May 3, 1927. 1,626,897

A. G. W. WEDBERG

CONCRETE CONSTRUCTION

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Fig. 2.

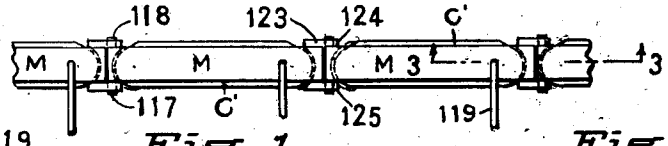


Fig. 1.

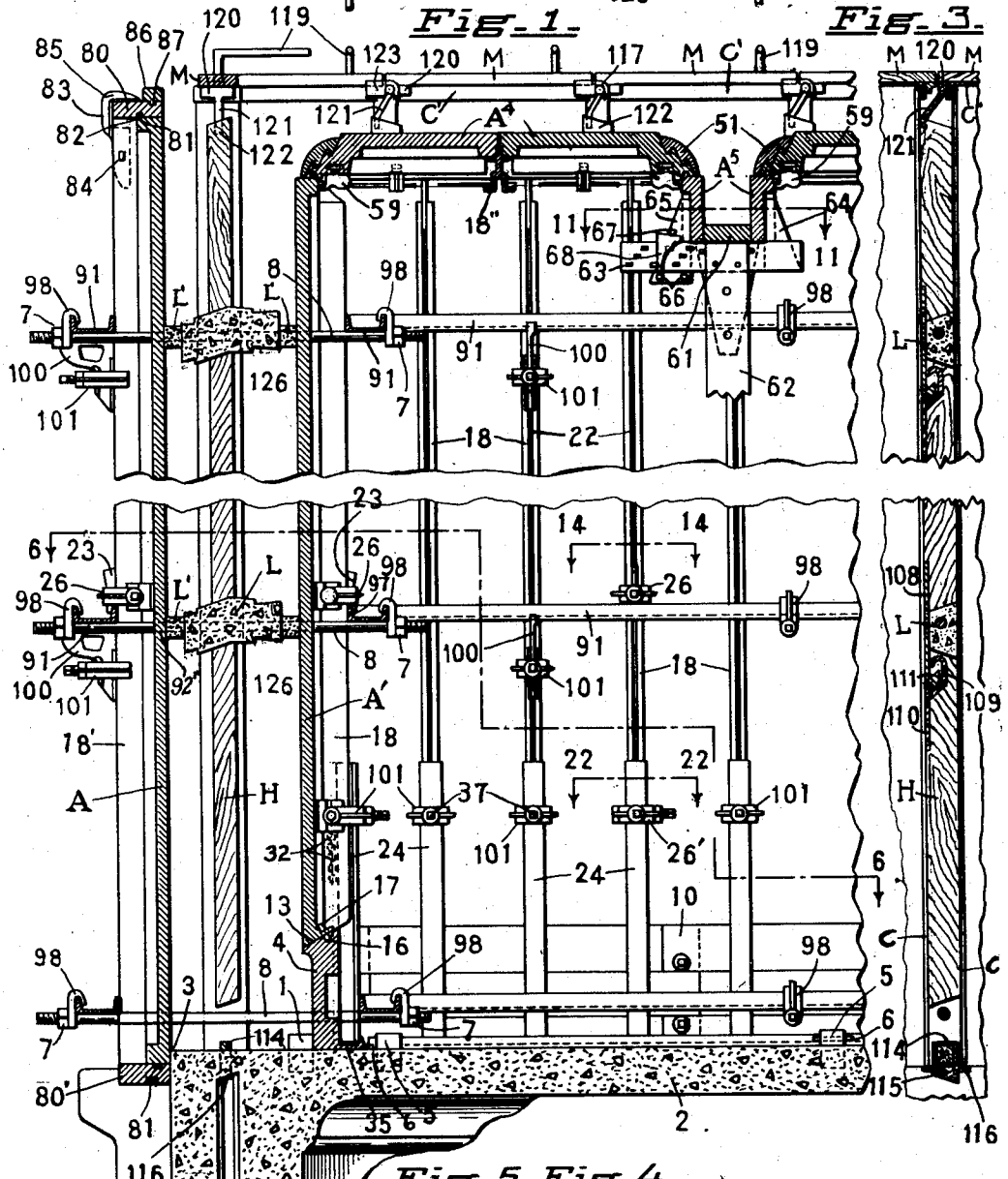


Fig. 3.

Fig. 5. Fig. 4.

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Fig. 6.

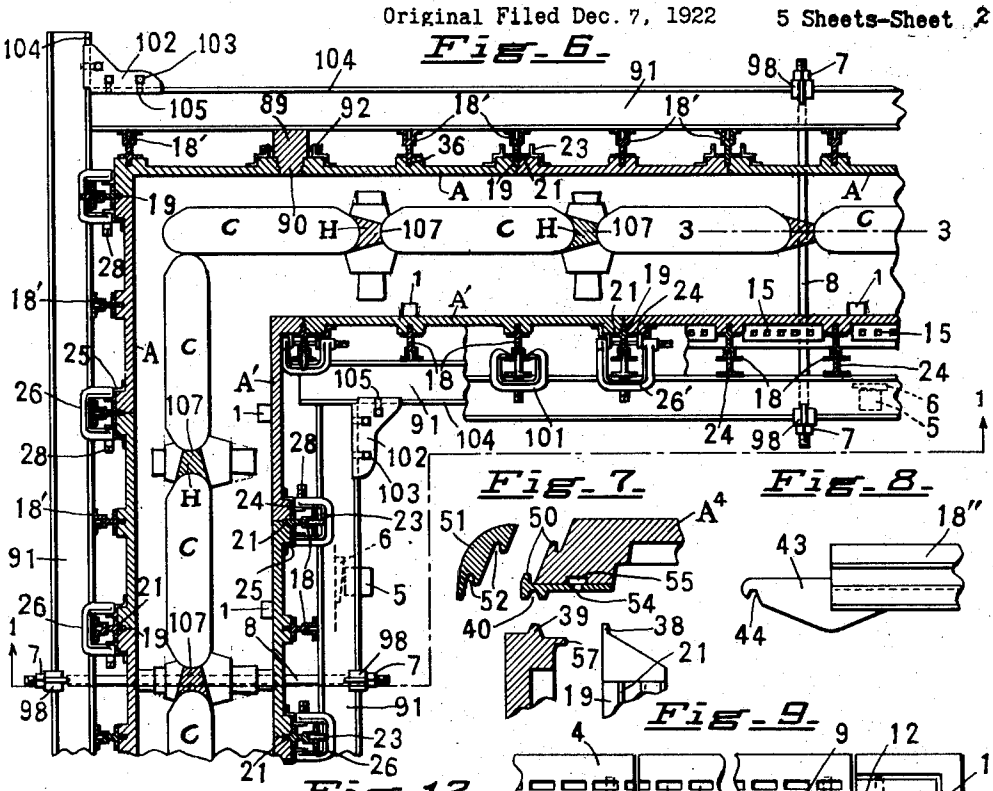


Fig. 7.

Fig. 8.

Fig. 9.

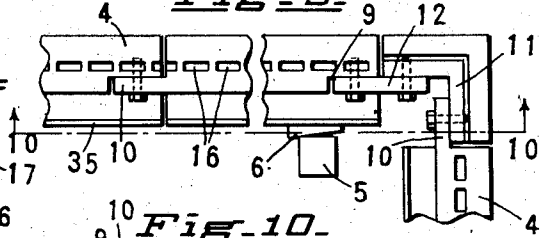


Fig. 12.

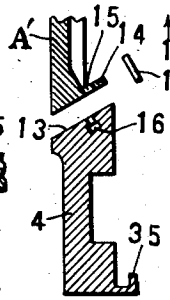


Fig. 13.

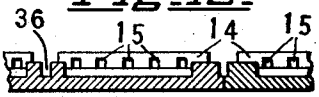


Fig. 10.

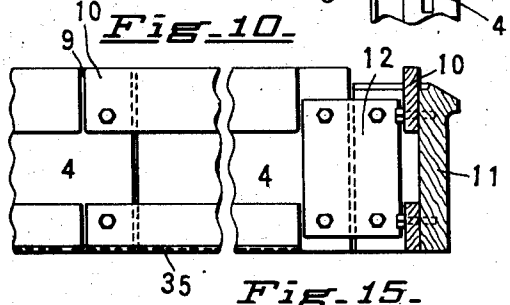


Fig. 11.

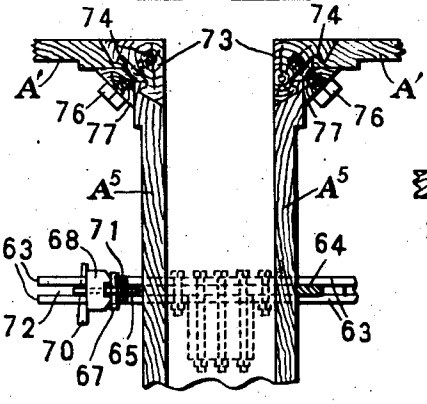


Fig. 14.

