A. W. EACHES.

MOLD FOR COLUMNS.

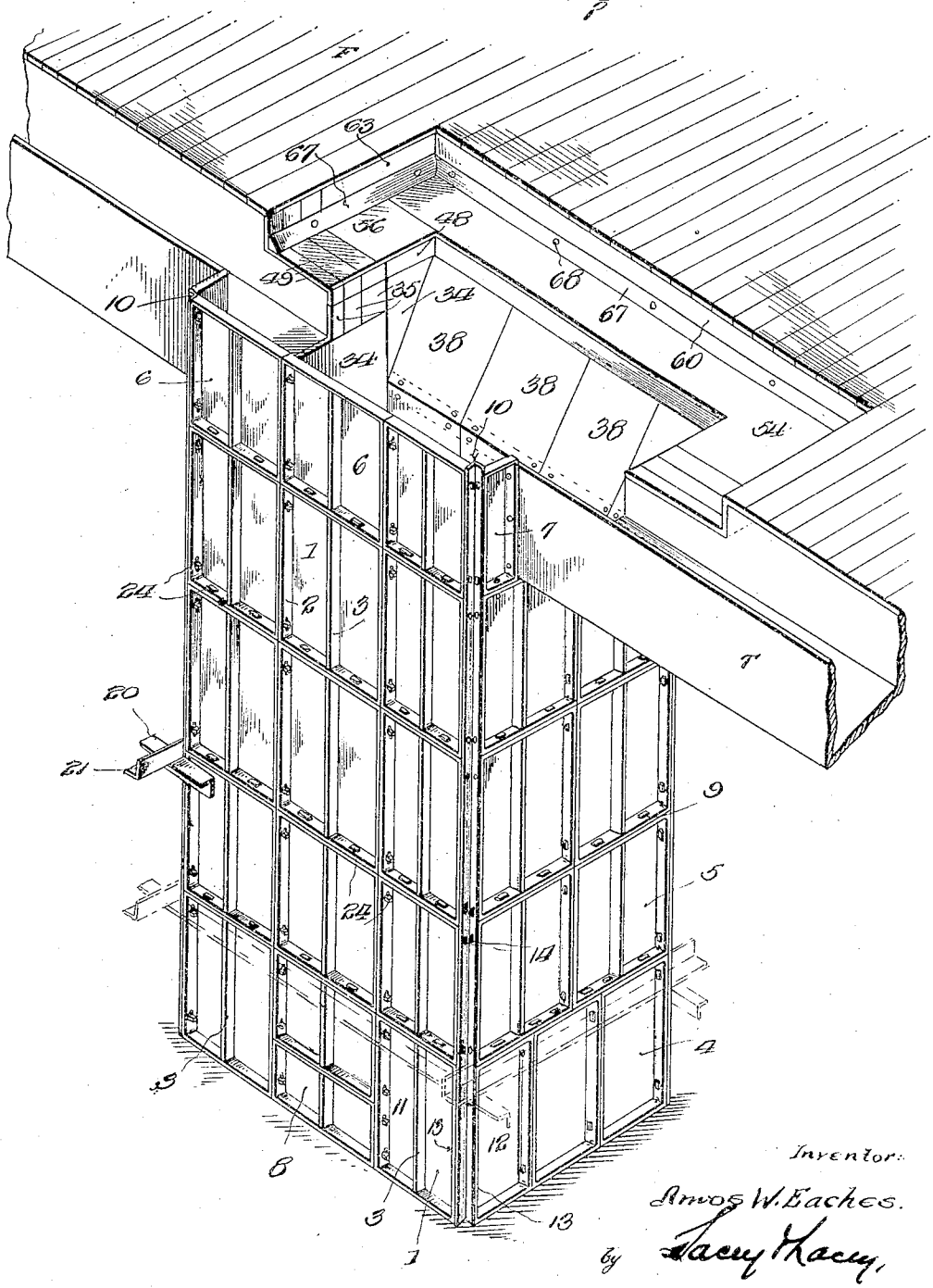
APPLICATION FILED JUNE 30, 1919.

1,331,096.

Patented Feb. 17, 1920.

4 SHEETS—SHEET 1.

Fig. 1.



Inventor:

Amos W. Eaches.

by Lacey & Lacey,

Attorneys.

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4 SHEETS—SHEET 2.

