Jan. 5, 1932. L. G. FINLAY ET AL 1,839,304

CONCRETE PILE

Filed May 29, 1929 2 Sheets-Sheet 1

FIG.1.

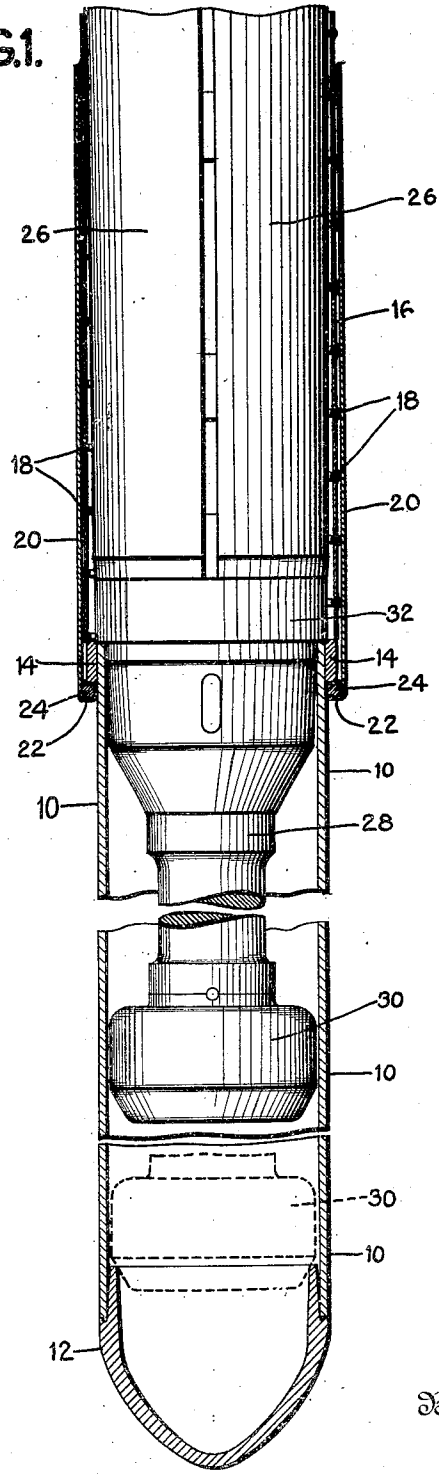

FIG.2.

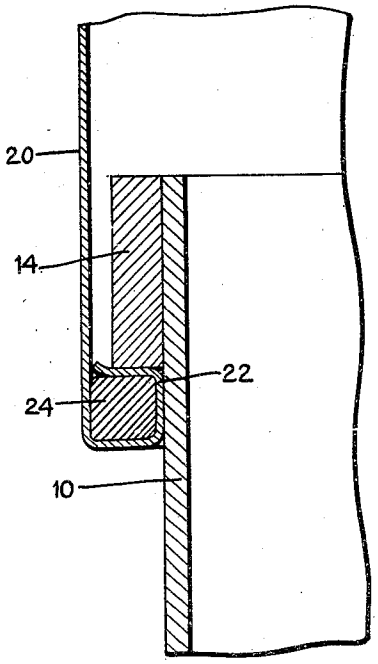

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FIG.3.

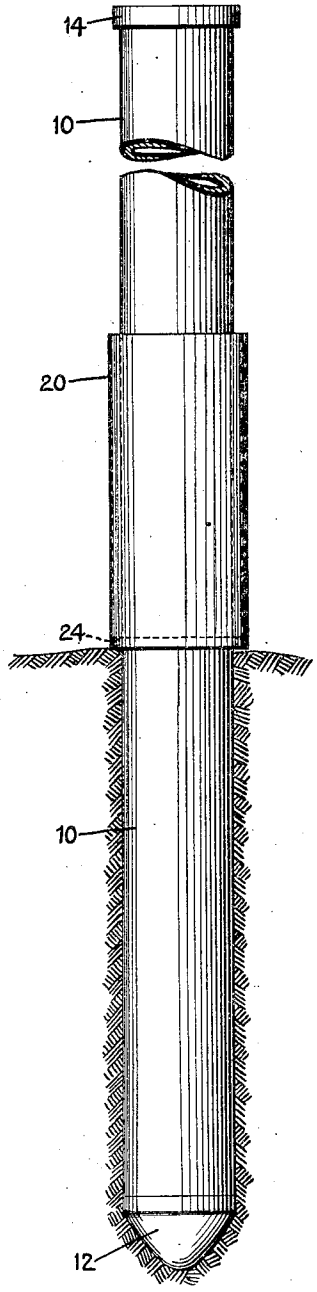


FIG.4.

