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SINKING COMPOSITE PILES

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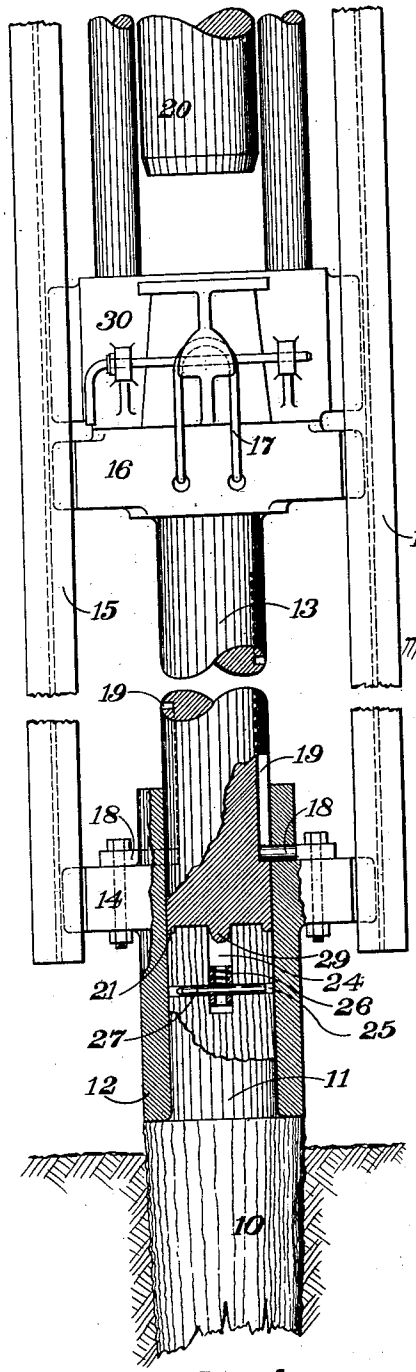


Fig. 1

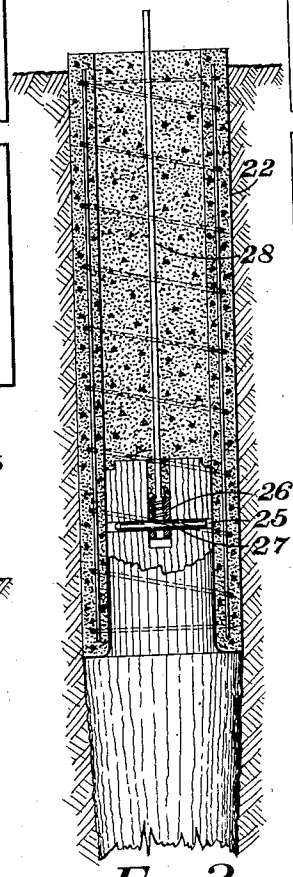


Fig. 3

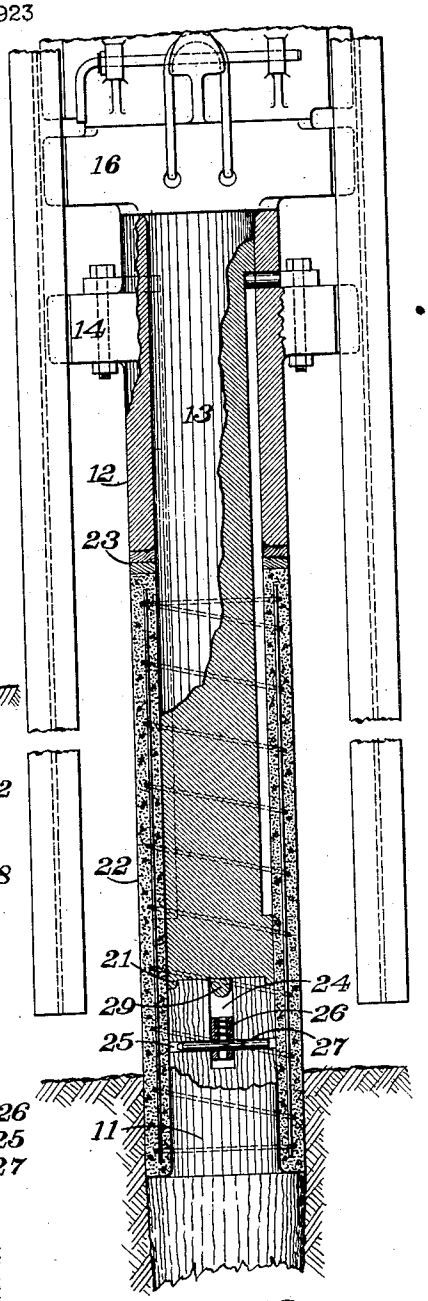


Fig. 2

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SINKING COMPOSITE PILES.

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This invention relates to composite piles, as for example piles composed of a lower wooden portion and an upper concrete portion, and relates more particularly to setting such piles in the ground. The chief object of the invention is to provide an improved method and apparatus by which such piles can be sunk rapidly and accurately at low cost. A further object is to provide a method and apparatus by which the wood portion or section can be driven to the desired depth, say to a position below the permanent water level of the soil, without injury to its top, so that the concrete upper portion or section can be completed with a good joint between the two. To these and other ends the invention consists in the novel features hereinafter described.

