

June 16, 1925.

1,542,037

C. E. CORTES

PROCESS OF AND APPARATUS FOR MAKING CONCRETE STRUCTURES

Filed March 8, 1922

2 Sheets-Sheet 1

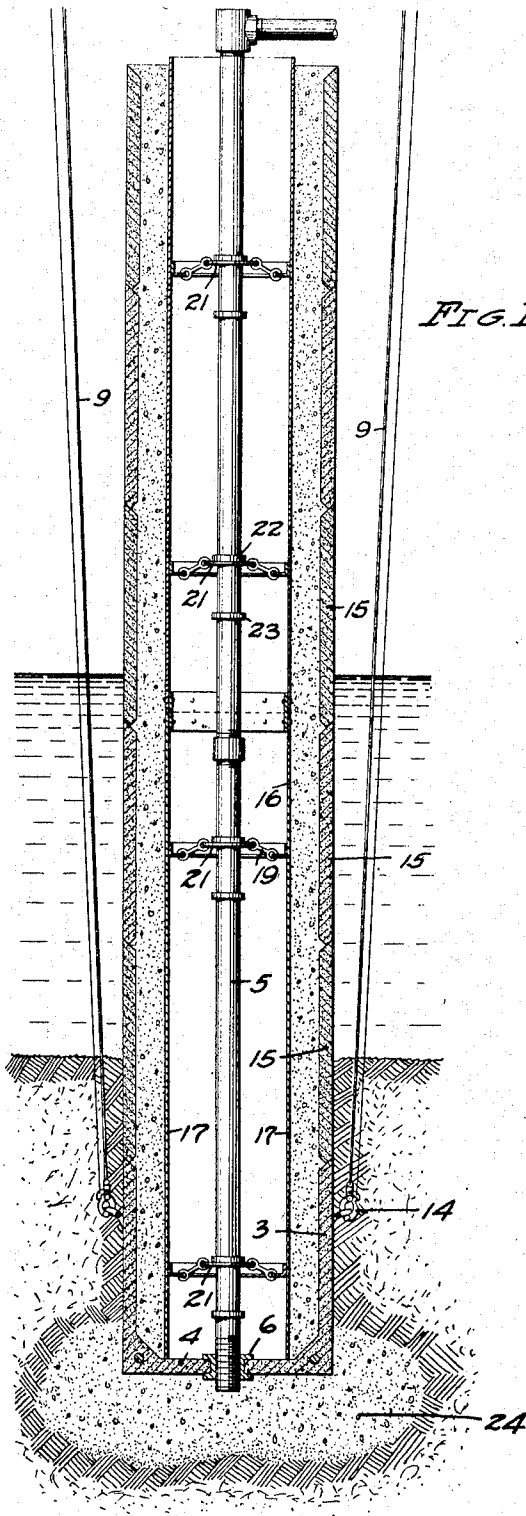
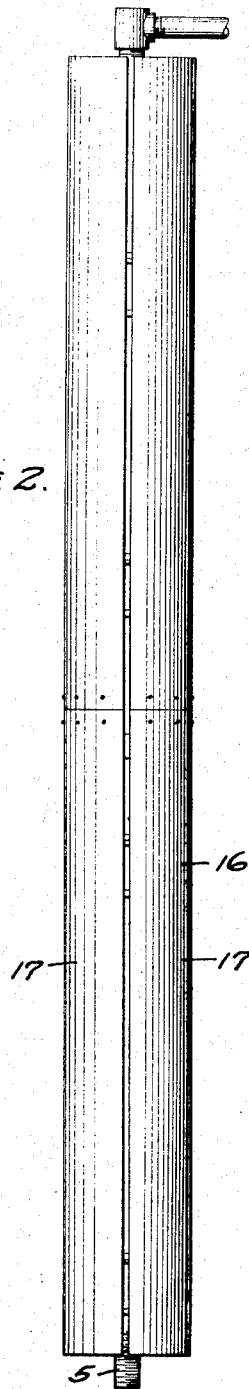


FIG. 1.

FIG. 2.



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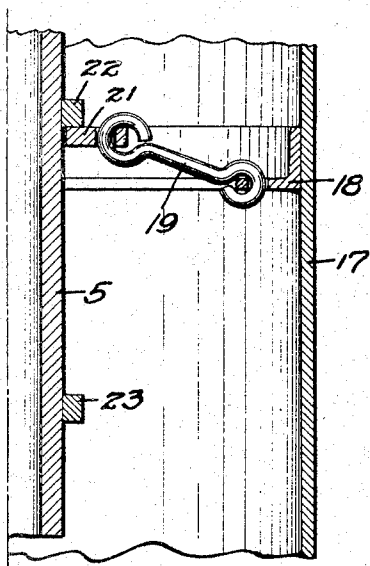


FIG. 3.