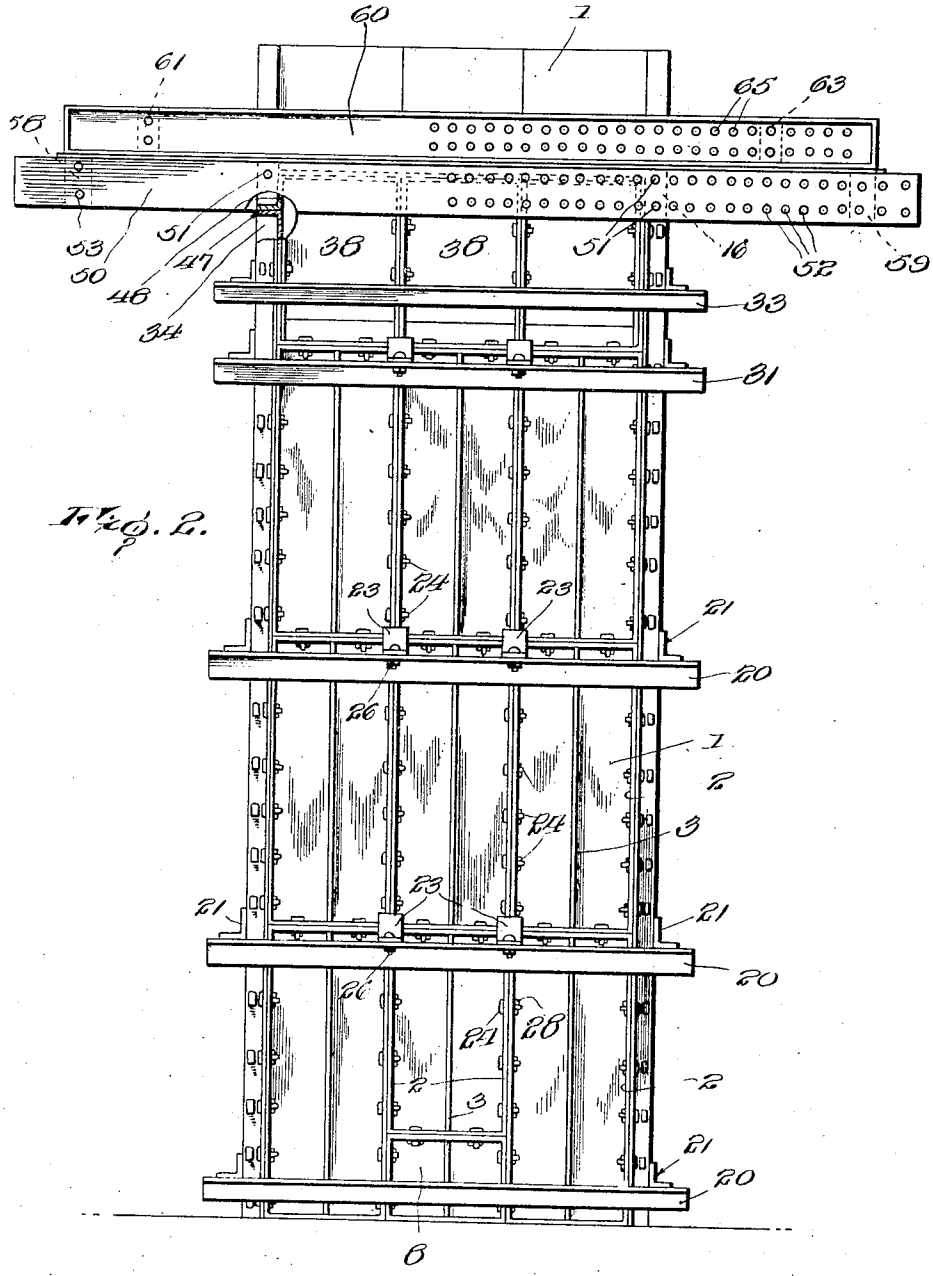


Fig. 2.

Inventor.

Amos W. Eaches.

by Lacey & Lacey.

Attorneys.

A. W. EACHES.

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4 SHEETS—SHEET 3.

Fig. 3.