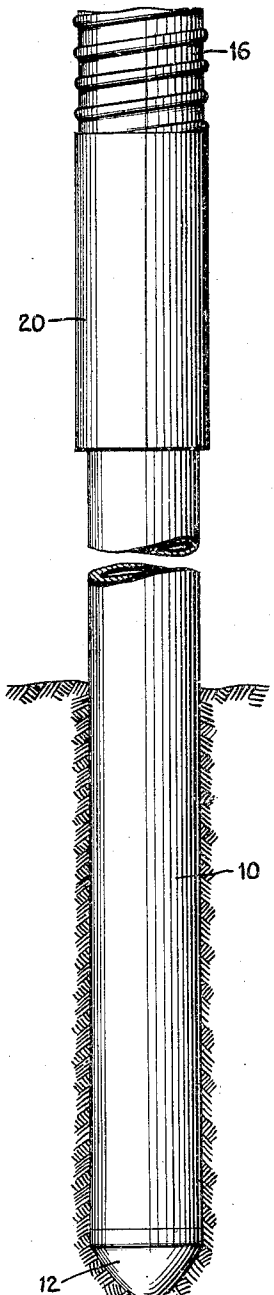
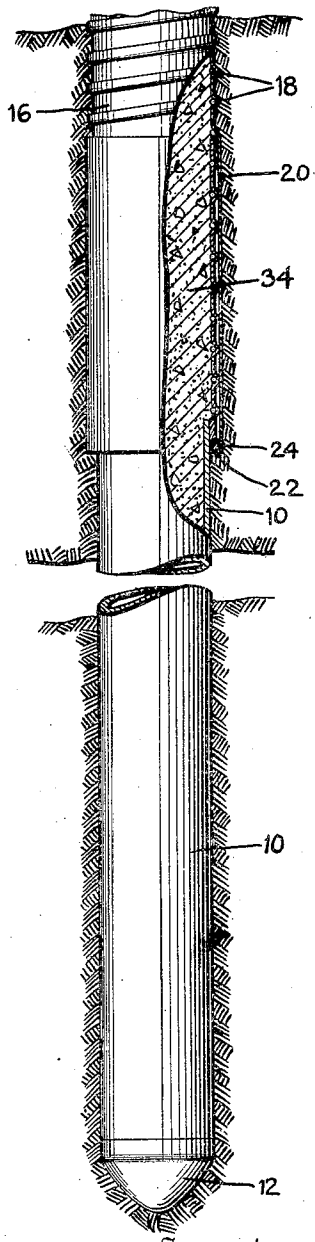


FIG.5.



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UNITED STATES PATENT OFFICE

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CONCRETE PILE

Application filed May 29, 1929. Serial No. 366,919.

When concrete piles are cast in situ it is sometimes necessary to leave the shell open for inspection for a certain length of time after it is driven. The usual shell is of very thin steel. It is driven by means of a core which is removed after the driving is completed, and the shell is immediately filled with concrete. The thin shell is usually corrugated and otherwise reinforced sufficiently to resist ordinary ground pressure or "back pressure" without collapsing or deforming. But if the back pressure is unusually severe, as for instance when unusual depths are reached, the thin shell is unable to resist deformation after the core is removed, especially if the shell be required to keep the hole open some little time for inspection.

The object of this invention is to devise a pile shell and pile forming method which will meet the above conditions.

