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APPARATUS FOR PRECASTING CONCRETE PILES

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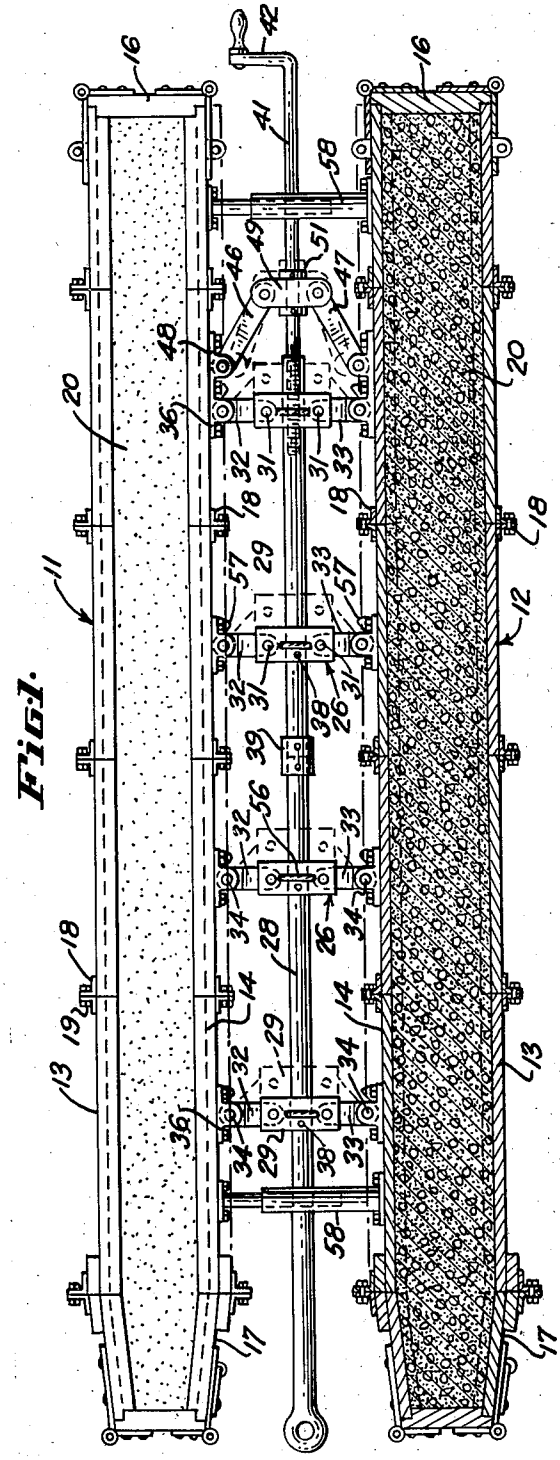


Fig. 1.

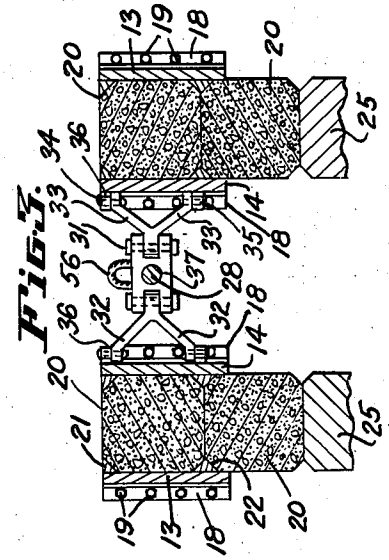


Fig. 3.

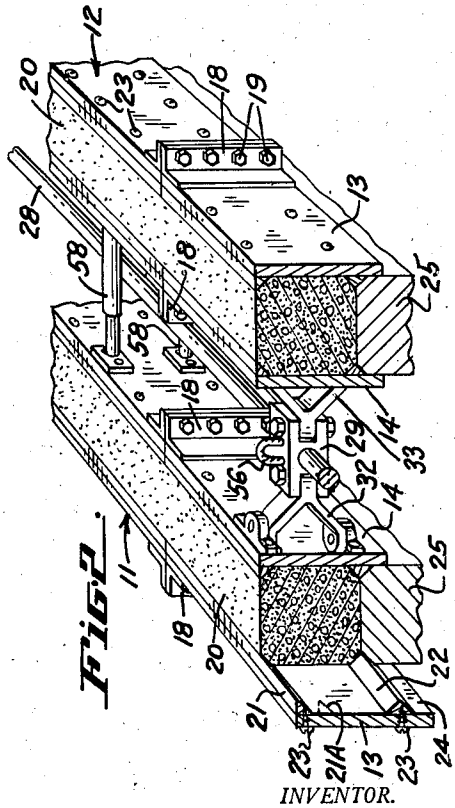


Fig. 2.

