Feb. 24, 1959 A. HENDERSON 2,874,442

APPARATUS FOR MAKING CONCRETE STRUCTURAL SHAPES

Filed June 13, 1955 2 Sheets-Sheet 1

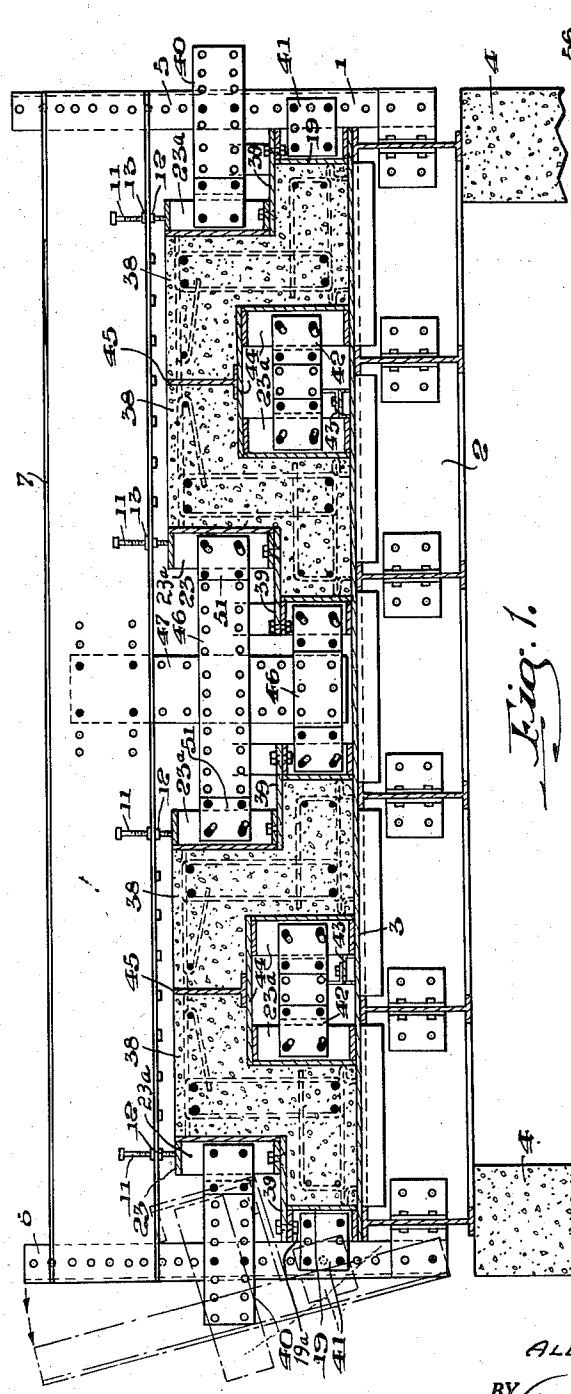


Fig. 1.

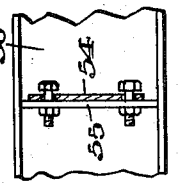


Fig. 5.

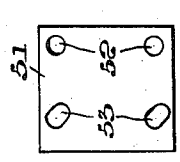


Fig. 6.

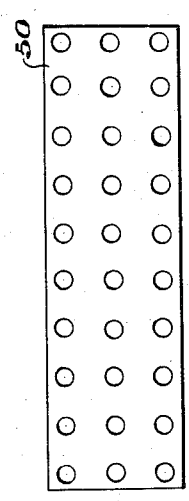


Fig. 4.

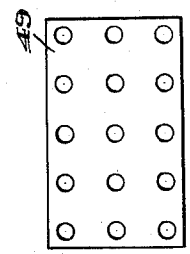


Fig. 3.

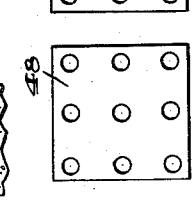


Fig. 2.

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APPARATUS FOR MAKING CONCRETE STRUCTURAL SHAPES

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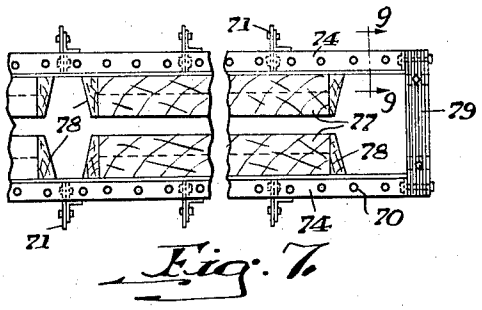



Fig. 7.