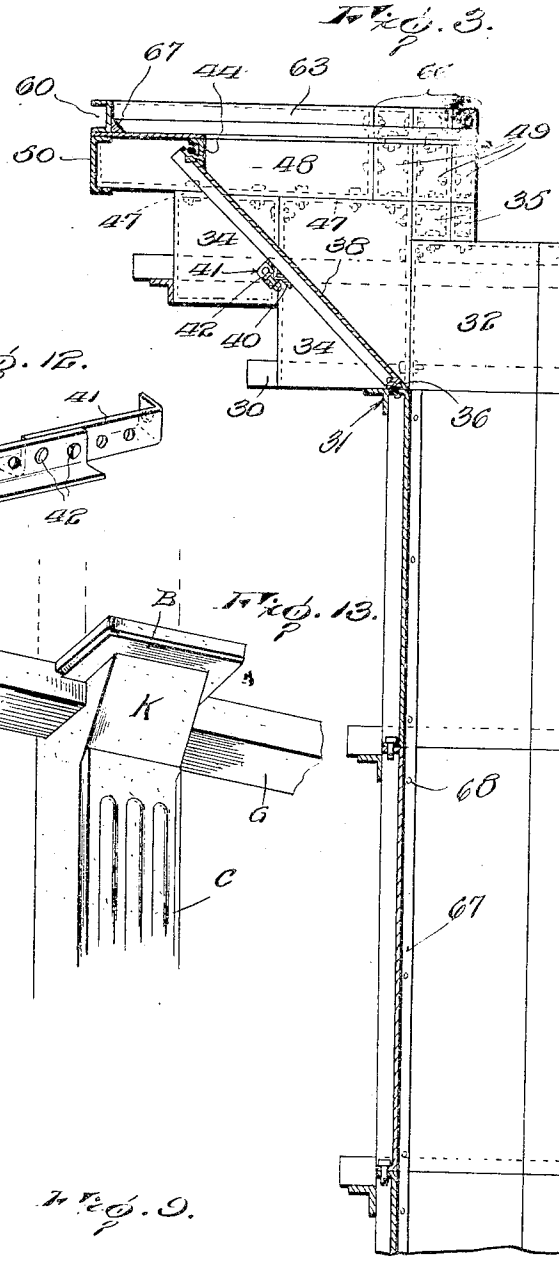


Fig. 10.

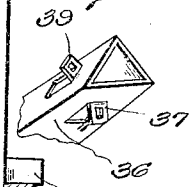


Fig. 12.

Fig. 13.

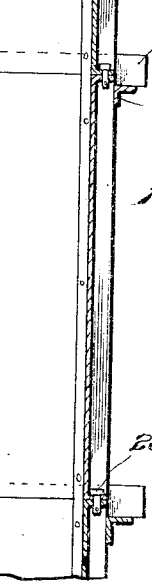


Fig. 11.

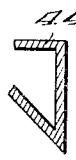
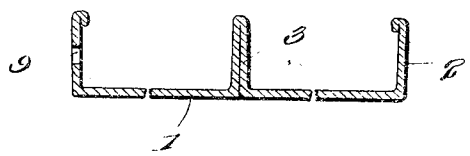


Fig. 9.



Inventor:

Amos W. Eaches.

by Lacey & Lacey.

Attorneys.

A. W. EACHES.

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4 SHEETS—SHEET 4.

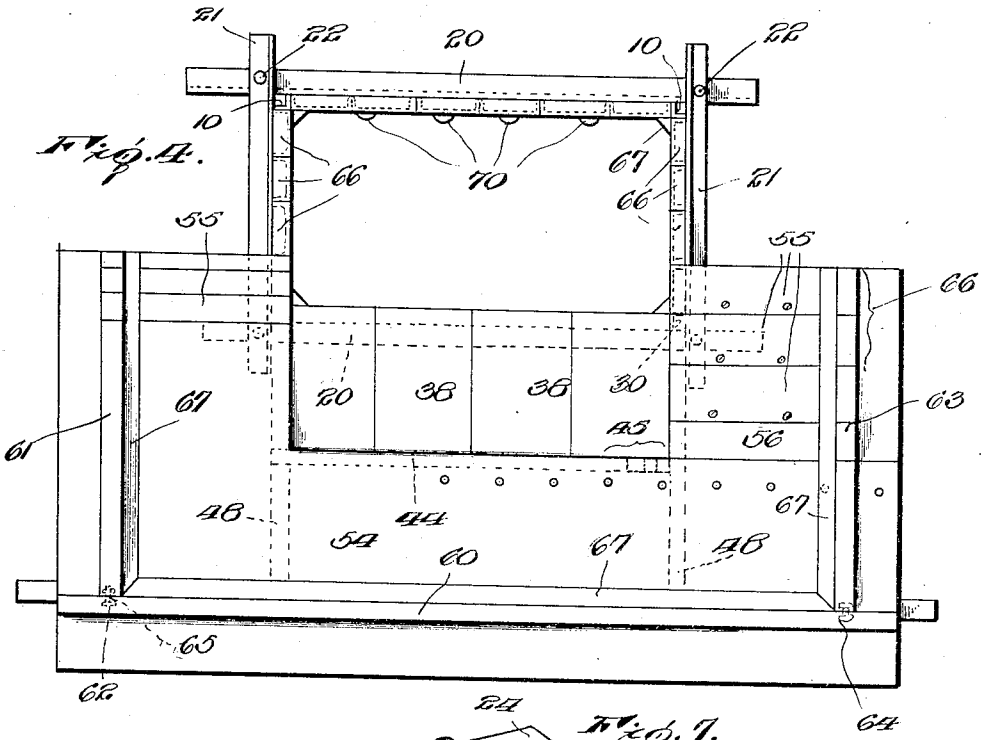


Fig. 4.