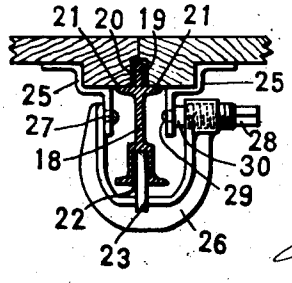
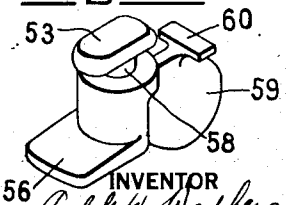


Fig. 15.



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Fig. 17.

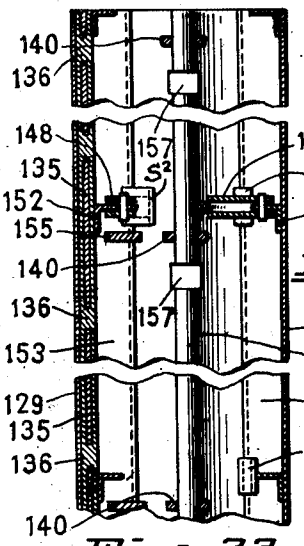


Fig. 24.

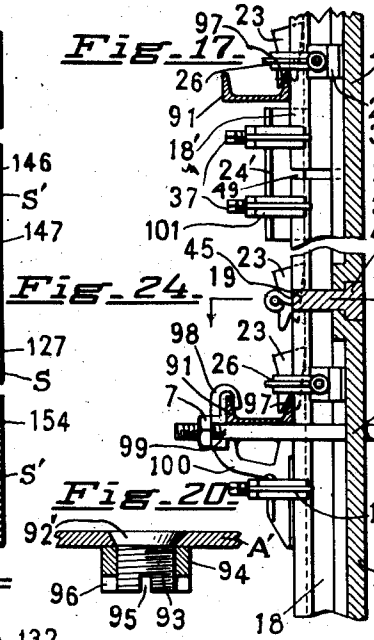


Fig. 16.

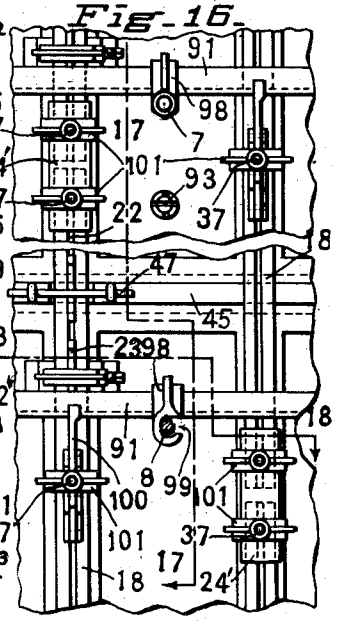


Fig. 20.

Fig. 23.

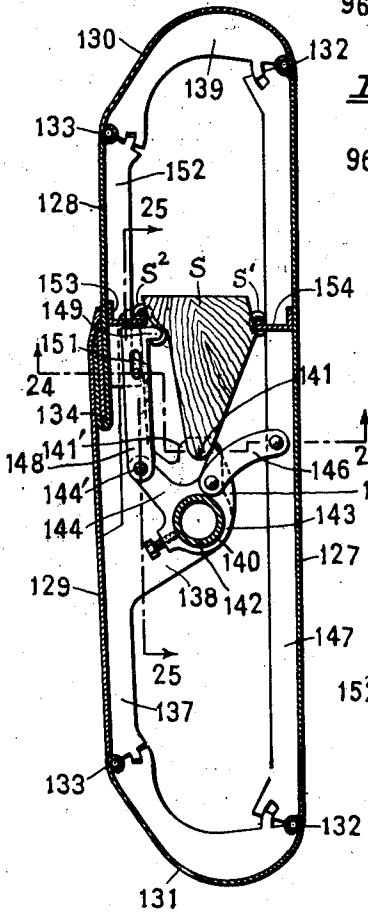


Fig. 21.

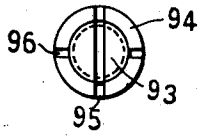


Fig. 18.

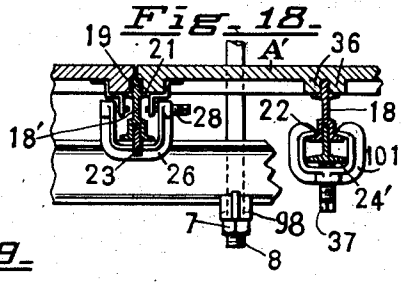


Fig. 19.

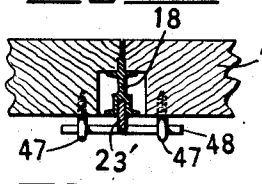


Fig. 22.

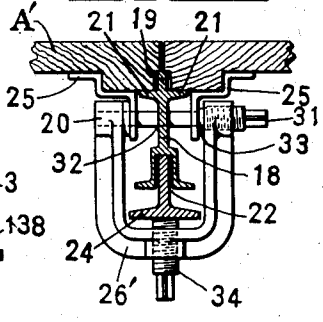
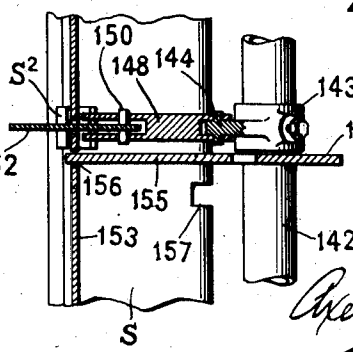


Fig. 25.



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Fig. 26.

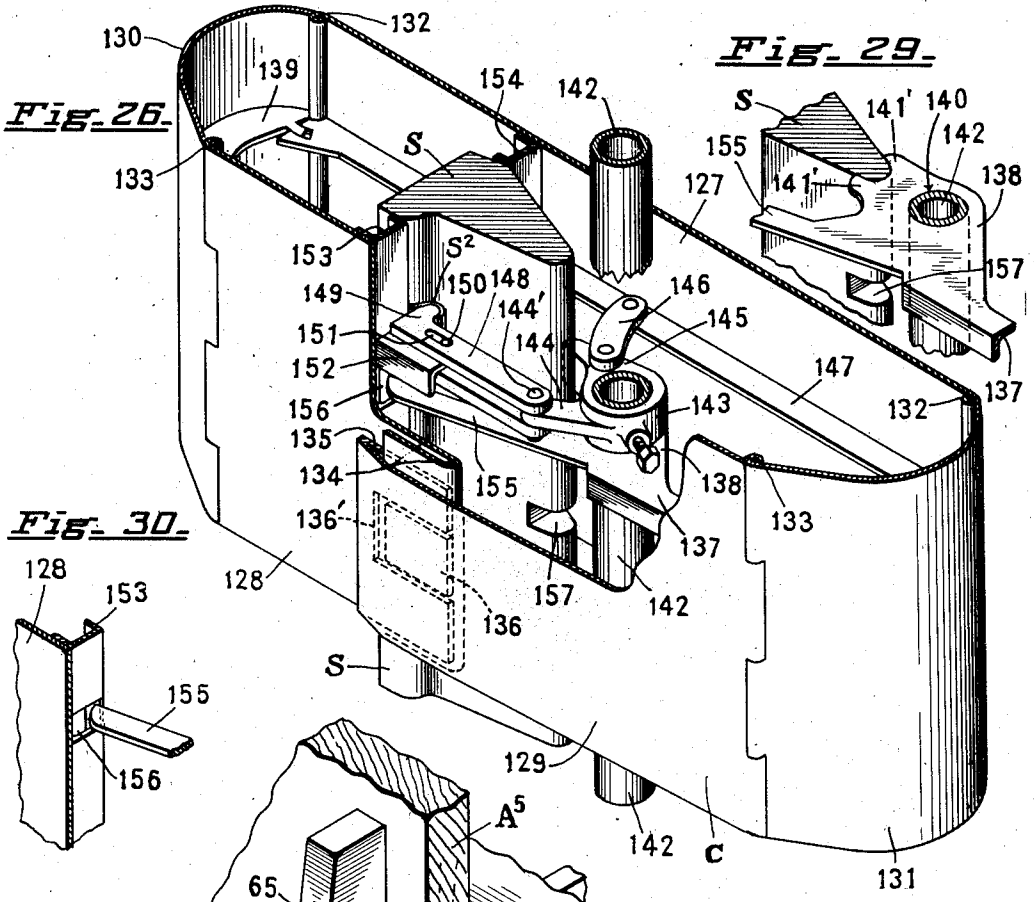


Fig. 29.

Fig. 30.

Fig. 28.