Fig. 8.

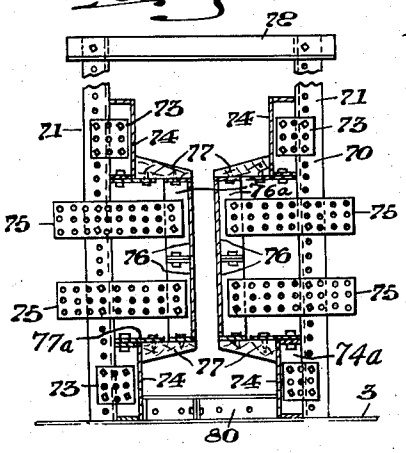
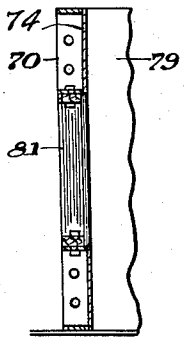



Fig. 9.




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2,874,442

# APPARATUS FOR MAKING CONCRETE STRUCTURAL SHAPES

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Application June 13, 1955, Serial No. 514,818

2 Claims. (Cl. 25—118)

This invention pertains to an apparatus comprising a steel flat topped casting bed having means thereon for rigidly and accurately positioning on the bed detachable mold side walls.

The apparatus makes reinforced concrete structural shapes for use as building members such as columns, beams, floor or roof slabs, wall panels, etc.

My invention has for its primary object the provision of mold apparatus of forms whereby structural shapes such as those mentioned in the preceding paragraph, and particularly shapes of I-beam form, may readily be made to various dimensions in their web and flange portions either conjunctively or selectively, by molds or forms that are conveniently adjustable to a wide range

The casting beds are made of structural steel frames having a flat plate welded or bolted to the top of the frames. The casting beds may suitably be 12 ft. wide and 30 ft. long and may be bolted end on end so as to extend as much as several hundred feet. The beds have perforated steel standards spaced along both sides and secured thereto. The standards support perforated steel hold-down beams which are horizontal and are adjustable above the beds.

On the casting beds are placed spaced steel mold side walls which are adjustable horizontally by the use of perforated steel plates secured to the mold side walls and to the standards. Set screws in the hold-down beams clamp the mold side walls against the flat plates of the casting beds. The sides of the casting beds, which are mounted on foundations, provide a straight, accurate and rigid base line which will always assure straight and accurate mold side walls, because the mold side walls are secured by standardized perforated steel plates to the perforated steel standards secured to the sides of the casting beds.

The concrete structural shapes each have uniformly graduated widths and depths. The variations in widths and depths being a common multiple of two inches and the heights and widths of the mold side walls are also common multiples of two inches, and the spacing of the holes in the perforated spacer plates and in the perforated steel standards and hold-down beams is also two inches.

This 2-inch standard spacing and its relation to the widths and depths of the mold side walls and concrete structural shapes is of vital importance, because it reduces labor costs in the casting operations and assures accuracy when the mold side walls are bolted to the spacer plates and standards, and the 2-inch spacing in the hold-down beam assures that the set screws in the hold-down beam will engage the tops of the mold side walls at their middle point, so that full pressure can be applied to the top of the mold side walls and thus prevent leakage under the mold side walls and also prevent the side walls from moving in vertical or horizontal directions. The spacing of the holes in the plates in both directions is a multiple of two inches.

The lengths of the mold end walls are common multiples of the spacing of the holes in the spacer plates,



and the sum total of width of said mold side walls and the sum total of the lengths of said end mold walls all being a common multiple of the spacing of the holes in the spacer plates.

The mold side walls are made from welded plates and are channel shaped. There are three sizes of mold side 2" high, 8" high, and 12" high, and are all 4" wide. They have perforated steel ribs welded to the webs and legs of the channel-shaped mold side walls. Holes are spaced along the centers of the legs in the mold side walls and the holes in the ribs also are centered at the middle of the mold side walls.