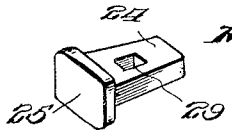


Fig. 7.

Fig. 5.

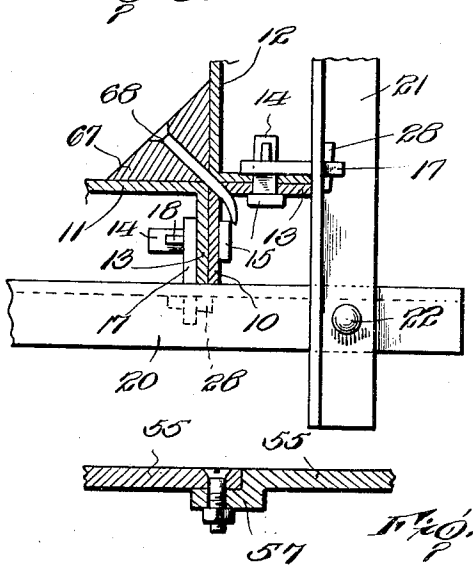


Fig. 8.

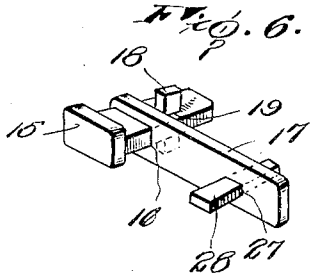


Fig. 6.

Inventor.

Amos W. Eaches.

by Lacy & Lacy.

Attorneys.

UNITED STATES PATENT OFFICE.

AMOS W. EACHES, OF WASHINGTON, DISTRICT OF COLUMBIA.

MOLD FOR COLUMNS.

1,331,096. Specification of Letters Patent. Patented Feb. 17, 1920.

Application filed June 30, 1919. Serial No. 307,526.

To all whom it may concern:

Be it known that I, AMOS W. EACHES, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Molds for Columns, of which the following is a specification.

This invention relates to masonry and concrete structures, and more especially to reinforced columns therefor; and the object of the invention is to produce a collapsible mold for erecting such columns *in situ* and in dimensions appropriate to the edifice of which they are to form a part, and so constructed that when the column has set the mold may be removed and its elements used again.

It is well known to those engaged in construction work that large edifices, such as office buildings, are now constructed first in skeleton form, after which the walls and floors are built and laid according to the plans of the architect, and the skeleton structures for this purpose are commonly made of reinforced concrete. The custom is at selected intervals to mold columns in lengths or sections reaching from the line of one floor to the next, connect the upper ends of these sections by reinforced concrete girders, then carry the columns up another section and connect them by another set of girders, and so on; and meanwhile or subsequently the walls are built in, with their appropriate door openings and window openings, and the floor slabs (usually also of reinforced concrete) are laid, to be surfaced later with floors of tile or wood or any appropriate material. It will be at once apparent that the so-called slabs at each floor line should be supported by the columns. Even where the girders are connected by joists, it is wise to support the flooring also from the columns, and it is highly desirable that interior walls shall be supported by columns, especially where they occur on upper floors to divide them into smaller rooms, when the floor or floors beneath may not be divided on the same lines. In other words, in order to impart to these structures the greatest strength consistent with lightness and rapidity of formation, it is desirable to impose all weight as far as possible on the upright columns which are very strong and well able to sustain it. This invention therefore contemplates the formation of a bead supported by a knee, these parts being cast integral with the shaft of the column and constituting in effect its capital since they are exposed on the interior of the building on each floor, and the girders are molded so as to extend into and form an integral part of such capital, the girders and the bead supporting the floor slabs above mentioned. These columns should occur in the corners of all rooms of ordinary dimensions, as well as at the mid-lengths of the sides of long rooms such as stores, and possibly at considerable intervals along the sides of quite long apartments, such as auditoriums, and the columns should occur in line with all interior walls above.

It is also well known to those who are expert in this art that these columns are built in many sizes, varying in their width and thickness according to the architecture of the building being erected, the weight to be supported, and the story of the building containing the section considered; and varying in their length or height to suit the distances between floors. It is the common practice to construct molds for these columns from boards and rather rough lumber, insert the reinforcing elements and pour the cement, the mold being then knocked down and the lumber used again if possible. But the moisture of the cement on the interior and the effect of rain or snow on the exterior often warps this lumber so that it may not be used again and again, and at best the column thus produced has an extremely rough surface and must necessarily be finished "neat" before the contractor can turn over the work to his successor. It is the purpose of this invention to produce a mold made entirely of metal, the same being composed mostly of panels varying in sizes and of appropriate angle irons constituting the different elements as will be explained below, and when the mold is made up of units of this kind it is oiled or greased on the inner surface before the concrete is poured, with the result that the column presents a neat finish and the units of the mold can be taken down without adhering thereto and possibly breaking off pieces as frequently occurs. Moreover, the mold made in units of this kind can be used over and over again indefinitely, and if the units are made in sizes as is contemplated, a mold can be properly set up to cast a column having almost any dimensions within reasonable limits.