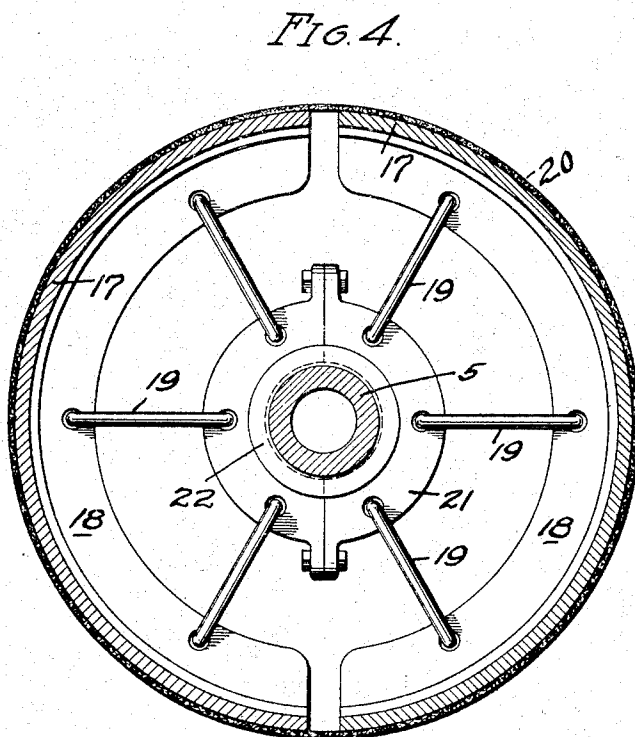


FIG. 4.

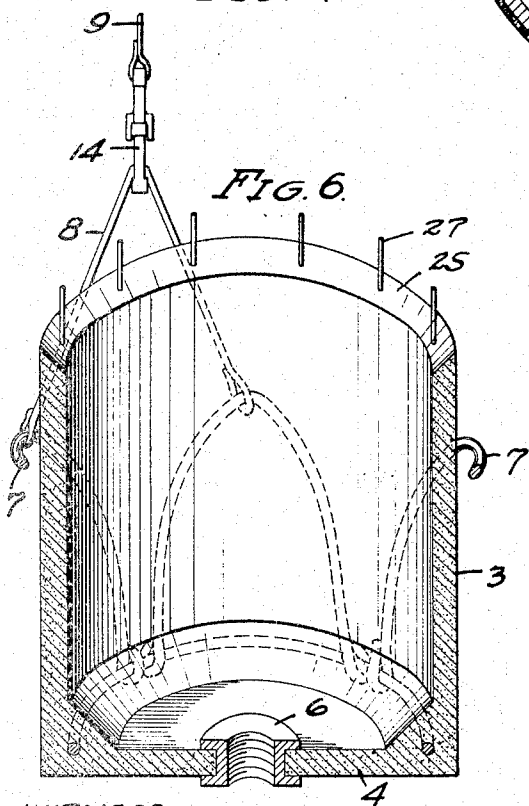


FIG. 6.

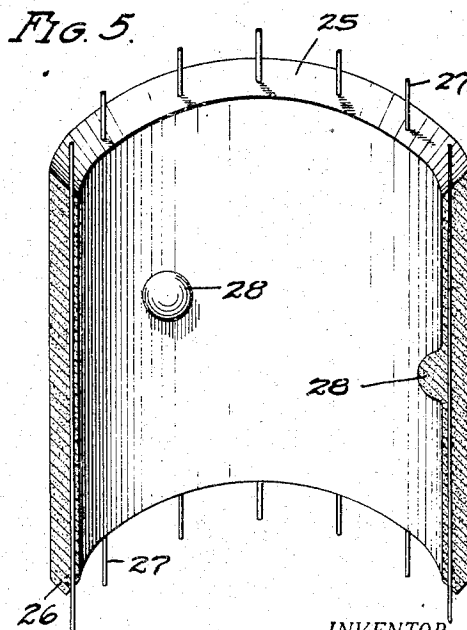


FIG. 5.

WITNESS:

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UNITED STATES PATENT OFFICE.

CARLOS E. CORTES, OF MARTINEZ, CALIFORNIA, ASSIGNOR TO SHELL COMPANY OF CALIFORNIA, A CORPORATION OF CALIFORNIA.

PROCESS OF AND APPARATUS FOR MAKING CONCRETE STRUCTURES.