The spacing of the holes in the ribs and legs of the mold side walls is also a common multiple of two inches and the spacing between the ribs extending along each mold side walls is also a common multiple of two inches. The spacing of the standards along the sides of the casting beds is also a common multiple of two inches, and the distance between the spaced holes in one standard to the spaced holes in the opposite standard across the bed is also a common multiple of two inches. I make slotted holes in some of the plates, to provide fractions of two inches, if required.

I cast my precast reinforced concrete channel-shaped slabs upside-down, so that the slabs can have an accurate flat surface free from trowel marks, and to assure accurate depths of the legs of the slabs. This is important, because it is difficult to get a true flat surface by screeding and trowelling, and when the slabs are set in position, it is vital that the surfaces of adjacent assembled slabs be absolutely level. It is an easy matter to get exact depths of the legs at the slab ends where the slab rests on its supports when the slab is cast upside-down, since the bearing area of the slab is only a few square inches and can easily be leveled to the exact depth. The casting of the slabs upside-down also means that the costly inside and outside mold side walls can be removed quickly and not be tied up, as would be the case if the slabs were cast in the reverse position. When cast upside-down, none of the slab concrete is in bending action and all of the concrete, being in compression, makes for quick removal of the mold side walls. If not cast in the upside-down position, the web and cross beams in the slab would be under bending action and the core or inside form walls would have to stay until the concrete attained enough strength to be self-supporting.

I provide end mold walls by using short lengths of the standard mold side walls and using the standard spacer plates to rigidly hold the end mold walls, by bolting the spacer plates to the tops of the short lengths and long lengths of the mold side walls. The end-wall plate that is in contact with the end of the concrete shape is adjustable, so that fractions of two inches can be obtained.

The precast reinforced concrete shapes for which this apparatus can be used are rectangularly-shaped, channel-shaped, Z-shaped, and I-shaped, and are fully described in my pending application Precast Reinforced Concrete Structural Shapes and Their Assemblies, Serial No. 470,674, filed November 23, 1954.

In the accompanying drawings:

Figure 1 shows a cross section through one form of concrete casting bed for casting Z-girders, concrete Z-girders being shown in position therein.

Figures 2, 3 and 4 show various types of connecting plates for the mold members employed in conjunction with the apparatus.

Figure 5 shows a connecting plate with angular slots.

Figure 6 is an elevational view of a portion of a mold wall shown in association with a connecting plate, the latter being shown in section.

Figure 7 is a plan view of a modified form of mold for molding I-beams.

Figure 8 is a cross sectional view of the mold of Figure 7.

Figure 9 is a cross sectional view through a mold side wall as shown in Figure 7 by the section lines 9—9.

Referring now to the drawings in detail, Fig. 1 shows a cross section of the concrete casting apparatus, with the mold side walls 23 and 19 which are provided with outwardly extending flanges 23*a* and 19*a*, respectively assembled on the casting bed plate 3, to make reinforced concrete Z-girders 38. Plates 39 which form horizontal mold side walls support the mold side walls 23 and serve also to mold the tops of the lower legs of the girders 38. Long plates 40 are attached to the upper mold side wall 23 and the standards 5. The standards 5 can be hinged on one bolt and thus can be moved outwardly, bringing with them the short plates 40 and the mold side walls 23. Also, plates 41 are attached to mold side walls 19 and standards 5 can be moved outwardly as shown on the dotted lines.

The inner mold side walls 23 are tied together by plates 42. A wedge member 43 can be used to push up the plates 42 and release mold side walls 23. Plates 44 are loosely positioned on the mold side walls 23. Dividing plates 45 are secured to the plates 44. Plates 46 are secured to the mold side walls 23, and vertical plates 47 are secured to the plates 46 and the hold-down beam 7. When the standards 5 are moved outwardly, the hold-down beam 7 can be elevated, thus simultaneously releasing and elevating the plates 46 and 47, and also the mold side walls and plates 39.

Figs. 2, 3 and 4 show spacer plates 48, 49 and 50 of various lengths and each having horizontally and vertically-spaced holes at 2" center-to-center spacing. The holes are large enough to receive ¾" bolts. The center-to-center spacing of these holes, longitudinally, is always equal to the increment in the depths of the uniformly-graduated depths of the concrete structural shapes.