With this introductory explanation we come to the details of the invention itself

which are fully set forth in the following specifications and claims, reference being had to the accompanying drawings wherein—

Figure 1 is a perspective view of this mold set up ready for use, illustrating also the troughs T in which the girders are to be molded, and showing how the floor F will finally appear.

Fig. 2 is an elevation of the mold from the inside of the building.

Fig. 3 is a vertical section through the upper portion of the column mold.

Fig. 4 is a plan view thereof.

Fig. 5 is an enlarged sectional detail showing the connection between the panels and one corner post and between the latter and the bars of the clamping frame.

Fig. 6 is a perspective detail of the key for use in these corners.

Fig. 7 is a perspective detail of the key which is used for connecting panels at other points.

Fig. 8 is an enlarged sectional detail showing the lip to be referred to hereinafter.

Fig. 9 is a sectional detail of one panel unit.

Figs. 10 and 11 are details of the angle irons used respectively at the lower end and the upper end of the knee panels.

Fig. 12 is a perspective detail of the extensible support for these panels, and

Fig. 13 is a reduced perspective view showing how the capital of a column section will appear from the interior of the building before the floor slabs are laid.

Referring first to Fig. 13, the column C will have an upright rectangular shaft whereon sharp corners are avoided by the use of a fillet as explained below, and the girders G will be cast integral with the capital of this column at each floor line or in other words at the top of each section of the column itself. At this point the column will be formed on the interior of the building with a knee as shown at K, and the knee will underlie a flange or bead as shown at B, the entire structure forming a reliable support for the floor when it is to be laid and for interior walls which will usually come opposite the columns. At the completion of the section illustrated in Fig. 13, the next section will be erected thereupon, and the column carried upward as indicated in dotted lines. As this specification is not concerned with the formation of the girders, the troughs T employed in constructing said girders are shown in Fig. 1 only. Neither is the contractor who erects the skeleton framework usually concerned with the formation of the floor, and the letter F is used in Fig. 1 as indicating a surface flooring merely for the purpose of illustration.

Coming now to the present invention, the body of this mold is made up of sheet metal panels, each of which (as seen in Fig. 9) is by preference stamped from a sheet 1 having flanges 2 along both sides and both ends, and having a longitudinal rib 3 along its center if it be a full-width panel as shown at the bottom of Fig. 1, or if it be anything but what might be called a medium panel as indicated at 4 in Fig. 1 or a narrow panel as shown at 5. The panels in this view are all of one height or length for four rows, and the panels 6 in the upper row are shorter, the panels 7 being a short unit which is also quite a narrow unit. At the bottom of the front of the mold is shown an extremely small panel 8 which is to be eventually removed for cleaning out the interior, just before the cement is poured. Through the various flanges of the panels of all sizes are formed slots or openings 9 for the passage of connecting devices yet to be described. The outfit will include a large number of these panels, and they will be made in sizes, preferably differing from each other in width at two inch intervals, with a few shorter ones as indicated at 6. With an outfit of this kind the contractor will be able to build sections of columns having almost any dimensions, as required by the specifications.

Four corner posts 10 are first erected, the same being of rather heavy angle iron, as seen in Fig. 5, and with the angles directed inward. The panels are now placed edge to edge and end to end, and the right hand front side panel 11 and the forward right hand end panel 12 eventually reach the angle of the post 10 whose leaves are lapped by their flanges 13. Said leaves are provided at stated intervals with openings or slots similar to those numbered 9 in Fig. 9, and through the registering openings are passed keys 14 as best seen in Fig. 6, the head 15 of the key standing within the angle of the post and the shank projecting alongside the body of a panel. Over this shank is slipped a large opening 16 in a link 17 whose use will presently be explained, and next beyond the link a pin or wedge 18 is driven down through a hole 19 in the key. It might here be stated that the key 24, shown in Fig. 7, has a similar head 25 and hole 29, but the hole is a little closer to the the head because no link is used on this key, the latter being merely for the connection of the abutting flanges of two panels as indicated at 24 at several points in Fig. 1. Similar wedges 28 may be used, or the same wedges 18. In this manner is built up a hollow rectangular form which is to contain the shaft or staff of the column.