Application filed March 8, 1922. Serial No. 542,029.

To all whom it may concern:

Be it known that I, CARLOS E. CORTES, a citizen of the United States, and a resident of Martinez, Contra Costa County, State of California, have invented a certain new and useful Process of and Apparatus for Making Concrete Structures, of which the following is a specification.

The invention relates to concrete structures formed in situ, and particularly to concrete piles.

An object of the invention is to provide a method of making hollow or solid concrete piles in situ.

Another object of the invention is to provide a method of forming a concrete footing under the pile after it has been formed.

A further object of the invention is to provide an apparatus for forming a hollow or solid concrete pile in situ under water.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, where I shall outline in full, the process of my invention and that form of the apparatus which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of the apparatus of my invention, but it is to be understood that I do not limit myself to such form, since the invention, as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is a vertical section through a hollow concrete pile in construction.

Fig. 2 is an elevation of the collapsible mandrel.

Fig. 3 is a vertical section through a portion of the mandrel showing the means employed for expanding and contracting it.

Fig. 4 is a transverse section through the mandrel.

Fig. 5 is a perspective view of a half section of a concrete casing section.

Fig. 6 is a perspective view of a half section of the lower casing section.

My invention relates particularly to the construction of hollow or solid concrete piles in situ. These piles may be circular or rectangular in cross section, and in the drawings, for the sake of convenience, I have shown the application of the invention to

the formation of a cylindrical pile, but it is to be understood that the invention is equally applicable to the formation of piles of other cross section. The pile of my invention may be hollow or solid and in making a solid pile, a hollow pile is first formed and the core then filled with concrete. In accordance with my invention I employ a plurality of concrete casing sections of the desired form. These casing sections are preferably formed by placing the concrete thereof by impact, so that a very dense homogeneous concrete is formed. This is usually accomplished by forming the casing sections on a mold or form by the use of a cement gun, and rotating the form during the application of the concrete so that a dense, uniform, impervious casing is formed. The finished casing sections are arranged in superposed relation about a core or mandrel and the space between the mandrel and the casings filled with concrete and the mandrel removed after the concrete has set.

In forming a concrete pile in situ I employ a lower concrete casing section 3 having a bottom 4 through which a pipe 5 extends and with which the pipe is associated. In the drawings I have shown the section provided with a concrete bottom 4 having a threaded metallic bushing 6 fitted centrally therein, with the pipe 5 threaded into the bushing. When a metallic bottom is used the threads may be formed directly in the bottom and the bushing omitted. Embedded in the concrete of the casing section 3 and extending from the sides thereof are metallic bails 7 to which slings 8 are attached. Supporting cables 9 are connected to the slings by releasable hooks 14 and during the construction of the pile it is supported by the cables 9.

Arranged on the lower section 3 are one or more concrete casing sections 15 which form the outer shell of the finished pile. Disposed within the shell formed by the superposed sections is a concentric collapsible mandrel 16 mediatey connected to the pipe 5, movement of which controls the expansion and contraction of the mandrel. The mandrel shown comprises two semi-cylindrical shells 17 having their adjacent vertical edges contiguous when the mandrel is collapsed. Secured to each shell, at

spaced points perpendicularly, are circumferentially disposed angles 18 to which are connected a plurality of links 19. The other ends of the links associated with the angles
 5 lying in a horizontal plane are connected to a ring or collar 21 surrounding and free to move with respect to the pipe 5. In the present construction, these links incline upwardly from the shells to the collar, so that
 10 downward movement of the collar with respect to the shells, expands the mandrel and upward movement of the collar with respect to the shells, collapses the mandrel. The expansion and collapse of the mandrel is
 15 effected by longitudinal displacement of the pipe 5 with respect to the mandrel and this displacement of the pipe is produced by rotating the pipe in the threaded bushing 6. Fixed to the pipe above each collar 21 is
 20 a collar 22 and fixed to the pipe below each collar 21 is a collar 23. The vertical spacings of the collars 22 and of the collars 23 is the same as the vertical spacing of the collars 21, so that when the pipe is moved
 25 longitudinally with respect to the mandrel, all of the collars 21 are engaged by either the collars 22 or 23 at the same or substantially the same time, causing a uniform expansion or contraction of the mandrel
 30 throughout its length. The mandrel and the pipe are formed in sections, which are connected together to increase the length of the structure as the formation of the pile progresses.
 35 In starting to form a pile, a bottom section and one or more superposed sections 15, with the associated mandrel structure, are supported by the cables 9, above the level of the water. The mandrel is in its
 40 expanded condition and is sheathed with a layer of building paper 20, particularly at the joints between the mandrel shelves, to prevent leakage of concrete through the joints. The space between the casings and
 45 the mandrel is then filled with concrete and the assembly lowered, so that the lower end thereof is submerged and so that the upper surface of the fresh poured concrete is above the water level. This prevents or minimizes
 50 the inflow of water into the interior of the casing, by producing an internal pressure greater than the water pressure. Additional casing sections are then added, and if necessary, an additional mandrel section, the
 55 added space filled with concrete and the assembly again lowered, always maintaining the surface of the fresh concrete above the water level. When the bottom of the pile penetrates the mud or soil, water under pressure is discharged through the pipe 5 into the mud to cause the pile to penetrate the mud. The casing sections are built up in groups and the concrete poured into the additional space formed and the assembly
 60 lowered, until the pile has been sunk the