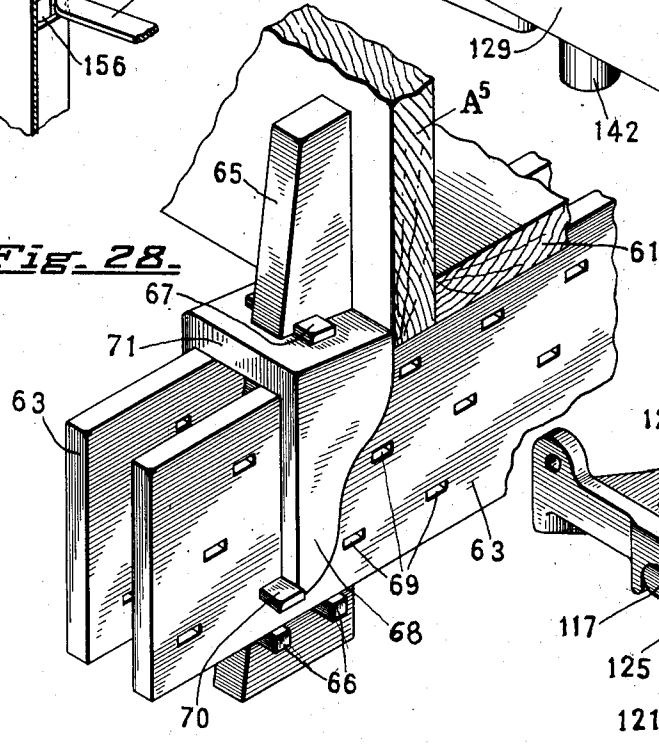
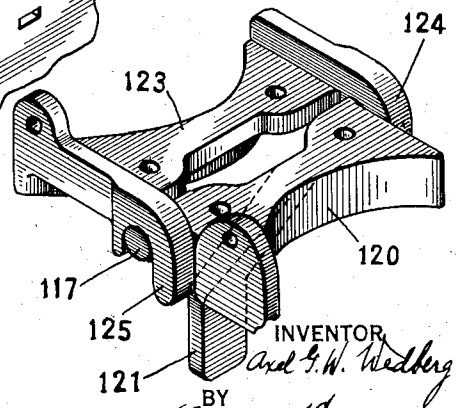


Fig. 27.



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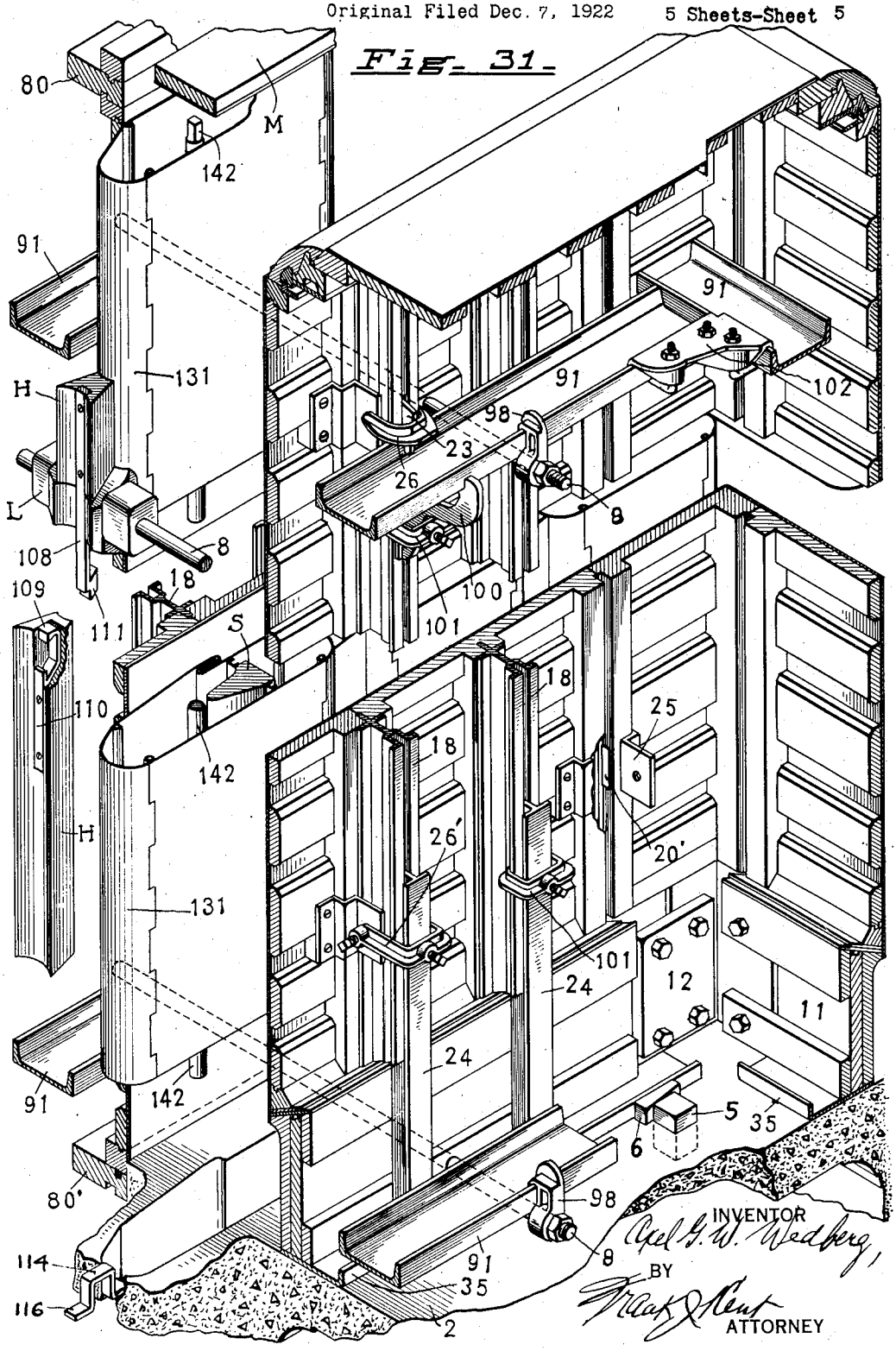
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Fig. 31.



Patented May 3, 1927. 1,626,897

UNITED STATES PATENT OFFICE.

AXEL G. W. WEDBERG, OF FLORAL PARK, NEW YORK.

CONCRETE CONSTRUCTION.

Application filed December 7, 1922, Serial No. 605,394. Renewed February 7, 1927.

This invention relates to improvements in the art of erecting monolithic structures of concrete or similar plastic materials. One or more stories, including all exterior walls, inside walls and partitions, floor slabs, base molds and stairs, are cast in a single pour, forming one coherent mass. The exterior wall construction embodies hollow walls, and weather resisting key elements incorporated as a unitary part of the wall and joining the inner and outer portions thereof. Said key elements are preferably in the form of blocks, molded separately and united with the wall portions, said keys being composed of weather resisting materials and shaped to shed moisture which may seep within the concrete materials, or the moisture that may be created by condensation, whereby the moisture is directed toward the outer surface of the wall, with the result that the inner portion of the wall will remain dry.

The mold apparatus, generally speaking, includes an outside form, base-mold, inside forms used for inside of exterior walls and for both sides of inside walls and partitions, collapsible forms positioned in series intermediate the outside and inside forms, means for accurately locating and holding the collapsible forms with respect to the inside forms and the outside forms, together with forms for molding the floors, beams and girders.

The forms include a series of panels of relatively small weight in comparison to area, which are reinforced by a plurality of detachable stiffening members, that may be spaced to the different requirements so as to impart sufficient rigidity to the forms to withstand the pressure exerted against the form when the concrete is being poured into the mold. Said panels are locked together by simple and effective means operating to retain them in a flush and aligned relation, and providing for expeditious assembling of the forms when setting them up or taking them down.

With the panels of the inside forms there is associated a base-mold member by which the bottom part of the walls on the inside thereof may be molded to a desirable contour and thickness. Said base-mold member is locked in position by means affording the desired security, whereby the bottom of the panels of said inside forms may be swung away from the finished wall and lowered from a normal position, and thereafter removed from the wall.

The invention also provides for locking elements between ceiling panels and inside wall panels whereby removal of the forms after the hardening of the concrete is greatly facilitated without, however, rendering the assembling of the molds upon the ceiling and vertical panels very difficult.

Co-operating with adjacent collapsible cores is a series of spacers which are foldably or separably coupled and operate primarily for retaining the collapsible cores in desired relation during the operation of pouring the concrete.

The spacers perform the important function of carrying the moisture-resisting key members or blocks prior to pouring the concrete material, and of accurately locating the key blocks or members with respect to the collapsible forms, the outside form, and the inside form. Said spacers remain in position during the operation of pouring the concrete, so that the moisture-resisting key blocks or members will be held in position for union with the concrete material composing the inner and outer wall portions, but when the concrete sets and hardens, the spacer blocks are displaced from the wall and from contact with the keys, leaving the latter unitary with the wall.

The collapsible cores are covered while pouring the concrete, provision being made for holding their upper ends in position, and for locking the covers over them. Co-operating with the inside form and the outside form are appropriate horizontal stay members, positioned externally with respect to the outside form, and tied by stay bolts which pass through the moisture repellent keys and which stay bolts are removable prior to dismantling the forms.