For bracing this form against bulging under the pressure of the plastic cement when first poured, I inclose the form at intervals with a clamping frame. This is made up of four angle irons or bars where-

of two numbered 20 run across the outer and inner faces of the mold and two numbered 21 run across its ends, lapping each other as indicated at the left of Fig. 1 in dotted lines and in full lines in Fig. 5 and connected at their lapping points by bolts 22. The links 17 are led outward beyond the leaves of the angle iron post 10 and through appropriate openings in the upright leaves of these two bars, and keys or wedges 28 are driven through holes or slots 27 in these links as shown in Figs. 5 and 6. By preference the end bars 21 are so disposed that their upright leaves lap the meeting ends of the panel units as seen in Fig. 2, but the front and rear bars 20 are a little below such point. In order to very firmly support such points, angle iron knees 23 may be employed, connected with the horizontal leaves of the bars 20 by bolts 26. Obviously however, this arrangement could be reversed and the front and rear bars could lap the meeting ends of the panels while the end bars carried the knees. Thus is formed the mold for the shaft of the column, and it may be carried to any appropriate height. It is made up of panel units of various widths, but all of one height or length until we come to the uppermost series, where shorter units may be used at 6 or full-length units may be herein employed as indicated at 1 in Figs. 2 and 3, the result being that the uppermost tier of panels will project considerably above the upper clamping frame, and may in effect become the lowermost tier of the mold for the next column section. The girder troughs T are now laid, being inset from the front line or face of the column to the desired distance by special panels, indicated at 7.

The capital of the column section calls for the employment of mold units differing slightly from those already described. The outer posts may be carried upward as seen at 10 in the foreground of Fig. 1 and as shown at 10 at the top of Fig. 4, but the inner posts and panels will terminate at the line 30 just above the upper clamping frame 31 which appears in Figs. 2, 3 and 4 but is omitted from Fig. 1. Special panels 32 now carry the sides of the main mold upward to the bottom of the trough T, and a special clamping frame 33 is built across the front, and alongside these panels, and behind the entire structure, the panels 32 being filled out with plates as shown at 34 in Fig. 3, and other special panels or plates 35 being connected up behind the trough T which is omitted from this view. Now a triangular bar 36 see Fig. 10 is brought into place, being laid across the upper ends of the inner panels and inner posts, and ears 37 thereon are passed through openings in the end flanges of said panels and keyed thereto as described above. Inclined panel units 38 are next applied, connected edge to edge, and their lower ends connected to other ears 39 on the bars 36. Fig. 12 shows an extensible support made up of two angle irons 40 and 41 whose inner ends lap each other and may be connected by a bolt or bolts 42 passing through any of the holes with which these bars are provided, and their outer ends may be connected with the plates 34 so that they underlie the knee panels 38, as seen in Fig. 3. Across the upper ends of said panels is bolted the angle iron bar 44 best seen in Fig. 11, the same having extensible sections 45 at one end, preferably made in two inch, four inch and six inch lengths as indicated in Fig. 4 so that this bar may be adapted in length to the width of the knee. The triangular bar 36 will also have these extensible sections at one end for the same purpose; but the uppermost clamping frame 31 will have its rear bar passing beneath the plates 34, and therefore it may project at its ends and will not need these sections. The upper edges of the plates 34 are by preference flanged outwardly as indicated at 47, and the special panels 35 will have their upper flanges alining therewith as seen in Fig. 3; and overlying and secured to all these flanges is an inner pair of channel beams 48 having similar extension sections 49 at their front ends, while their rear ends are connected by a cross channel 50, the same being bolted at 51 to one beam and provided along its other end with holes 52 whereby it may be adjustably bolted to the other beam so that these two beams may be set a desired distance apart. Bolted also at 53 to the cross beam is one member 58 of an outer pair of channel beams, while the other member 59 is shown at right of Fig. 2 as capable of adjustable attachment in some of the holes 52. These several beams form a support for the flooring which is made up of an L-shaped member 54 whose foot has extension sections 55, and a separate foot piece 56 also having extension sections 55, these various sections each having a lip 57 at one edge underlying the adjacent edge of the next section as seen in Fig. 8, and the sections being supported at their inner edges by channel beams 48 and at their outer edges by the channel beams 58 and 59 respectively. The several plates constituting the members of the flooring are provided copiously with bolt holes for attachment to the channel beams as will be clear. Thus is made up the bottom of the mold on which the bead B is to be formed said bead extending around three sides of the knee which of course requires that the members of its bottom shall be adjustable so that they are adapted to columns of different dimensions. While the panels 38 are shown in Fig. 3 as extend-