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APPARATUS FOR PRECASTING CONCRETE PILES

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1 Claim. (Cl. 25—121)

The invention, in general, relates to the production of structural pillars, columns, piles and the like. More particularly, the invention relates to an improved method of and equipment for manufacturing pre-cast concrete piles or other structural elements serving as foundations for superstructures, as well as for the production of smaller articles or devices such as conduits, or tubes, or like structures.

While my invention is entirely suitable and adaptable for forming or pre-casting a variety of different types of devices as above indicated, the present embodiment of my invention has been especially devised for use in the manufacture of pre-cast concrete piles of indeterminate length and height. Accordingly, my improved method and equipment will be described in the latter environment.

A primary object of my invention is to provide equipment for pre-casting concrete structural pillars, columns, piles and other elements of predetermined cross-section but of indeterminate length and height.

Another object of the present invention is to provide improved pre-casting moulds and associated apparatus for carrying out my improved method of pre-casting without likelihood of warpage of moulds during the manufacture of concrete piles or the like.

A still further object of the invention is to provide an improved apparatus of the indicated nature which is relatively inexpensive to manufacture and which is rugged and positive in operation or use.

Another object of my improvement is to provide novel means for pre-casting concrete piles which reduces the handling of moulds to a minimum as well as appreciably reduces the labor required for dismantling and re-positioning moulds to produce concrete piles of indeterminate heights.

The foregoing and other objects are attained in a preferred embodiment of my invention which is illustrated in the accompanying drawing. It is to be understood that I am not to be limited to the precise embodiment shown, nor to the precise arrangement of the several parts of the apparatus, as my invention, as defined in the appended claim, can be embodied in a plurality and variety of forms.

Referring to the drawing:

Figure 1 is a top plan view, partly in section, of a preferred embodiment of the present invention.

Figure 2 is a fragmentary perspective view of the preferred embodiment of my invention.

Figure 3 is a cross-sectional view of the preferred embodiment of the invention, this view showing the equipment in an elevated position after two structural elements have been produced and the apparatus re-positioned for increasing the height of the initially produced elements.

In its preferred form, the pre-casting apparatus of my invention for manufacturing pre-cast concrete piles, pillars, columns and the like preferably comprises a pair of separate moulds for receiving the material, such as concrete, of which the structural supporting elements are to be made; each of said moulds including an inner side wall, together with a spacer assembly which includes the inner side walls of said moulds as well as a plurality of spacer members arranged at spaced distances longitudinally of said moulds; each of said spacer members being adapted to exert pressure against opposite inner side walls of adjacent moulds to hold said walls rigidly in position during the setting of the material in the moulds, and means for actuating all of said spacer members simultaneously whereby the pressure against said inner side walls is relieved throughout their entire lengths in one operation.

While I have illustrated but two moulds in the accompanying drawing, it is to be understood that a multiplicity of structural supporting elements, such as pre-cast concrete piles, can be produced substantially simultaneously simply by duplicating these moulds, in pairs and in parallel relationship, over an extensive area. In other words, the number of concrete pillars, columns or piles that can be manufactured more or less simultaneously is dependent only upon the available space and prepared flooring therefor, as well as the number of pairs of parallel arranged moulds and associated apparatus of my present improvement.

As illustrated in the accompanying drawing, the improved pre-casting apparatus of my present invention includes a pair of similarly constructed moulds 11 and 12 into which the material of which the structural supporting element is to be made may be poured. These moulds 11 and 12 are so constructed as to be readily extensible in length in order to accommodate average lengths of concrete piles, such as fifty feet, or to produce concrete piles of any desired length ranging from fifty feet to one hundred feet or greater. Each of the moulds 11 and 12 consists of an outer, sectional side wall 13 and an inner sectional side wall 14, together with a flat wall end piece 16 and a tapering nose or end piece 17, the latter being shaped to the form desired