Severe back pressure is often encountered when piles are driven to unusual depths and the present invention is therefore particularly advantageous where extra long piles are necessary. Such piles cannot be economically built by usual methods because extra length cores are very flexible, very expensive to make, and very expensive to transport, because two railway cars are required. Also, very high leaders are necessary on the pile driver to take the hammer, core, and to provide room for shelling up. Therefore the whole process is expensive to carry out, and as explained above, the results may, after all, be unsatisfactory on account of the inability of the shell to withstand the back pressure at its lower end.

Long piles can also be made in composite form, with the lower section of wood or concrete, but some builders object to the joint between the sections, and at the same time they want a pile which can be inspected clear to the bottom before filling, and which permits of being reinforced.

To meet all the above conditions the present invention contemplates the use of a comparatively heavy steel pipe shell for the lower part of the pile, and the ordinary type of shell for the upper part thereof. The pipe is provided with a conical driving shoe, which may be welded on, and is driven down in advance of the core and upper shell. In driving to rock the driving shoe may be omitted, the pipe being driven open ended to rock and then the earth cleaned out of the pipe by compressed air or other means. The lower pipe section is self-sustaining and needs no core, therefore we can use a core of usual length for the upper nonself-sustaining shell section only, and still obtain a long pile. It is desirable to have leaders high enough to drive, in one operation, the lower pipe surmounted by the core and upper shell, but where this is not feasible the lower pipe end may first be driven to ground level and then followed down by core and upper shell. Preferably a number of pipe ends would first be driven and then followed down.

Usually the center bar of the core extends only a sufficient distance into the pipe section to guide it in direction, but if desired the core bar may extend down to the shoe and thereby help to plow the path for the pipe. If this be done, a pipe of less thickness may be used. There are other advantages of our method, not mentioned above. For instance, the pipe is not as easily bent as a core. The core, being collapsible, is usually made of a center bar and three plates or leaves, and is therefore not as able as a thick pipe to resist damage by boulders. Also, the pipe, being of comparatively thick material, is better able to resist abrasion than is the ordinary thin shell. Furthermore, the pipe is absolutely water-tight, with the result that water and sand are effectively kept out.

Further and other objects and advantages will be apparent from the specification and claims, and from the accompanying drawings which show by way of illustration what is now considered the preferred embodiment of the invention.

Fig. 1 is a cross-section of the lower pipe, upper shell, and boot connecting the pipe and shell, with the core in place.

Fig. 2 is an enlarged detail showing method of fitting the boot to the top of the pipe.

Fig. 3 shows the boot partly driven, with the boot in place on the ground.

Fig. 4 shows the pipe partly driven and

with the boot in place to jam the lower pipe and upper shell.

Fig. 5 shows the lower pipe, upper shell, and interconnecting boot, all below ground level.

In the drawings the pipe comprising the lower pile shell is designated 10, the driving shoe 12, and a ring welded around the top of the pipe, 14. Resting on top of ring 14, near its outer edge, is the thin upper pile shell 16, which may be any of various designs but which is shown as the well known corrugated type with wires 18 in the corrugations.

Outside of the lower end of shell 16 is the sheet metal boot 20, provided at its lower end with an inturned bead 22 adapted to surround pipe 10 underneath ring 14. Bead 22 is formed around a steel ring 24 which serves to reinforce the bead.

The boot is adapted to be packed in well known manner to keep water from entering the joint between the upper and lower shell sections.

Within shell 16 is a collapsible driving core having leaves or segments 26 and a center rod 28 which extends downwardly into pipe 10 and has on its lower end a collar 30 adapted to fit the inner bore of pipe 10 for keeping pipe and core in proper alignment. The center rod is also provided with another collar 32 which rests on the upper end of pipe 10 and preferably is of sufficient diameter to extend partly over ring 14 as well. If desired, rod 28 may be extended until collar 30 rests in shoe 12, as indicated by dotted lines.

When the hammer is applied to the upper end of the core, collar 32 forces pipe 10, collar 14, and boot 20 into the ground, and the collapsible part of the core causes shell 16 to follow the pipe downwardly.