The preferred embodiment, for carrying out the method, is illustrated in the accompanying drawings, in which—

Fig. 1 is a front view, partly in vertical section, showing also the wood pile-section driven to the surface of the ground.

Fig. 2 is a front view similar to Fig. 1 but showing a later stage in the setting of the pile.

Fig. 3 is a vertical section of the concrete portion of the pile, in its final position, showing also the upper end of the wooden portion.

The wood section of the composite pile is shown at 10, and is formed at its upper end with a tenon 11, preferably cylindrical in form. This section is driven by means of a vertically movable follower mechanism comprising a hollow guide member 12, and a follower proper, shown at 13. The former fits down over the pile tenon 11 and is provided with ears 14 extending laterally into the channeled guides or leads 15 to permit free descent of the guide member as the driving proceeds. The follower 13 fits smoothly inside of the upper end of the guide 12 (which projects above the pile tenon) and is suspended from a yoke 16 extending into the channeled leads 15 and itself suspended from the hammer mechanism by means of suitable links of which one is shown at 17. The downward movement of the guide 12 relative to the follower is limited by pins 18 mounted on the ears 14 and extending through the sides of the guide into vertical grooves 19 in the follower. It will be understood that the blows of the hammer 20, delivered on the anvil 30, are imparted to the yoke 16 and thence through the follower 13 to the wooden pile-section 10.

In starting the work the wooden pile-section is held upright at the point where it is to be sunk and the guide 12 is fitted down over the tenon. The driving then proceeds until the pile section is sunk, say, to about the position shown in Fig. 1, with the tenon projecting well above the surface of the ground. During this operation the wooden pile is kept straight by the guide 12, so that it is driven straight into the ground, in line with the guide 12 and follower 13. Preferably the lower end of the follower, bearing on the tenon, is formed with a circumferential flange 21 at its edge providing a recess which fits down on the correspondingly shaped top of the tenon. This construction, which prevents spreading or brooming of the tenon, forms a highly advantageous feature of the invention.

The wooden pile section having been driven to the desired point the hammer and follower mechanisms are raised well above the tenon and the guide 12 is lifted on the follower as far as it will go, bringing its upper edge into contact with the underside of the yoke 16, and an auxiliary casing or shell, preferably a pre-cast reinforced concrete cylinder, 22, of the same diameter as the top of the wooden section at the base of the tenon, is set down on the tenon, after which the hammer and follower mechanisms are lowered and the follower 13 thus brought down again upon the tenon 11. Preferably the concrete guide cylinder 22 is in any case short enough to admit one or more driving cushions 23, of wood or other suitable material, between its upper edge and the bottom of the guide 12 to protect the concrete cylinder in the subsequent driving.

The parts being arranged as just described the driving is resumed, and the wooden pile section, now guided by the concrete cylinder or shell 22, is driven to the desired depth. At the same time the concrete cylinder, itself guided by the follower 13, is carried down by the guide 12, which, it will be noted, is interposed between the concrete cylinder and the yoke 16. The hammer and follower mechanisms are now raised clear of the concrete shell or casing, and the lat-

ter is filled with concrete, as indicated in Fig. 3.

In many cases it is desirable to lock the concrete and wood sections of the pile positively together, as for example to prevent separation of the two by heaving of the ground. Convenient and effective means for the purpose is shown in the drawing, in which the tenon 11 is provided with an axial recess 24 intersected by a transverse hole 25. Before the concrete shell 22 is placed on the wooden section a steel socket piece 26, Fig. 2, having its upper portion threaded inside, is placed in the recess 24 and fastened therein by a pin 27 passed into the hole 25. Just before the shell 22 is filled with concrete a locking rod 28, threaded at its lower end, is screwed into the socket 26. Then when the concrete sets it grips the rod and thereby anchors the concrete portion of the pile securely to the wooden portion. To prevent spreading or brooming of the tenon into the recess 24 during the first driving operation, the recessed face of the follower 13 may be provided with a stud or boss 29 which fits down into the recess.

It will be observed that the wooden section of the pile makes the hole into which the concrete shell or cylinder is sunk. Hence less force is needed to make the cylinder follow the wooden pile, with the result that the comparatively small portion of the hammer-blow imparted to the cylinder by the follower 12 through the cushion 23 is sufficient.

It is to be understood that the invention is not limited to the specific apparatus and procedure herein illustrated and described but can be carried out in other ways without departure from its spirit.

I claim:

1. A method of placing composite piles, comprising sinking a wooden pile section to a suitable depth, arranging on the upper end of the wooden section an auxiliary casing to guide the wooden section in its further descent, inserting in the auxiliary casing a follower to communicate the blows of a driving hammer to the wooden section and to guide the auxiliary casing, driving the wooden section and the auxiliary casing to final position in the ground, and withdrawing the follower and filling the auxiliary casing with concrete.