An important feature of the invention is the construction of a collapsible core, of length corresponding substantially to the height of a story of the building. Said core embodies two side members, one of which is continuous and the other composed of two parts the meeting edges of which are at all times in overlapping relation, said side mem-

bers being parallel; two end members curved in cross section and hingedly attached to the parallel side members, and a system of levers and toggles co-operating with the respective side members and operable for collapsing the form by releasing the sectional side member, so that its overlapping parts are free to have a limited sliding movement concurrently with an inward movement and a pivotal movement of said end members; the whole co-operating to effect the withdrawal of the sectional side member and the pivotal end members from contact with the molded wall, while the other side member remains undisturbed in position, the direction of movement of the parts of the sectional side member being parallel to the continuous side member, so that the core may be collapsed without disturbing the molded wall. Co-operating with the members of said collapsible core and with the system of levers and toggles, is a member which performs the double function of stiffening the core internally against collapse, and of locking the system of levers and toggles so as to retain the side and end walls firmly in expanded condition. Said member is an elongated piece of tapering form in cross section and is insertible and withdrawable accordingly as it is desired to perform the functions of a stiffener and a lock for the core in the operative position thereof, or releasing the core prior to the operation of collapsing it, so as to displace the latter from contact with the molded wall in order to withdraw the core from the molded wall. The locking and stiffening member is insertible and withdrawable by sliding it longitudinally with respect to the core, within the latter, and when inserted said member is adapted by a rotative movement to be shifted into co-operative relation to the parts of the core and the parts of the lever and toggle system for locking the core against the pressure of the concrete material.

Other functions and advantages of the invention will appear from the following detailed description taken in connection with the drawings, wherein—

Fig. 1 is a vertical section through a concrete form of this character, the section being taken on line 1—1 of Fig. 6;

Fig. 2 is a top plan view of a series of collapsible cores;

Fig. 3 is a vertical, sectional view on line 3—3 of Fig. 2 through the spaces between said cores;

Fig. 4 is an end elevation of the bottom portion of a spacer when cores are set up on the footing or on a solid wall;

Fig. 5 is a vertical section through the spacer and its attachment to the underlying concrete;

Fig. 6 is a horizontal, sectional view through a corner portion of the concrete mold for an exterior wall on line 6—6 of Fig. 1;

Fig. 7 is a sectional view through the ceiling mold and ceiling cornice on a larger scale, the elements being shown disassembled;

Fig. 8 is a side elevation of the end portion of a ceiling stiffening member;

Fig. 9 is a top plan view of the base-mold portions;

Fig. 10 is a sectional view of the same on the line 10—10 of Fig. 9;

Fig. 11 is a horizontal, sectional view through a beam mold portion on line 11—11 of Fig. 1;

Fig. 12 is a vertical, sectional view of the base mold and adjacent foot portion of a panel, the parts being shown disassembled;

Fig. 13 is a horizontal, sectional view through a vertical mold panel and adjacent panel;

Fig. 14 is a top plan view and partly sectional view of a clamp for securing a stiffening member to vertical and horizontal panels;

Fig. 15 is a turn-button or key for locking the ceiling panels to the top of the wall panels;

Fig. 16 is a fragmentary front elevation of an assembly of panels;

Fig. 17 is a vertical, sectional view on line 17—17 of Fig. 16;

Fig. 18 is a horizontal, sectional view on line 18—18 of Fig. 16, showing stiffening members and clamps for the same;

Fig. 19 is a horizontal, sectional view through a fractional panel for uniting superposed vertical panels;

Fig. 20 is a sectional, detail view through a device for occluding holes in the mold panels;

Fig. 21 is a front elevation of a mold utilized for the attachment of screw plugs to occlude these openings;

Fig. 22 is a sectional view through a base extension clamp on line 22—22 of Fig. 1;

Fig. 23 is a horizontal, sectional view through one of the collapsible cores;

Fig. 24 is a vertical, sectional view on line 24—24 of Fig. 25, through one of these cores; and

Fig. 25 is another vertical, sectional view on line 25—25 of Fig. 23.

Fig. 26 is a perspective view with parts broken away, revealing the interior of a collapsible core and the interior mechanism appurtenant thereto.

Fig. 27 is a detail perspective illustrating adjacent core-holding members, and the means for interlocking one with the other.

Fig. 28 is a detail perspective illustrating the beam or girder holding means illustrated in Fig. 11.

Fig. 29 is a detail of the core expanding and collapsing mechanism.

Fig. 30 is another detail of other parts of the core expanding and collapsing mechanism.

Fig. 31 is a perspective view, with parts broken away and parts, in section, illustrating most of the subject-matter of Fig. 1.

Fig. 1 illustrates part of a finished story at the bottom of the figure, the forms have been removed, and on top of said finished story forms are set up ready for pouring the next story above. However, Figs. 1 and 6 illustrate how an exterior wall is connected to the ceiling slab, but it is to be understood that all other parts (except outside forms for exterior walls and cores) are used for forming inside walls and partitions, girders, etc., required to produce a monolithic concrete structure.

The molds are composed of vertical panels A and A′, respectively, the panels A defining the outer surface of the exterior wall to be erected, and the panels A′ forming inner surface of the wall. The thickness of the wall or partition to be erected is established by the arrangement of blocks 1, which are inserted into the concrete floor 2 before the concrete is hard. While the outer wall surface of the substructure defines the location of the panels A, the distance of the panels which form the inner wall structure is defined by the location of the blocks 1, and by their distance from the corner 3 of the concrete structure. Base forms 4 abut against the inner edges of the blocks 1, which have been set in the concrete. Their proper engagement with the blocks 1 is assured by tightening up nuts or connections 7 on tie-rods 8, which results at the same time in drawing the outer panel A tight against the concrete edge 3 at the outside of the building.

The thickness and locations of interior walls and partitions may be defined by blocks 1 set in the concrete floor 2 against which the base members 4 are placed. The proper engagement is assured by the provision of other blocks 5. The distance between the blocks 1 and 5 slightly larger than the width of the bottom of the base 4, thus allowing for insertion of wedge shaped member 6, forcing the face of the base member tight against the blocks 1 resulting in the block 5 holding the base and bottom portion of the wall panels, the lower tie-rod arrangement shown in Fig. 1 can be eliminated.

The mutual connection of the base mold portions 4 as to their horizontal aspect will be apparent from Figs. 1, 9 and 10. The back part of these individual base mold portions is undercut at one end, as indicated at 9, while the opposite end has an extension 10 adapted to project into the recesses 9 of the next adjacent base mold portion 4. By this arrangement the base mold portions will be held in strict alignment with each other, and any desired number of individual base mold portions may be connected to make up the desired length of base. A corner block 11 is also connected with the base mold portions 4, as indicated in Figs. 9 and 10, and the extension 10 of one mold portion 4 is connected with the corner block 11, while a connecting plate 12 is utilized for attaching the other flange of the corner block 11 to the other base mold portion 4.

The construction of the wall panels A′ and their attachment to the base mold portions 4, is illustrated particularly in Figs. 1, 6, 12 and 13. The panels A′ may have any desired width. They terminate at the lower end in a slanting surface, as shown in Fig. 12, corresponding to the top surface 13 of the base mold portion 4 for connection therewith in vertical alignment. A slanting flange 14 at the bottom of the panels A′ is provided with a plurality of aligned rectangular openings 15, which openings, upon placing the panel A′ into engagement with the mold portion 4, underlie approximately similar openings 16 extending from the top surface 13 of the base mold portion 4 downwardly. Connecting elements in the form of pins 17 may be inserted through the aligned openings 15 and 16, whereby the panels will be properly aligned with the base mold portion 4 and with each other. The bevel surfaces 13 and 14 are also for the purpose of facilitating the removal of the wall panels A′, the base molds 4 being first drawn away laterally.

The panels are made relatively light in comparison with their large area, and in order to reinforce these panels and adapt them to resist the pressure of the concrete poured into the mold, detachable stiffener member 18 is placed at the edges of adjacent panels with the ribs 19 of the stiffening members between the edges of the panels, the edges of the panels meeting beyond the enclosed edge of the rib. The thickness of the ribs 19 is not sufficient to completely fill the seat formed between the rabbeted panel edges, leaving therefore slight play between the rib 19 and the edges of the panels. (See Figs. 14 and 22.) However, to take care of the play between the panel edges and at the same time maintain uniform slight distance between the surface edge portions of the panels, I provide on the edge of the panels opposite each screw-clamp attachment a $\frac{1}{16}''$ washer constituting a pad 20′ (indicated in Fig. 31) which limits the relative movement of the panels at the points where the clamps are attached, while leaving considerable play 2^{D} between the rib 19 and the edges of the panels at intermediate points. If the portion of the panels between the clamping attachment should in any way be bent, the least pressure on the face of the panels from the concrete will force the back of the panels

tight against the flange 21 of the stiffening members.

The meeting edges of the panels and the stiffening members 18 at the edge of the panels are held together by means of screw clamps of the form illustrated in Figs. 14, 18 or 22. It will be seen that the stiffening members are provided with flanges 21, adjacent the central rib 19, which flanges engage the back edge of the panels, the opposite edge of the stiffening member having a longitudinal slot 22 to receive the wedges 23 (Fig. 14) and T-bars 24 and 24′ (Fig. 22). On the back of the meeting edges of the panels A and A′ are attached suitably shaped elements 25 adjacent those points at which the screw clamps 26 and 26′ are to be applied (Fig. 14). One of the legs of the clamp 26 is detachably connected with the flange of the member 25 by means of a pin 27 on the clamp entering a hole in the lug 25, while the other leg of the clamp 26 is provided with a threaded opening through which the screw 28 extends through a suitable opening 29 in the lug member 25 and the portion of the screw between the lug 25 and the leg of the clamp 26 is formed with a shoulder 30 whereby, upon tightening the screw 28, the edges of the panels are forced towards each other, at the same time holding the stiffening member 18 in place. The flanges 21 of the stiffening member are forced into engagement with the back of meeting edge of the panels through the wedge 23, seated in the slot 22 of the stiffening member and forced inwardly by the clamp member 26, drawing the panels tight against the flanges 21.