ing inward at an angle of about 45°, it is clear that the knee need not have its face on exactly this inclination, the angle being regulated by the proper disposition of the upper angle iron bar 44. For the formation of the outer edge of the bead B, a frame is necessary. This is made up of a rear cross bar 60, also of channel iron formation as seen in Fig. 3, a left side bar 61 rigidly connected at 62 to the rear bar, and a right side bar 63 adjustably connected to the rear bar at point 64 by means of a bolt passing through holes 65 with which this bar 60 is provided, as seen in Fig. 2. The side bars of the frame may have extension sections 66 of two inch, four inch and six inches as above described so that they can be adapted to the size of the bead B. The frame when laid upon the flooring occupies the position best shown in Fig. 4, and a fillet 67 is secured within and around the frame as shown in this view and in Fig. 3; in fact, a similar or other form of fillet, as shown in Fig. 5, will be disposed within the corners of the body mold, being held in place by a fastening device such as a nail 68, and these fillets may be used at all proper points to prevent sharp angles in the finished structure. This frame structure as a whole may be bolted upon or otherwise secured to the flooring on which it rests, and the height of the frame bars will regulate the thickness of the bead B. For a thinner bead the cement may be poured to a less depth, and for a thicker bead higher frame bars may be used. If the column is wider or narrower than shown, the inner channel beams 48 will be appropriately adjusted as well as the foot piece 56. If that portion of the bead which projects beyond three sides of the knee K is to be wider or narrower than shown, the frame bars will be properly adjusted upon the flooring.

When all is ready, the metal reinforcing elements are inserted, but as they form no part of the present invention they are not illustrated. It is sufficient to say that they will doubtless extend vertically within the shaft or shank of the column and be carried laterally into the girders and also deflected inward through the knee and carried over into the bead, and some of the upright reinforcing elements will project well above the form shown in Fig. 1 so as to extend up into and eventually be carried upward through the next column section above. The panels 8 are now removed to expose the clean-out opening, and all extraneous matter is removed from the inner part of the mold as set up. The cement mixture is then poured, and doubtless the girders will be formed in the troughs T at the same time. When the cement is set, the structure will be taken down piece by piece, leaving only the uppermost tier of panels as shown at 1 at the top of Figs. 2 and 3, and perhaps the special panels 7, and leaving or removing the troughs T as desired; and the entire mold is carried unit by unit and set up for the next section, the lower ends of the posts being left in place or removed at will. The height of the second story may be not quite so great as that of the first, but this difference can be taken care of by using the shorter special panels 6 or perhaps two tiers of these special panels. At the third story it may be that the size of the column will be reduced, and this can be taken care of by utilizing proper panels. Thus the units of the mold are used over and over again as the work progresses, and each column section leaves a capital at the ceiling line which has the general appearance shown in Fig. 13. It might be added that fanciful fillets could be inserted at any point desired, as for instance those of semi-circular cross section shown at 70 in Fig. 4, which would produce a fluted effect on the face of the column; but this and other details form no part of the present invention.

Having thus described the invention, what is claimed is:—

1. A knockdown mold for forming a column in sections, the same including corner posts, panels connected edge to edge and end to end to form side and end walls of the mold, the edges of said walls being connected with the posts, and clamping frames surrounding the structure at intervals.

2. A knockdown mold for forming a column, the same including corner posts, panels connected edge to edge and end to end to form side and end walls of the mold, the edges of said walls being connected with the posts, clamping frames surrounding the structure at intervals and contacting with said posts, and knees on the frames contacting with said panels and lapping their meeting lines.

3. A knockdown mold including corner posts of angle bars, panels having marginal flanges and contacting edge to edge and end to end to form the wall of the mold, the flanges at the sides of the walls mating with the leaves of said posts and connected thereto, clamping frames surrounding the structure in contact with the upright flanges and leaves of all units which they inclose, and means for supporting said frames.

4. A knockdown mold including corner posts of angle bars, walls made up of panels having side flanges mating with the leaves of the posts, said panels being in tiers with end flanges mating with each other on horizontal lines around the mold, clamping frames made up of bars across the faces and ends of the mold and connected with each other at its corners, all bars contacting with the upright flanges and leaves of units which they cross and one set of bars also contact-

ing with the end flanges along said horizontal lines, and knees on the other set of bars contacting with the remaining end flanges.

5. A mold including walls made up of panels in tiers, outstanding mating end flanges connected with each other on horizontal lines around the mold, means for connecting the walls with each other at the corners of the mold, clamping frames made up of angle bars in two pairs, one set having its upright leaves contacting with the panel flanges on said horizontal lines and its horizontal leaves projecting outward and the other set having its upright leaves out of alinement with the remaining mating panel flanges and its horizontal leaves projecting outward in contact with and attached to the horizontal leaves of the first set, and knees on the second set contacting with said remaining panel flanges.

6. In a mold, the combination of walls with panels having outstanding edge flanges provided with holes, and corner posts of angle bars whose leaves mate with said flanges and are provided with holes; of keys for insertion in registering holes, each key having a head and a hole through its body spaced from the head, a wedge for insertion in said hole, a link having holes through it, the innermost hole receiving said key adjacent its wedge, a clamping frame surrounding the mold and its bars having holes through which said links pass outward, and wedges in the other holes in said links outside the frame bars.