Fig. 5 shows a spacer plate 51 with spaced holes 52 that are spaced on 4" centers, and its slotted holes 53 are sloped, to permit the plates to be released when the plates 51 are bolted to the mold side walls as in Fig. 1. The distance between the holes 52 and the holes 53 is approximately 4". When the plate 51 is attached to a mold side wall rib, the spacing between centers of the holes in the ribs of the mold side walls to the centers of holes 52 is a common multiple of the spacing of the holes in plates 48—49—50.

Fig. 6 shows spacer plate 54 bolted to a rib 55 of a mold side wall 56.

Figures 7, 8 and 9 show a modified form of construction comprising an adjustable mold 70 for making concrete I-beams, resting on the bed plate 3. Angle standards 71 are braced by spacer plates to standards 5 (not shown). A removable crosstie 72 is bolted to the angle standards 71 and short spacer plates 73 secure the upper and lower flange-forming mold side walls 74 to the standards 71. Mold side walls 74 have outwardly extending flanges 74*a*. Adjustable long spacer plates 75 are bolted to the vertical angle standards 71 and also bolted at their opposite ends to outwardly extending flanges 76*a* of web-forming mold side walls 76. Long spacer plates 75 are provided with rows of horizontally spaced apertures through which bolts may be selectively passed to secure and regulate the lateral position of the web-forming mold side walls 76 relative to the standards 71. Bevelled wood blocks 77, carried by horizontal plates 77*a* form substantially horizontal mold walls, the plates being bolted transversely between the flange-forming mold side walls 74 and the web-forming mold side walls 76. Tapered end wood blocks 78 are nailed to blocks 77. A removable end wall 79 is suitably bolted to the flange-forming mold side walls 74. Bottom mold walls or pallets 80 which can be made in single or multiples of the standard mold side walls may be provided if desired or the bed plate 3 may form the bottom mold wall. A splice mold wall 81 is bolted to the side walls 74.



I claim as my invention:

1. Apparatus for molding concrete beams of various sizes comprising a bed for supporting mold walls at various positions of horizontal adjustment thereon, vertical standards mounted on said bed, said standards each having a vertical row of spaced apertures therein, oppositely disposed mold side walls spaced from said standards and having confronting inner faces cooperating with one another to form a mold cavity, each mold side wall comprising a first vertical mold wall and a second vertical mold wall horizontally offset relative to one another and to said standards and having their adjacent longitudinal edges lying in the same horizontal plane, and a substantially horizontal mold wall fixed to the first vertical mold wall offset farthest from said standards and secured to the other of said vertical mold walls, connecting said adjacent longitudinal edges and forming a part of said mold cavity, spacer plates having horizontal rows of aligned apertures therein, means extending through selected aligned apertures in said vertical row of apertures in said standards and said horizontal rows of apertures in said spacer plates for securing said spacer plates to said vertical standards at selected positions of vertical and horizontal adjustment, flanges having apertures therein on the outer sides of said vertical mold side walls, means extending through said apertures in said flanges and the adjacent end apertures in said horizontal rows of apertures in said spacer plates connecting said mold walls to said spacer plates.

2. Molding apparatus for forming I-beams in various sizes wherein the web portions of the beams are integrally cast to the upper and lower flanges thereof, said apparatus comprising spaced vertical web-forming mold side walls that extend horizontally a distance to form a beam of a desired length and positioned to form the web of the I-beam, apertured vertical standards for said web-forming mold walls, positioned at spaced points longitudinally of said web-forming mold walls, upper and lower flange-forming mold walls carried by the vertical standards above and below the web-forming mold walls, horizontally positioned blocks mounted on plates forming substantially horizontal mold walls connecting adjacent longitudinal edges of said web-forming mold walls and said flange-forming mold walls, each of the spaces between the upper and lower flange-forming mold walls communicating with the space between the web-forming mold walls, long spacer plates having perforations at horizontally spaced points and securing means selectively extended through the perforations adjacent an end of the spacer plates to secure said spacer plates to the web-forming mold walls, said long spacer plates being horizontally adjustably secured through selected other perforations to the said apertured vertical standards for positioning the web-forming mold walls toward and from one another at various horizontal distances, outwardly extending apertured flanges on said flange-forming mold walls, additional apertured short spacer plates secured to said last-mentioned flanges, said additional short spacer plates being secured through selected apertures in said vertical standards for vertical adjustable mounting in order to form flanges of various depths, said first-mentioned spacer plates being also secured through selected apertures in said vertical standards to render the web-forming mold walls vertically adjustable.

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