As will be seen from Fig. 1, the bottom ends of the stiffening members 18 are cut off at a slant to correspond with the angle at which the top of the base mold portion 4 and the bottom of the panels A′ are in engagement with each other. In order to extend, however, the reinforcement attained by the provision of the stiffening members 18 to the bottom of the base mold member 4, the stiffening members 18 are extended downwardly through the insertion of vertical T-irons 24, which, as illustrated in Figs. 1, 6, 18 and 22, are also held in position with respect to the panels A′ by clamps 26′ (Fig. 22), having a screw 31 extending through openings at the ends of both the legs of the clamp 26′, and also passing through a round hole 32 in the stiffening member 18. On screw 31 is formed a shoulder 33 whereby upon tightening the screw 31, the edges of the panels A′ are forced toward each other. The T-bar 24 is forced tight into the slot 22 and against the back of the base member 4, and at the same time the back of the meeting edges of the panels is forced tight against the flange 21 of the stiffening member, the T-bar 24 extending down to the bottom of the base 4 into a shoe 35, and the base 4 is thus maintained in alignment with the wall panels A′ and the reinforcing of the panels is extended to the bottom of the base mold 4.

The stiffening members and panels for walls and ceilings are so made that the same stiffening members may be used either to reinforce adjacent panels at their meeting edges, or to reinforce any individual panel intermediate its edges. Thus, various size panels can be used by placing the stiffening members on the back of the panels according to strength required to properly reinforce the panels against the pressure from the wet concrete, the back of the panels having grooves 36 in which ribs 19 of the stiffening members are inserted.

At the end of the stiffening members adjoining the base 4 and at intermediate points on the back of the wall panels, the T-bar 24 placed in the slot 22 of the stiffening member 18 is held in place by tightening the screw 37 in clamp 101. (Figs. 1 and 6.)

The stiffening member 18 is further held in place at top of the panels by the central web of the stiffening member extended between the flanges 21, and the rearward portion of the stiffening member is cut at an angle terminating in an extension 38. (See Figs. 1 and 7.) The top of the wall panels A′ is also provided with an extension 39, and the projections 39 and 38 being in horizontal alignment with each other, are in an interlocking engagement with the groove 40 on the ceiling panels when assembled. The projection 39 on the wall panels fits into the groove 40 on the ceiling panels in such a way as to allow a rocking movement in the groove when the lower end of the wall panels is swung outward in taking down the forms. Similar stiffening members 18″, having a cross-section as shown in Fig. 1, like the stiffening members 18, are used for transversely reinforcing the panels A^4, which constitute the ceiling mold. The ends of the stiffening members 18″ for the ceiling panels are provided with extensions 43 terminating in notches 44 which may be entered into interlocking engagement with the projections 38 and 39, respectively, thus supporting the ends of the ceiling stiffening member 18″. (See also Fig. 8.)

By reference to Figs. 16 and 17, it will be noted that clamps are provided for permitting of the use of stiffening members 18′, which do not extend over the entire height of the wall or the entire length of a ceiling. In that case short connecting T-irons 24′ (Figs. 16, 17 and 18) are inserted into the slots 22 of stiffening members 18′, which are in alignment with each other. Clamps of the form illustrated in Fig. 18 at the right hand end may then be utilized for forcing these connecting T-irons 24′ firmly into en-

gagement with the aligned stiffening members 18′ with the same effect as a single stiffening member running over the entire length. Figs. 16, 17 and 19, furthermore illustrate the provision of interconnecting elements for vertically extending wall panels A′ to render them suitable for use on a relatively high wall. An upper panel A^2 and a lower panel A^3 are connected by a stiffening member 18′ which projects from the lower panel to a point above the bottom edge of the upper panel A^2. A transverse strip 45 having a head 46 is inserted between the adjacent horizontal margins of the upper and lower panels and eye-bolts 47 project from this strip. A pin 48 extending transversely through the eye-bolts is forced by means of a wedge 23′ so that the head 46 is drawn inwardly, effecting an interlocking connection between the two adjacent margins of the upper and lower panels A^2 and A^3.

The system shown in Figs. 16 and 17 for connecting the ends of the stiffening members, also applies to building up a longer length of stiffening members from shorter pieces and for obtaining a longitudinal adjustment of such sections with respect to each other by the variation of the distance 49 between the ends of the stiffening member 18′.

The same length of stiffening member 18 (Fig. 1) may be used for various heights of stories by having a series of holes 32 which allow the stiffening member 18 to be raised up to the desired height from the base member.

The construction of the ceiling cornice is apparent from Figs. 1 and 7. The ceiling panels A^4 have on their under-surface a notch 40 adapted to engage the projection 39 on the top of the wall panel, and tip 38 on wall stiffener. The marginal portion of the ceiling panels is also enlarged and is provided with tongues 50. These tongues 50 are used for holding a cornice member 51 (Fig. 7), which is provided on its under-surface with notches 52 adapted to be seated on the tongues 50. Owing to this arrangement, the removal of the ceiling panels A^4 is greatly facilitated after the concrete has been set, as the joint between the molding and ceiling panels will open up larger as the latter is drawn downward. The separation of the ceiling panel from the top of wall panels will leave the cornice member 51 free to be removed. The molding, however, is held in fixed position during the pouring of the concrete so as to cover the joint between the ceiling and the wall panel, owing to the engagement of the notches 52 with the projections 50 of the ceiling panels. The form elements just described are secured in their assembled relation, in the illustration, by turn-buttons or keys having angular heads 53 adapted in the position shown in Fig. 15 to pass through slots 54 in the lower face of the ceiling panels into seats or enlargements 55 which permit the buttons to be turned, as shown in Figs. 1 and 7, so as to bring the projecting fingers 56 at the inner ends of the same into engagement beneath outwardly projecting flanges 57 on the wall panels. The angular heads of these turn-buttons are connected with the body, portions thereof by shanks 58 of a size to operate in the entrance slots 54 and at the ends opposite the fingers 56, the buttons are shown provided with suitable operating handle 59. Different cornice effects may be obtained by various shapes of the top of the cornice mold member 51. The projecting pad 60 forms a shoulder which engages against the under side of the ceiling panels.

The ceiling panels are reinforced by stiffening members 18″ (Figs. 1 and 8) and constructed in a manner similar to the reinforcement and construction which is applied to the vertical panels.

The method of connecting a wall located at a higher elevation than the bottom of another wall into which it is connected, or of connecting a beam or girder into a wall, is shown in Figs. 1 and 11. The panels A^5 are united with adjacent ceiling panels A^4 substantially as described and shown with reference to Fig. 7 for joining the wall panels to the ceiling panels, except that no stiffening member is used. The bottom panel 61 of a beam mold, and the side panels A^5, are carried by posts 62 whose lower ends rest on the floor and which have at their upper ends transverse spaced strips 63. Between the strips 63 at one end is permanently attached an upright bracket 64, whose inner edge is vertical and is intended to engage one of the beam panels A^5. Bracket 65 indicates a part complementary to part 64, having an inner perpendicular edge to engage the other vertical beam panel A^5, and being slidable between the other ends of strips 63. Adjacent the lower edge of part 65 and extending beyond both faces thereof, are spaced stop lugs 66, arranged in a line perpendicular to the vertical edge of part 65, these lugs engaging the lower edges of strips 63; and there is also a fulcrum pin 67 extending through, and from both faces of, part 65. A rocking saddle 68 straddles the strips 63, having vertical arms which embrace the sides of the strips, and having also a horizontal part which overlies the upper edges of the strips with bifurcations 71 that take under the ends of pin 67, the edge of part 65 being received between these bifurcations. With the saddle in position as shown, a wedge 70 is driven through a selected one of a plurality of alined pairs of vertically and horizontally spaced apertures 69 in the strips 63, and this wedge, engaging

with the outward lower edge of saddle 68, with the result that the bifurcations 71 are driven upwardly against pin 67, forcing the movable plate 65 also upwardly until it is stopped by the engagement of lugs 66 with the lower edges of horizontal strips 63. Since strips 63 are horizontal and rigid on post 62, it follows that the inner edge of part 65 will be vertical, as it should be in relation to the beam panel A^5 to which it gives lateral support.

I also show in Fig. 11 how to unite a vertical beam panel A^5 to a wall panel A'. The beam panel and the wall panel are respectively provided with reduced hooked ends 74, over which is engaged a corner piece 73 having undercut recesses corresponding with hooked ends 74; and when the parts are in assembled relation as shown, a reactance piece 77 is fitted into the angle of the corner between panels A' and A^5, and a bolt 76 threaded through piece 77 into corner piece 73, drawing the parts firmly together. The corner piece 73 will of course be formed exteriorly so as to present surfaces flush with the adjacent surfaces of panels A' and A^5.