7. The herein described column mold made up of panel units of various sizes and having outstanding marginal flanges provided with holes, each full-size panel having an upright central rib, post units of angle bars whose leaves are of the same width as said flanges and are provided with holes, keys through registering holes in said flanges connecting the panels with each other to form the mold walls and through registering holes in the side panels of the walls and in the leaves of said posts to connect the walls and posts at the corners of the mold, outstanding links carried by the corner keys, clamping frames inclosing the mold at intervals, and connections between said links and frames.

8. The herein described mold for columns comprising corner post units and walls made up of panel units interchangeably connected with each other and with the posts for molding a column shaft of the desired dimensions and in sections of the desired height, and other units supported by said panels and posts and interchangeably connected with each other for molding a capital at the top of each section.

9. The herein described mold for columns comprising corner post units and walls made up of panel units interchangeably connected with each other and with the posts for molding a column shaft of the desired dimensions and in sections of the desired height, other panel units supported by the units mentioned and connected with each other for molding a knee near the top of each section, and still other units supported by the knee units and adjustably connected with each other for molding a bead of the desired dimensions at the top of said knee.

10. The herein described mold for columns comprising corner post units and walls made up of panel units interchangeably connected with each other and with the posts for molding a column shaft of the desired dimensions and in sections of the desired height, upright panels supported by the panel units of two end walls and by the front posts, said upright panels being connected edge to edge and continued beyond the rear posts and the rear side wall to shape the ends of the knee at the head of each section, and other panel units standing between said upright panels and leading obliquely rearward from the upper end of said rear wall to shape the face of said knee.

11. The herein described mold for columns comprising corner post units and walls made up of panel units interchangeably connected with each other and with the posts for molding a column shaft of the desired dimensions and in sections of the desired height, upright panels supported by the panel units of two end walls and by the front posts, said upright panels being connected edge to edge and continued beyond the rear posts and the rear side wall to shape the ends of a knee at the head of each section, a bar connecting the upper ends of said rear posts, their panel units connected to each other edge to edge to fill the space between said upright panels and connected at their lower ends to said bar and leading thence obliquely inward to shape the face of the knee, and a support underlying these units and made up of two sections connected at their outer ends to said upright panels and with their inner ends lapping each other and adjustably connected.

12. The herein described mold for columns comprising corner post units and walls made up of panel units interchangeably connected with each other and with the posts for molding a column shaft of the desired dimensions and in sections of the desired height, upright panels supported by the panel units of two end walls and by the front posts, said upright panels being connected edge to edge and continued beyond the rear posts and rear side wall to shape the ends of a knee at the head of each section, other panel units between said upright panels inclining rearward from the upper end of said rear wall to shape the face of the knee, and still other units supported by said upright

panels and adjustably connected with each other for molding a bead of the desired dimensions at the top of said knee.

13. A mold of the class described comprising upright side and end walls connected edge to edge to form the shaft of a column, each wall being made up of panel units interchangeably connected edge to edge and disposed in tiers to the height of a column section, one unit in the lowermost tier being removable to expose a clean-out opening, certain end panels in the upper tier of each column section being omitted to admit molds for the girders, additional panels connected to the rear edges of the end wall panels in the upper tier and leading inward to form the ends of a knee at the capital of said section, and still other panels between said additional panels leading inward from the upper edge of the inner wall to shape the face of said knee.

14. In a structure for forming plastic columns in sections, a mold comprising walls made up of units interchangeably connected for shaping the shaft of each section to the desired dimensions and of the desired height; combined with a mold made up of other units interchangeably and adjustably connected with each other and supported by the units of the shaft mold for forming a capital for each section to include a knee projecting from the inner face of such section and a bead at the top of the knee overhanging its inner face and both its ends.

15. In an adjustable structure for the purpose described, the combination with a mold for forming an upright shaft of the desired dimensions; of upright panels connected edge to edge and carried by the end walls of said mold and extended beyond its inner wall, oblique panels carried by said inner wall and interchangeable to fill the space between said upright panels, beams carried by the upright panels, a flooring overlying said beams, and an adjustable frame mounted on said flooring.

16. In an adjustable structure for the purpose described, the combination with a mold for forming an upright shaft of the desired dimensions; of upright panels connected edge to edge and carried by the end walls of said mold and extended beyond its inner wall, oblique panels carried by said inner wall and interchangeable to fill the space between said upright panels, channel beams carried by the upright panels, a cross beam rigidly connected to the rear ends of one channel beam and adjustably connected to the rear end of the other, additional beams carried by said cross beam, an L-shaped flooring supported by said beams, a separate foot-piece duplicating the foot of the L, both foot-pieces having extension sections, and an adjustable frame mounted on said flooring.

In testimony whereof I affix my signature.

AMOS W. EACHES. [L. S.]