to provide for entering the sub-strata into which the pile may be driven and seated. Preferably, each of the sections of the side walls 13 and 14 of both moulds is made approximately ten feet in length, and these sections preferably are fabricated of relatively strong, cross-grained plywood presenting smooth, straight inner surfaces throughout. Any suitable means can be employed for uniting the sections of the side walls of the moulds but I preferably utilize a pair of angle irons 18 at each joint between adjacent sections, together with suitable screw-bolts 19 for fastening the legs of the angle irons together so that the sections of each side wall of each of the moulds are detachably connected and the side walls thus can be readily extended to the desired lengths. Since it is customary to build concrete piles of square cross-section with beveled corners, as shown in the drawing and designated by the reference numeral 20, each of the moulds 11 and 12 can be made to square cross-section and I provide suitable shaped strips 21 and 22 on the inner surfaces of the side walls 13 and 14 in order to afford the beveled corners upon the ultimately formed or cast structural supporting element 20. Strips 21 and 22 preferably are cut from hardwood and are detachably fastened in position by means of suitable screws 23. As particularly illustrated in Figure 2 of the drawing, strips 22 are fastened to the inner surfaces of both side walls 13 and 14 a short distance above the bottoms of such walls so that a portion of each of these walls, as indicated by the reference numeral 24, extends to the base of a prepared flooring or board 25 upon which the poured concrete seats. For producing a square cast concrete pile of predetermined cross-section, the strips 21 are so fastened to the inner surfaces of the side walls as to have their upper surfaces flush with the upper surfaces of these side walls, as shown in Figure 2 of the drawing. In the event that it is desired to produce with these same moulds a square cast concrete pile of less cross-section, the two side walls 13 and 14 of the moulds can be moved closer together and the strips 21 lowered correspondingly to provide for the square concrete pile of such lesser cross-section, the new or lowered position of strips 21 being indicated by the dotted line showing in Figure 2 of the drawing and designated by the reference numeral 21A.

In accordance with my invention, I provide a spacer assembly in my improved apparatus which serves not only to space the moulds 11 and 12 apart and to hold the inner walls 14 of adjacent moulds rigidly in position under sufficient pressure to maintain the poured material in place during the setting thereof, but also serves to relieve the pressure on such inner walls 14 all along their lengths at one instant and in a single operation thus avoiding all likelihood of warpage of the moulds which otherwise would occur should such side walls be loosened, or the pressure thereon relieved section by section as in present practice of pre-casting concrete piles. The spacer assembly is so constructed that it can be lifted as a unit, such as by cranes where long piles are being manufactured, and shifted to a new position or elevated for increasing the height of the piles, as desired. As shown, the spacer assembly of my improved pre-casting apparatus includes as a part of the same both of the inner side walls 14 of adjacently positioned moulds 11 and 12. The assembly also includes a plurality of separate spacer members 26 which are all connected together by a sectional actuating rod 28, and which are spaced apart substantially equal distances longitudinally of the moulds. Each of the spacer members 26 preferably includes a central casting 29 to which are pivotally connected, by means of pivot pins 31, a pair of opposed, bifurcated arms 32 and 33 which are pivoted at their outer ends, by means of pivot pins 34 and 35, to spaced lugs 36 secured to the outer surfaces of the inner side walls 14 of the moulds adjacent the top and bottom thereof. Each of the central castings 29 of the spacer assembly is cored, as at 37, so that sections of the actuating rod 28 may be tapped thereinto, and pins 38 are provided for rigidly securing the castings 29 to the rod sections that are tapped therein, with the exception of the end casting as hereinafter explained. Preferably, the rod 28 is made hollow with the sections thereof joined together by suitable unions 39. In addition to the hollow sections of rod 28, I provide a solid steel rod section 41 as an extension of actuating rod 28 for moving the castings 29 and their associated elements simultaneously; the rod section 41 being threaded at its inner end for threaded engagement with not only the threaded core 37 of end casting 29 adjacent the rod section 41, but also for threaded engagement with the adjacent threaded end of an end rod section of the actuating rod 28. Section 41 of the actuating rod is conveniently provided with a suitable crank 42 to facilitate rotation of the rod.