For the purpose of holding the top of the panels A in perfect alignment, rail 80, which may be composed of long lengths of adjoining sections, is placed on the top of the panels A, which constitute the outer wall of the mold. These rail sections are provided on their under-surface with a groove 81 to receive a projection 82, extending from the top of the outer mold panel A. This sectional rail 80 is maintained in position by means of a hook 83 having an extension which projects downward into the slot 22 of a stiffening member 18', and which is held in place by means of transverse wedge shaped keys 84 extending through the downward projection and through the stiffening member. The upper end 85 of the hook is transversely bent to overlie the sectional rail 80. A gauge strip 86 may then be placed on the rail 80 and may be held against displacement outwardly or inwardly with respect to the wall by means of a tongue 87 entering a suitable longitudinal groove in the rail 80. This gauge strip 86 also gives the necessary thickness of the floor, and may be made of various sizes to take care of the different thickness of the floor. After the concrete is set and the gauge strip 86 is removed it forms a shoulder 3 at the outer edge of the floor as shown in the lower portion of Fig. 1 to position the lower edge of the outer panels A.

From Fig. 1 it will also be seen that rail 80' was used for guide rail on top of panels used for the finished story below, but left in place for supporting the outside panels for the next story to be poured, and supported temporarily by a bracket 88 which is secured to the outside of the finished wall of the structure by the tie rods 8' passing through the wall of the finished structure.

I have shown in Fig. 6 how the stiffening member 89 may be modified to operate as "fillers" for spacing apart the panels more or less. This is accomplished by making these stiffening members of the thickness necessary to space apart the panels the desired distance, and by providing these stiffening members at their inner edges with a projecting fillet 90 to fit in between the separated edges of the panels for forming the wall surface at this point. This modified stiffening member 89 may be held in place by the channels 91, and by placing bolts 92 through the holes in the lugs 25 of the panels and through the stiffening member 89.

As many openings 92' may be provided in the mold panels as desired. Those openings, however, which are not used for the arrangement of tie rods 8 are advisably plugged up to prevent the formation of unsightly lugs on the finished walls, and for this purpose the openings 92 are slightly enlarged on their inner surfaces. In those openings which are not to be used to receive tie rods, a flat headed screw 93, as indicated at Figs. 16, 20 and 21, may be inserted and a nut 94 may be mounted on the threaded part of the flat headed screw 93 on the outer surface of the panel. The reduced portion of the flat headed screw 93, as well as the outer margin of the nut 94 are provided with slots 95 and 96, respectively, to facilitate the insertion of the end of a screw driver, whereby the nut 94 may be tightened against the outer surface of the panel A' or A to hold the screw 93 against displacement.

For the purpose of holding the inner and outer mold panel together and for maintaining them at the required distance from each other, rods 8 are passed transversely of the wall space through the panels A and A' at predetermined, suitably selected points. The projecting ends of these tie rods 8 also serve for supporting horizontal channels 91 having vertical side flanges 97. From Fig. 1 it will be seen that the nose of wedges 23, which hold the clamps 26 and stiffening members 18 in place on the panels, also engage over the tops of the flanges 97 of these horizontal channels 91, thereby preventing longitudinal displacement of these channel members, and securing them in engagement with the rear faces of the stiffening members 18 and 18', respectively. The horizontal channels 91 are secured to the tie rods 8 by means of hook-shaped castings 98 illustrated particularly in Figs. 1, 6, 16 and 17. The castings 98 fit over the outer flange of the channel iron 91 and is provided in its lower portion with a slot 99. The slot 99 allows said casting 98 to be placed on the flange of the channel 91 and slid over the rod 8.

The channels being secured at intervals against the stiffeners by the wedges 23, and being held at other points by the hooks 98 to the tie rods 8, it is obvious that a displacement of these channels cannot take place, and that they materially reinforce the assembled structure to withstand those pressures to which it may be subjected through the mass of concrete being poured in between the mold panels. The hook shaped castings 98 are maintained in position by the nuts 7, or with other means by which pressure can be applied at the outer ends of the tie rods 8.

The channel 91 is further supported by a bracket 100 which is held in place on the back of the stiffening member 18 by clamp 101. In order to connect the channels 91 to each other at the corners and securely hold them against displacement, also to maintain the channels 91 in a desired relation, corner brackets 102, as shown in Fig. 6, are placed at the intersection of those channels. These angle brackets 102 are secured to the channel 91 by means of grooves which engage over the flanges of the channel, and by means of screws 103 having a hook on the lower end to catch under the lower surface of the channel. These grooves are then tightened over the flange 104 by tightening up the nuts 105, whereby the angle brackets are fixedly maintained in position and hold the channels 91 against displacement in any direction.

The collapsible cores C are located accurately in the space between the outside form and the inside form, by devices which co-operate with said collapsible cores in a manner to not only position the cores, but to lock or retain them in required positions. One kind of locating and retaining means consists of the spacers H, each being in the form of a block, the vertical faces 107 of which are concave, whereby the spacers are constructed for contact with the curved end members of collapsible cores C so as to retain the latter against movement relatively to the outside and inside forms A, A', respectively. Between two adjacent cores C a vertical series of spacers H is employed. The adjacent ends of spacer blocks H are separably joined by means of plates 108 which are secured to one surface of the upper spacer block near the lower end thereof. These foot plates 108 terminate in inwardly directed fingers which project at an angle other than a right angle from the plates 108, and these fingers are adapted to enter into the bights of hooks 109, which form the terminal portions of plate 110 at the upper end of the adjacent lower section. Owing to this interlocking engagement of the fingers 111 with the hooks 109, the sections may be moved pivotally relatively to each other when it is desired to assemble or dissemble them while they are maintained in proper aligning position, after the fingers 111 have once been placed into these hooks. The foot plates 108 of each section of these spacers H project a relatively large distance beyond the lower end of each spacer block, leaving thereby gaps between each superposed section, and these gaps are used for receiving key blocks L which are held in position between the cores C. This type of interlocking engagement of the fingers 111 with the hooks 109 permits the spacers to be turned out of their vertical position one at the time or all in one series at the same time in removing the spacers from the moulded wall and the key blocks L therein. The lower spacer of the vertical series for the first story is provided with a notch 112 to receive the key 113, which locates the position of the spacers intermediate the outside and inside forms and with respect to the collapsible forms, and provision is made also for locating and retaining the upper portions of the vertical series of spacers H relatively to the collapsible forms and the covers C' thereof (see Figs. 2, 3 and 7).

The collapsible forms C extend vertically in the space between the inside and outside forms and for the full depth thereof, and over the top of each form is placed a flanged cover C', for excluding the concrete material from the interior of the form during the operation of pouring the concrete.

The cores C are supported on a U-bar 114 which rests on the concrete rib 115, said U-bar having a projecting finger 116 on each end on which adjacent cores C may be rested.

Upon the covers C' rest the parts M of a separable locking rail the parts of which are detachably connected at 117 and 118. The parts M of the rail are detachably imposed upon the core covers C' and extend longitudinally thereof, and the sectional rail M engages the cover and the core, said rail M having the rods 119 connected detachably thereto and fastened to some point on the floor. Each part M of the rail is provided on its under side on one end with a curved retainer or seat 120 positioned to embrace the cover C' on the top of the collapsible core at the curved end thereof (see Fig. 2); and from this retainer depends a finger 121 which is engaged in a slot 122 in the upper end of spacer H between two cores C. On its opposite end, each part M of the rail is provided on its under side with another curved retainer or seat 123, to embrace the curved end of the adjacent collapsible core, and with two hook fingers 124 and 125 which are detachably engaged over two projecting pins 117 and 118, respectively, on the retainer 120 of the next adjacent rail part M.

Each vertical series of spacers H shown in Fig. 1 carry or support a series of the water repellent blocks or keys L, positioned upon the upper ends of the spacers and contacting

with the cores C, whereby the blocks or key members are adapted for union with the concrete material so as to become unitary therewith. Each block L is composed of concrete material, rendered water repellent by the incorporation of a suitable waterproofing agent or agents therewith.

The blocks L being supported by the spacers in the intervals between the forms, the concrete material is poured into the spaces and surrounds the blocks L, whereby the blocks unite the outer wall portion O and the inner wall portion O′ composing the concrete wall (see Fig. 1). Any moisture seeping within the hollow of the wall strikes the water repellent blocks, the surfaces 126 of which are inclined so as to deflect or shed the water toward the outer wall portion, with the result that the inner portion O′ remains in a dry condition. As stated, the blocks L may be composed of concrete rendered water repellent, but I may use blocks of other suitable material having the desired characteristics. Key blocks L are to be in general of standard size, though small additional blocks L′ are provided which will vary in thicknesses to provide for various thickness of walls. These blocks L′ are located one at each side of a key L, the tie-rod 8 passing through blocks L and L′, and after the concrete has been poured until it reaches a level somewhat below the blocks, the end blocks L′ are broken off, and as additional concrete is poured the key L is entirely surrounded, and no part of any precast block is exposed on the finished wall surface.

