the removal of the bolts 18, the panel portions 5 and 6 may be separated and removed from around the column 1. The various panel assemblies may now be reassembled in new portions of the same job or removed for use to a new building structure.

I claim:

1. In form apparatus for concrete slab construction, a marginal frame formed of channel irons, brace members reinforcing said frame and coacting with said channels in forming a rigid structure capable of withstanding deformation under the weight of a concrete slab, a fibrous nailing strip secured in each channel and having a portion extended to the plane of the top surface of said channel, a seamless facing element supported by the top surfaces of said channels and brace members, and removable securing elements extending through said facing element and into said nailing strip.

2. In form apparatus for concrete slab construction, a marginal frame formed of channel irons, brace members reinforcing said frame and coacting with said channels in forming a rigid structure capable of withstanding deformation under the weight of a concrete slab, a fibrous nailing strip secured in each channel and having a portion extended to the plane of the top surface of said channel, a seamless facing element supported by the top surfaces of said channels and brace members, and removable securing elements extending through said facing element and into said nailing strip, said facing element and frame structure having similar geometric shape, with the facing element larger than the frame and disposed to project an equal distance from all sides of the frame.

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