2. A method of placing composite piles, comprising mounting a shell on the upper end of a wooden pile-section to guide the latter in the subsequent driving thereof, inserting into the shell a follower to guide the shell and receive the driving blows, driving the wooden pile-section and the shell to the desired depth, withdrawing the follower from the shell, and filling the latter with concrete.

3. A method of placing composite piles, comprising fitting a concrete shell on a tenon formed on the upper end of a wooden pile-section to guide the same in its subsequent descent into the ground, inserting a follower into the concrete shell to guide the shell and to receive the driving force and transmit the same to the wooden pile-section, driving the wooden pile-section and concrete shell into the ground, removing the follower; and filling the concrete shell with concrete.

4. A method of placing composite piles, comprising mounting a concrete guide-shell on a tenon formed on the upper end of a wooden pile-section, inserting a follower into the concrete guide-shell to guide the latter in the subsequent driving, and sinking the wooden section and guide-shell into the ground by exerting driving force on the follower and transmitting the same thereby to the wooden section.

5. A method of placing composite piles, comprising mounting a concrete shell on the upper end of a wooden pile section, and driving the two into the ground by force exerted chiefly on the wooden pile section while the latter is guided by the concrete shell and filling the concrete shell with concrete.

6. A method of placing composite piles, comprising placing on the upper end of a wooden pile-section a tubular guide and driving the wooden section by force exerted on a follower extending into the tubular guide from above, substituting a tubular concrete guide for the first guide and continuing the driving, and removing the follower from the concrete guide and filling the latter with concrete.

7. A method of placing composite piles, comprising mounting on the upper end of a wooden pile-section a tubular guide and a follower projecting upwardly therefrom, driving the wooden pile section by force applied to the follower and communicated thereby to the wooden section, raising the tubular guide on the follower and inserting a concrete shell under the raised guide and around the follower and the upper end of the wooden section, and driving the wooden pile section by force applied to the follower while allowing the weight of the raised guide on the concrete shell to aid the descent of the latter in company with the wooden section.

8. A method of placing composite piles, comprising placing on top of a wooden pile-section a vertically elongated follower and enclosing the lower end of the follower and the upper end of the wooden section in a tubular guide to maintain the follower and wooden section in alignment, driving the wooden section by force exerted on the follower and transmitted thereby to the said section, raising the tubular guide and plac-

ing under the same a concrete shell to maintain the follower and wooden section in alignment, and continuing the driving as before but with the tubular guide bearing on the concrete shell to urge the same into the ground with the wooden section.

9. In an apparatus for placing composite piles, in combination, a vertically movable follower; vertical guides therefor; a tubular guide on the follower, movable vertically relatively to said vertical guides in company with and independently of the follower and adapted to be seated over the upper end of a wooden pile section; and means for applying driving force to the follower for transmission thereby to the wooden pile section.

10. In an apparatus for placing composite piles, in combination, a vertically movable follower; vertical guides therefor; a tubular guide movable vertically on the follower relatively to said vertical guides and adapted to project below the lower end of the latter to embrace the upper end of the lower section of the composite pile; and means for applying driving force to the follower for transmission thereby to the wooden pile section.

11. In an apparatus for placing composite piles, in combination, a vertically movable follower; a tubular guide movable vertically on the follower and adapted to embrace the upper end of the lower section of a composite pile; means for limiting the downward movement of the guide relative to the follower but permitting the guide to be raised on the follower a substantial distance above the lower end of the latter; and means for applying driving force to the follower for transmission thereby to the lower section of the composite pile.

12. In an apparatus for placing composite piles, in combination, a vertically movable longitudinally grooved follower; a tubular guide movable vertically on the follower and adapted to embrace the upper end of a pile on which the follower is seated; and means carried by the tubular guide and cooperating with a groove in the follower to limit the downward movement of the guide relative to the follower.

13. In an apparatus for placing composite piles, in combination, a vertically movable follower adapted to be seated on the upper end of a pile to transmit driving force thereto; a tubular guide embracing the lower end of the follower and movable upwardly thereon, and projecting below the same to embrace the pile on which the follower is seated; and vertical guides for the follower and the tubular guide to permit the same to descend together as the pile is driven.

14. In an apparatus for placing composite piles, in combination, an elongated vertically movable follower adapted to be seated on a pile to transmit driving force thereto; vertical guides for the follower; a relatively short tubular guide movable vertically on the follower and adapted to project below the same to embrace the pile on which the follower is seated; means carried by the tubular guide and cooperating with said vertical guides to permit descent of the tubular guide in company with the follower as the pile is driven; and means for limiting the downward movement of the tubular guide relative to the follower but permitting upward movement of the tubular guide a substantial distance above the lower end of the follower.

15. In an apparatus for placing composite piles, in combination, a vertically movable transverse yoke, upright guides for the yoke, a follower depending from the yoke and having longitudinal grooves terminating above its lower end, a vertically movable tubular guide embracing the follower and having members extending laterally into cooperation with the said upright guides, and pins carried by the tubular guide and extending into the grooves in the follower to limit the downward movement of the tubular guide relative to the follower but permit relative vertical movement a substantial distance above the bottom of the follower.

In testimony whereof I hereto affix my signature.

MAXWELL M. UPSON.