The cores C are preferably formed of sheet metal, as shown in Figs. 23 and 24. They consist of one side wall 127 and an opposite parallel side wall composed of two sections 128 and 129, the curved end walls being formed by the portions 130 and 131, respectively, which are connected flexibly with the opposite side walls through the hinges 132 and 133. Owing to the provision of these hinges between the side walls of the core and the end walls of the same, or owing to other means for readily permitting a displacement of one of the side walls relatively to the other towards the interior of the mold, the mold can be partly collapsed and in this collapsed condition it can readily be removed from the structure. In order to provide for the movement of the wall sections 128 and 129 inwardly, a longitudinal displacement of these two sections relatively to each other is provided for. For this purpose the section 128 is bent back on itself adjacent its free end, as indicated, at 134, leaving, however, between the main portion 128 and the bent portion of this section an interspace in which a bent portion 135 of the section 129 may be introduced. The two bent portions on sections 128 and 129 are maintained in a sliding fit relatively to each other, there being sufficient play between these bent portions to permit the parts 128 and 129 to slide towards each other when the core is to be collapsed, and to slide away from each other when the core is to be expanded. In the space formed between section 128 and its bent portion are inserted and welded at intermediate points plates 136, making a solid connection at such points. On the portion of 129 which is doubled up on itself are cut-outs 136′ corresponding to the several connections 136 which allow the bent portion of 129 to slide into the spaces defined between the several solid connections 136. This solid connection 136 reinforces the joint and prevents the bend 135 being pulled away from the plate 128.

The core is stiffened internally by the provision of a series of transverse ribs positioned at intervals wthin the form, one of the sets of ribs being shown in Fig. 23, which ribs are preferably made of angle iron and extend substantially along the wall portions 127 to 131. The reinforcing ribs 137 associated with the wall section 129 are each provided with an extension 138, which provides a bearing 140, and beyond this bearing the extension is provided with a notch 141. The bearing 140 fixes for journaling a preferably tubular rock shaft 142, which extends advisably through the entire height of the core.

Each rib 137 is also provided with a finger 155, which extends into an aperture 156 in channel 153 (see Figs. 23, 26 and 30), channel 153 being rigid on wall 128 and extending vertically of the core throughout the height thereof. A collar 143 is secured to the rock shaft 142 at a slight distance above or below the bearing 140, wherever one of these bearings is shown. This collar 143, which is fastened to the tubular shaft 142 by means of a set screw, has two angular arms 144 and 145, and a link 146 extends from the arm 145 to the reinforcing rib 147 of the wall 127, said link being pivotally mounted on rib 147 at one end and on arm 145 at the other end. The other arm 144 of the bracket 143 is in pivotal connection with a slide 148 at 144′, and slide 148 is provided with a locking nose 149, as shown in Figs. 23 and 26. A pin 150 extends through a slot 151 in the slide 148, said pin being rigidly mounted in the reinforcing rib 152 rigid on wall 128 (Figs. 23 and 26). At a certain position of the slide 148, the free end of the same having the locking nose 149, engages the channel 153, and thereby prevents movement of the slide beyond a certain limit. A similar abutment 154 is fastened to the opposite wall section 127 for a purpose to be described below.

From the above it will be seen that upon

rotation of the tubular shaft 142 in a predetermined direction, the core C will be expanded to assume the condition indicated in full lines in Fig. 23 and in Fig. 26. In this position the end of the slide 148 rests approximately in engagement with the abutment 153, and collapse of the core is effected by rotation of the tubular shaft 142 and the collar 143 secured thereto, in the opposite direction, as for instance, in anti-clockwise direction, which will have the effect of causing the slide 148 to move first from the position shown in full lines in Fig. 23 to a position in which the pin 150 is in engagement with the opposite end of the slot 151 from the position shown in Fig. 26.

On account of the slot 151, during the initial collapsing movement, the slide 148 can move a small distance without sliding the sides 128 and 129, while the fingers 155 extending into the apertures 156 will also act, by reason of their angular movement due to the rotation of shaft 142, to draw side 128 away from the concrete when the shaft is turned; and the links 146 being attached to the collar 143, the turning of the shaft 142 also draws the side perpendicularly towards side 127; so that both walls 128 and 129 are released from the concrete surface, eliminating friction against the concrete surface, in the subsequent sliding movement of parts 128 and 129. The continued rotation of shaft 142 in the same direction will then cause the wall sections 128 and 129 to slightly slide upon each other and will at the same time, cause a bending of the walls of the core at the hinged points 133, or in case the hinges should be omitted, at that point at which the wall of the core is weakened of perforated.

For the purpose of maintaining the core in expanded condition, as shown in Fig. 23, and preventing collapse of the same due to the pressure of the concrete poured into the mold, a key S is inserted into the core. This key is of substantially triangular cross-section and has a length approximately equal to the height of the core. The apex of the triangle is provided with a plurality of notches 157 which are spaced vertically from each other, distances equal to the spacing of the extensions 138. The side surfaces of the key S are provided with clips s^2 and s', respectively, which are also spaced, vertically from each other, distances equal to the spacing of the slides 148 and which are adapted, when the key S is moved to locking position, to partially embrace the locking noses 149 and the adjacent abutment channels 153 and the opposite abutment bar 154, respectively (Figs. 23, 26 and 30). In order to facilitate the introduction of this key S into the core, the core is first expanded to assume the shape illustrated in Fig. 23. The key S is then inserted from above with the apex s out of alignment with the notch 141 of the extension 138. During this movement of introducing the key S, the guide clips s' on the right hand surface of the key S remain in that engagement with the abutment 154 which they occupy after the final adjustment of the key. The other clips s^2, however, are at a slight distance from the locking noses 149 of the slides 148, and from the flanges of the abutments 153. After the key has been placed in this position with the apex s for instance at the left of the left prong 141′ of the notch 141, it is vertically adjusted until a notch 157 in the apex registers with the prongs 141′, whereupon this key may be slightly turned until the apex is aligned with the notch 141. A vertical adjustment of the key will bring the notch 157 out of alignment with the notch 141, whereby the key is then held in notch 141, locked against any lateral movement.

The final adjustment also brings the clips s^2 into that relation with respect to the slide 148 and the abutment 153 which is illustrated in Figs. 23 and 26. As long as the key is in the core, a collapse of the core cannot take place and the device, therefore, is rendered adaptable to withstand relatively great pressure from the concrete. In this position the collar 143 cannot be rocked, and when it is desired to collapse the form after the concrete has set, it is necessary to remove the key S. The key is first moved vertically until the notches 157 in its apex are in registry with the prongs 141′. In this position it is rotated about the clips s', and after the apex has been moved to the side of the prongs 141′, the key may be entirely withdrawn in vertical direction. The collar 143 cannot be rocked by means of the shaft 142 until the links 146 and slide 148 cause the opposite walls 127 and 128, 129, respectively, to approach each other and to draw also the end walls 130 and 131 slightly towards each other.

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

1. In combination, a panel, a vertical stiffener, means for holding the stiffener in vertical relation to the panel, and a separable stiffener extension engaged by said holding means.

2. In combination, two panels in edge to edge relation, and a stiffener in reactive relation, to both panels, throughout, the length thereof, the stiffener having a rib that projects between the edges of the panels but short of the molding surfaces of the panels.

3. In combination, panels having uninterrupted front or mold surfaces and rabbeted edge portions, the panels disposed in edge-to-edge relation with the matched rabbeted portions forming a seat that extends in the line

of the meeting edges at the rear of the panels, and a stiffening member having a portion engaged in the seat and other portions engaging the rear surfaces of the panels.

4. A device as set forth in claim 2, in which means are provided for holding the stiffening member in position relatively to the panels.

5. A panel having a stiffener seat formed in the back and throughout the length thereof, and a stiffener detachably held in the seat.

6. In a concrete construction, mold panels providing a mold surface, said panels being provided with seats throughout the length thereof, stiffening members engaged in the seats and detachably connected to the panels, said stiffening members having grooves therein and stiffener extensions seated within the grooves.

7. In combination, two panels having mold surfaces and rabbeted edge portions, the panels disposed in edge-to-edge relation with the matched rabbeted portions, forming a seat that extends in the line of the meeting edges at the rear of the panels, a stiffening member having a relatively narrow rib projecting into the seat, filler pads inserted between the seat and the rib at spaced intervals longitudinally of the seat, means for maintaining the panels in edge-to-edge relation, and means in reactive relation to the last named means and to the stiffening member for maintaining the stiffening member in desired relation to the panels.

8. A stiffening member for the purpose described, having a rib part and flanges at each side of the rib.

9. An extensible stiffening member comprising relatively slidable parts, each provided with spaced apertures, and a pin engageable in selected apertures.

10. A stiffening member of the kind described having a rib part, flanges at each side of the rib, and a groove seat in line with the rib.

11. A stiffening member of the kind described having a rib part, flanges at each side of the rib, and a groove seat in line with the rib, the stiffening member having an end shaped for interengagement with a correspondingly formed ceiling panel.

12. In concrete construction, wall panels detachably connected to each other, ceiling panels detachably connected to each other and to the wall panels, and stiffening members detachably connected to the several panels, the wall panel stiffeners being in interlocking engagement with the ceiling panels.

13. In concrete construction, a mold for the casting of a vertical wall, comprising inside and outside forms, each made up of panels in edge to edge relation, stiffening members for the panels, a transverse stay reactively engaging the stiffening members, means detachably engaging the stays and passing through the panels for holding the panels in spaced relation, and means for adjustably fixing the reactive relation between stay and stiffeners.