proper distance and then the pile is built up to the desired height by adding more casing sections.

In some instances, the consistency of the mud is such that the pile is not properly
 70 supported therein and in such instances a foot 24 is formed around the bottom of the pile by forcing concrete down through the pipe 5.

After the concrete within the casing has
 75 set, the pipe 5 is rotated to unscrew it from the bushing 6 and raised, causing the mandrel to collapse and the mandrel is then withdrawn from the hollow pile. When a solid concrete pile is desired, the core of the
 80 hollow pile is then filled with concrete. The cables 9 are released from the lower section after the pile has been sunk to the desired level.

The casing sections 15 are formed with a
 85 bevelled upper edge 25 and a wedge shaped lower edge 26 which seats in the bevel of the casing section next below forming an internal circumferential groove. The sections are preferably provided with reinforcing
 90 wires 27, which project from the casing at the edges and when the casings are assembled in superposed relation, the projecting ends of the reinforcing wires are twisted together, to tie the sections together.
 95 To center the sections on the mandrel, each section is provided with a plurality of spaced internal bosses 28.

By virtue of this invention, I form a
 100 hollow or solid concrete pile, of any desired cross sectional shape, which has a very dense skin or shell.

I claim:

1. The process of forming a concrete pile
 105 in situ comprising forming a sectional concrete casing about a mandrel, filling the space between the casing and the mandrel with concrete, lowering the filled casing and removing the mandrel therefrom after the filled concrete has set.

2. The process of forming a concrete pile
 110 in situ comprising forming a sectional concrete casing about a mandrel, filling the space between the casing and the mandrel with concrete, lowering the casing into place
 115 and permitting the filled concrete to set, contracting the mandrel and removing the mandrel.

3. The process of forming a concrete pile
 120 in situ comprising forming a sectional concrete casing about a mandrel, filling the space between the casing and the mandrel with concrete, lowering the casing, discharging a stream of water at the bottom
 125 of the casing to sink the casing into the mud, and contracting and removing the mandrel.

4. Apparatus for forming a concrete pile
 130 comprising a casing, a mandrel adapted to be arranged within said casing and form

therewith an annular chamber into which concrete may be poured and means engaging the casing for expanding or collapsing said mandrel.

5 5. Apparatus for forming a concrete pile comprising a casing, a mandrel adapted to be arranged within said casing and form therewith an annular chamber into which concrete may be poured, a pipe extending
10 through the bottom of the casing and means connecting the pipe and the mandrel whereby longitudinal movement of the pipe produces expansion and contraction of the mandrel.

15 6. Apparatus for forming a concrete pile comprising a casing, a longitudinally split mandrel adapted to be arranged within said casing and form therewith an annular chamber into which concrete may be poured, a
20 longitudinally disposed element in said mandrel, spaced collars on said element, a ring surrounding said element between said collars and links connecting said ring with the mandrel sections.

25 7. Apparatus for forming a concrete pile comprising a casing, a longitudinally split

mandrel adapted to be arranged within said casing and form therewith an annular chamber into which concrete may be poured, a
30 pipe within said mandrel engaging said casing, spaced collars on said pipe, a ring surrounding the pipe between said collars and links connecting said ring with the mandrel sections.

8. Apparatus for forming a concrete pile
35 comprising a closed bottom casing, a pipe disposed in said casing and forming a threaded joint with said bottom, a longitudinally split mandrel in said casing and means connecting the mandrel sections and the pipe,
40 whereby longitudinal displacement of the pipe causes expansion or contraction of the mandrel.

9. Apparatus for forming a concrete pile comprising a plurality of superposed concrete casing sections, and a collapsible mandrel arranged within said superposed sections and forming therewith an annular
45 chamber adapted to be filled with concrete.

In testimony whereof, I have hereunto set
50 my hand.

CARLOS E. CORTES.