In addition to the inner side walls 14 of the two moulds and the spacer members 26, the spacer assembly of my improved apparatus includes means associated with the solid rod section 41 of the actuating rod, and acting in conjunction therewith, to effect simultaneous movement of all spacer members 26. These means include four separately mounted arms arranged in pairs on each side of the rod section 41 one above the other, the showing of Figure 1 of the drawing only depicting the upper arms 46 and 47 of each pair in this group. Arms 46 and 47 are pivotally connected at their one ends to extensions 48 formed on lugs 36 which are secured to the inner side walls 14 of the moulds, and are pivotally connected at their other ends to links 49 carried by a sleeve 51 secured to the rod section 41 of the actuating rod. It will be clear from this construction and the showing of Figure 1 of the drawing, that rotation of crank 42 to tighten the rod section 41 into the threaded core 37 of the adjacent end casting 29 of the spacer assembly will draw the castings and their associated arms 32, 33, as well as the arms 46, 47 and links 49 to the positions indicated by the dotted lines in Figure 1. Clearly, the movement of all spacer members 26 is simultaneous, and at once relieves the pressure on the inner side walls 14 throughout their entire lengths. Since the arms 32, 33, 46 and 47 are all connected to lugs 36 and extensions thereof, which are secured to the side walls of the moulds, such inner side walls 14 will be drawn toward one another, or away from the cast concrete piles, upon tightening of the rod section 41 into the core of end casting 29 adjacent to such rod section, all as indicated by the dot and dash lines of Figure 1 showing the loosened positions of such inner side walls. Once the pressure has been relieved on such inner side walls, and this is done of course only after a predetermined time interval to insure the setting of the concrete in the moulds, the entire spacer assembly can be lifted as a

unit and moved to a new position, such as indicated in Figure 3 of the drawing, in order to increase the height of the initially produced cast piles. For convenience in lifting the spacer assembly, each of the castings **29** of the separate spacer members **26** is provided with a bale **56** which may consist of a loop of cable that can be cast into the castings **29** as a part thereof. In order to limit the movement of the spacer members **26** when the pressure on the inner side walls **14** of the moulds is relieved, I provide short abutments **57** on each of the lugs **36** against which the arms **32** and **33** strike as they are moved to the dotted line positions of Figure 1 of the drawing. It is of course clear that turning of crank **42** in the opposite direction will effect simultaneous movement of all spacer members **26**, including the castings **29** and their associated parts, as well as the linkage **46**, **47** and **49**, back to the positions indicated by the full line showings of Figure 1 of the drawing, wherein the arms **32** and **33** of the spacer members **26** are in a straight line exerting pressure against opposite inner side walls **14** of the adjacent moulds **11** and **12**. It may also be observed that each of the outer side walls **13** of each end or outer mould of the pairs of moulds, regardless of the number of pairs of parallel arranged moulds employed in producing a plurality of pre-cast concrete piles, is of course braced with a plurality of suitable rods, all not shown, to compensate for the pressure applied against the inner side walls **14** of each mould by the arms **32**, **32** of the spacer members.

To prevent longitudinal movement or shifting of the inner side walls **14** of adjacent moulds relative to one another, I fasten four tie-rods **58** across these side walls adjacent to the longitudinal extremities thereof, as shown. Preferably, the tie-rods **58** are arranged in pairs one above the other and since the spacer assembly of my improved pre-casting apparatus functions to draw the inner side walls **14** of adjacent moulds toward each other when relieving the pressure thereon in readiness for dismantling and repositioning of the moulds and spacer assembly, each of the tie-rods **58** is made of two telescopic sections, as shown, to allow for such movement of the inner side walls **14** of the moulds.

The apparatus described herein affords an improved mode of pre-casting concrete piles over present methods in general use, in that it affords simultaneous relief of pressure along the entire length of the inner side walls of the moulds in a single operation, rather than relief of pressure section by section or at isolated points, as in present practice, thus preventing warping of the moulds entirely. My improved method of pre-casting concrete piles will be exclusively used on defense projects of this country for the duration of the current war.

It is to be understood that the appended claim is to be accorded a range of equivalents commensurate in scope with the advance made over the prior art.

I claim:

Pre-casting apparatus for manufacturing pre-cast concrete piles, said apparatus comprising a pair of separately disposed moulds of indeterminate length for receiving the material, such as concrete, of which the structural supporting elements, such as piles, are to be made; said moulds being arranged in parallel relationship and each including an extensible inner side and an extensible outer side, a spacer assembly between said inner side walls of said moulds including a plurality of separate spacer members arranged at spaced intervals longitudinally of said moulds; said spacer members each comprising a central casting, a pair of opposed bifurcated arms pivotally connected to opposite sides of said castings, a pair of lugs secured to each of said inner side walls of said moulds adjacent the tops and bottoms thereof in line with said castings, and pivot pins connecting said arms to said lugs, and means for moving all of said castings simultaneously in either one or the other of two opposite directions, movement of said castings in one direction affording the application of pressure by said arms against opposite inner side walls of adjacent moulds adjacent the tops and bottoms thereof while movement of all of said castings in the opposite direction effects the relief of all pressure on said inner side walls instantaneously and throughout their lengths in a single operation.

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