14. In concrete construction, a mold for the casting of a vertical wall, comprising inside and outside forms, each made up of panels in edge-to-edge relation, stiffening members extending between adjacent panels short of the molding faces thereof and having portions engaging the rear surfaces of said adjacent panels, a transverse stay reactively engaging the stiffening members, and means for simultaneously adjusting and fixing the reactive relation between stay and stiffeners and for urging adjacent panels into edge-to-edge relation and into reactive relation with their respective stiffeners.

15. The combination with a channel member and a transverse rod passing under the channel, of a connecting member having an open hook part engaging the rod, and a part engaging over a flange of the channel.

16. In a mold of the character disclosed, mold panels, stiffening members at the edge portions of adjoining panels, said members having slotted head portions, bars seated in the slots of said heads and clamps engaged with the heads and provided with clamp screws bearing on said bars.

17. In combination, mold panels and stiffening bars for the same, said bars being slotted and arranged in end to end relation, splice bars overlapping the end portions of adjacent bars and fitting within the slots therein and clamps adjustably securing said splice bars in position.

18. In combination, two channel members, one perpendicular to the other with flanges uppermost, and an angle bracket having grooves to fit over the flanges forming the angle between the channel members, and screw threaded members carried by the angle bracket having hooks engaging under the respective channels for locking the bracket over said flanges.

19. In concrete construction, a panel having an outwardly beveled aperture therein, a correspondingly beveled plug for the aperture having a threaded part extending through the panel to the inner side thereof, and a nut engaging the threaded portion of the plug.

20. A ceiling panel stiffener and a wall panel having interengaging parts.

21. In combination, an inside wall mold panel, a ceiling panel designed to rest thereon, said panels having a tongue and groove joint at their meeting edges, relieved to enable the swinging movement of one panel with respect to the other and turn-buttons

detachably engaged with one of the panels and having hooks to interlock with the other panel.

22. In combination, a wall panel, a cooperating ceiling panel and turn-buttons detachably carried by the ceiling panel and interlocking with the wall panel.

23. In combination, a wall panel, a cooperating ceiling panel and turn-buttons detachably carried by the ceiling panel and interlocking with the wall panel, said buttons having projecting hooks and the wall panel having an outstanding flange to be engaged thereby.

24. In combination, a wall panel provided with a laterally projecting lug, a ceiling panel having a seat with a narrow entrance slot in the lower face of the same and a turn-button having an elongated head to pass up through the entrance slot in one position and to interlock in the seal when turned angularly to a different position, said turn-buttons having a projecting jaw to engage the lug of the wall panel.

25. The combination with cooperating wall and ceiling panels, of a cornice mold overlapping the joint between said wall and ceiling panels.

26. The combination with cooperating wall and ceiling panels, of a cornice mold overlapping the joint between said wall and ceiling panels, said cornice mold having an inclined joint with the ceiling panel for enabling the latter to be removed without disturbing the separable stiffener extension engaged by said holding means.

27. In concrete construction, a wall panel and a ceiling panel in interlocked relation, and a cornice member overlying the connection and freely separable from the ceiling panel.

28. In combination, a plurality of wall panels, means for holding them in edge-to-edge relation, and aligning means engaging the top edges of the panels and a gauge strip carried by the aligning means and removable therefrom.

29. A mold for casting one complete story of a building, including the wall, ceiling and floor, comprising outside and inside wall panels, a ceiling panel and a detachable edge strip supported above the outer wall panel to raise the floor level and provide a shoulder at the edge of the floor for positioning the base of the outer wall panel in the subsequent casting operation.

30. In concrete construction, the combination with an outside form, an inside form, and a succession of collapsible cores, of spacers positioned intermediate the collapsible cores, said spacers being connected in series and said spacers provided with seats whereon there are supported a series of key blocks.

31. In concrete construction, the combination with an outside form, an inside form and a succession of collapsible forms, of spacers positioned intermediate the collapsible forms, said spacers being provided with key block seats and said spacers being connected in series.

32. In concrete construction, inside and outside forms providing a mold for a vertical wall, concrete key blocks extending transversely across the mold space in vertical series, and a vertically extending spacer block between vertically adjacent key blocks.

33. In concrete construction, inside and outside forms providing a mold for a vertical wall, concrete key blocks extending transversely across the mold space in vertical series, and a vertically extending spacer block between vertically adjacent key blocks and having a cross-section that is wider at one side than at the opposite side.

34. In concrete construction, inside and outside forms providing a mold for a vertical wall, concrete key blocks extending transversely across the mold space in vertical series, and a vertical series of detachably interlinked spacer blocks, one between each two adjacent key blocks.

35. In concrete construction, inside and outside forms providing a mold for a vertical wall, concrete key blocks extending transversely across the mold space in vertical series, and a vertical series of detachably interlinked spacer blocks, one between each two adjacent key blocks, the interlinked blocks being restrained against movement in one direction relatively to each other.

36. In concrete construction, inside and outside forms providing a mold for a vertical wall, concrete key blocks extending transversely across the mold space in vertical series, interlinked spacer blocks in vertical series, one spacer between each two adjacent key blocks, the key blocks and spacers of one series being alined with those of another, respectively, and collapsible cores between adjacent series of spacers.

37. In concrete construction, inside and outside forms providing a mold for a vertical wall, concrete key blocks extending transversely across the mold space in vertical series, and a vertical series of detachably interlinked spacer blocks, one between each two adjacent key blocks, the interlinked blocks being restrained against movement in one direction relatively to each other, and means for holding the end of the lowermost spacer block in position.

38. In concrete construction, a core shell having a rigid back, overlapping sectional front portions, and means within the shell for moving the front portions first towards the back and thereafter slidingly one upon the other to partially collapse the shell.

39. In concrete construction, a core shell having a rigid back, overlapping sectional

front portions, and means within the shell for moving the front portions first towards the back and thereafter slidingly one upon the other to partially collapse the shell and locking means for holding the parts of the shell in expanded condition.

40. A device as set forth in claim 39 in which the operating means for the shell parts includes a rock-shaft extending through the shell, and connections from the shaft to the back and front sections.

41. A device as set forth in claim 39, in which the operating means for the shell parts includes a rock-shaft extending through the shell, links extending from the shaft to the back section, and a lost-motion connection from the shaft to one of the front sections.

42. The device described in claim 38, in which both front sections have bent-over or hooked ends, one constituting a female member or socket and the other a male member fitting into the socket, the socket being divided into a plurality of spacer pockets and the male member comprising a plurality of tongues fitting the several pockets.

43. In concrete construction, a collapsible form embodying a continuous side member, a sectional side member composed of plates, the margins of which are overlapped, and said plates being parallel to the continuous side member, cross sectionally curved end members hingedly attached to the side members, operating means for said side members, and means for locking and releasing said operating means.

44. In concrete construction, a collapsible core embodying a continuous side member, a sectional side member composed of plates, the margins of which are overlapped and said plates being parallel to the continuous side member, cross sectionally curved end members hingedly attached to the side members, a shaft, rockers carried by the shaft and having a link connection with one side member and a lever connection with the other side member and means for locking and releasing the rockers and said operating shaft.

45. In concrete construction, a collapsible form comprising parallel side members, cross sectionally curved end members hingedly attached to the side members, operating means for said members interiorly of the form, and a locking and stiffening member insertible into and freely withdrawable from said form for cooperation with said operating means.

46. In concrete construction, a collapsible form embodying parallel side members and curved end members hingedly attached to the side members, a guide rail fast with each side member, one of said rails being notched, operating means connected with the side members, an insertible bar for cooperation with the operating means, and channeled guides unitary with said bar and positioned for sliding contact with said guide rails on the respective sides of said form.

47. In concrete construction, a U-piece having outwardly extending flanges at the ends of its arms, said U-piece being held in inverted position with its flanges horizontal, and a core resting on each flange.

48. In concrete construction, the combination with a plurality of collapsible forms, and a cover for each form of a locking rail composed of bars having contact individually with the covers of said forms.

49. A panel having stiffener-seat portions at its edges, and also intermediate its edges, and a stiffener adapted to any of the seat portions.

50. A panel having a stiffener seat formed in the back surface thereof and a stiffener detachably held in said seat.

51. In combination, panels having uninterrupted front or mold surfaces and rabbeted rear edge portions, the panels disposed in edge-to-edge relation with the matched rabbeted portions forming a seat along the rear face of the panels, and a stiffener detachably held in said seat.

52. In combination, an inside wall mold panel, a ceiling panel designed to rest thereon, said panels having an interlocking fit at their meeting edges to permit swinging movement of one panel with respect to the other and detachable means associated with said panels to hold them in interlocked relation.

53. In concrete construction, a core shell having a rigid back portion, sectional front portions, and means within the shell for moving the front portions first towards the back and thereafter slidingly one upon the other to partially collapse the shell.

54. In concrete construction, a core shell having a rigid back portion, sectional front portions, means within the shell for moving the front portions first toward the back and thereafter slidingly one upon the other to partially collapse the shell and locking means for holding the parts of the shell in expanded condition.

In testimony whereof I affix my signature.

AXEL G. W. WEDBERG.