The above description covers the driving operation after lower pipe 10, upper shell 16, boot 20 and other parts have been assembled as in Fig. 1. They may be assembled in that manner before pipe 10 is started into the ground, and the whole assembly driven together, or pipe 10 may first be driven to ground level and the core and upper shell then added. If that be done, the details of procedure may be understood from Figs. 3, 4 and 5. Boot 20 is placed upright on the surface of the ground at the spot where the pile is to enter the ground and pipe 10 is driven through boot 20 as in Fig. 3 until collar 14 approaches ground level, whereupon upper shell 16 and boot 20 are drawn up to the position illustrated in Figs. 1 and 4 and the driving is resumed until pipe 10, boot 20, and shell 16 are all below ground level the desired distance, as in Fig. 5.

When the proper depth is reached, the core and its attachments are removed, the interior of pipe and shell are inspected, reinforcements are inserted if desired, and the mold is then filled with concrete 34, which, when it hardens, forms the monolithic core of the pile.

It is to be understood that the invention is not limited to the specific embodiment and construction herein described, but may be used in other ways without departure from its spirit as defined by the following claims.

We claim—

1. A shell for a concrete pile comprising a lower substantially self-sustaining pipe section adapted for driving without a core, in combination with an upper shell non-sustaining section adapted for driving only with a core.

2. A shell for a concrete pile comprising a lower substantially self-sustaining pipe section adapted for driving without a core, in combination with an upper shell non-sustaining section adapted for driving only with a core, and a boot engaging one of said sections and surrounding a portion of said other section.

3. A concrete pile comprising in combination, a lower substantially self-sustaining shell of comparatively thick material, an upper shell of thin material, and a monolithic core of concrete filling the interior of said shells.

4. In the method of forming a concrete pile, the steps of driving a substantially self-sustaining lower shell, mounting on the upper end thereof a non-self-sustaining shell, and driving said combined shells into the ground to form a mold for a pile.

5. In the method of forming a concrete pile, the steps of driving a substantially self-sustaining lower shell, mounted on the upper end thereof a non-self-sustaining shell, placing a boot about the joint between said sections, and driving said combined shells and boot into the ground to form a mold for a pile.

6. In the method of forming a concrete pile, the steps of driving a substantially self-sustaining lower shell, mounting on the upper end thereof a non-self-sustaining shell, driving said combined shells into the ground to form a mold for a pile, and filling the mold with concrete.

7. A shell for a concrete pile comprising in combination, a lower substantially self-sustaining section, an upper non-self-sustaining section, and a boot engaging the upper end of said lower section and adapted to surround the lower portion of said upper section, for the purpose set forth.

8. A shell for a concrete pile comprising in combination, a lower substantially self-sustaining section, an upper non-self-sustaining section, a ring integral with the upper end of said lower section, and a boot engaging said ring and extending upwardly to surround the lower end of said upper section, substantially as set forth.

9. Apparatus for forming a mold for a

concrete pile, comprising in combination, means for driving a substantially self-sustaining lower shell section, and means for supporting a non-self-sustaining upper section in alignment with said lower section and adapting said sections for driving together.

10. The invention set forth in claim 9 in which said aligning means comprises a rigid member adapted to pass through said upper shell section and into said lower section.

11. The invention set forth in claim 9 in which said lower section is provided at its lower end with a driving shoe, and in which said driving means is effective on said shoe.

12. The invention set forth in claim 9 in which said lower section is provided at its lower end with a driving shoe, and in which said driving means is effective on said shoe and on the upper end of said lower section simultaneously.

13. The method of forming a concrete pile comprising driving a substantially self-sustaining lower shell, mounting on the upper end thereof a non-self-sustaining shell, placing a driving core within said shells to hold said shells in alignment, attaching means to said shells to cover the joint, driving said combined shells into the ground and filling the shells with concrete.

14. The method of driving a substantially self-sustaining lower shell section and an upper non-self-sustaining shell section simultaneously which comprises aligning said sections, inserting a core therein, causing said core to positively drive the lower shell section and to frictionally drive the upper shell section, connecting the shells together whereby the lower shell section serves to exert a tension force on the upper shell section when said lower shell section is positively driven and filling said shells with concrete.

In testimony whereof we hereto affix our signatures.

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FRANCIS W. JOHNSON.