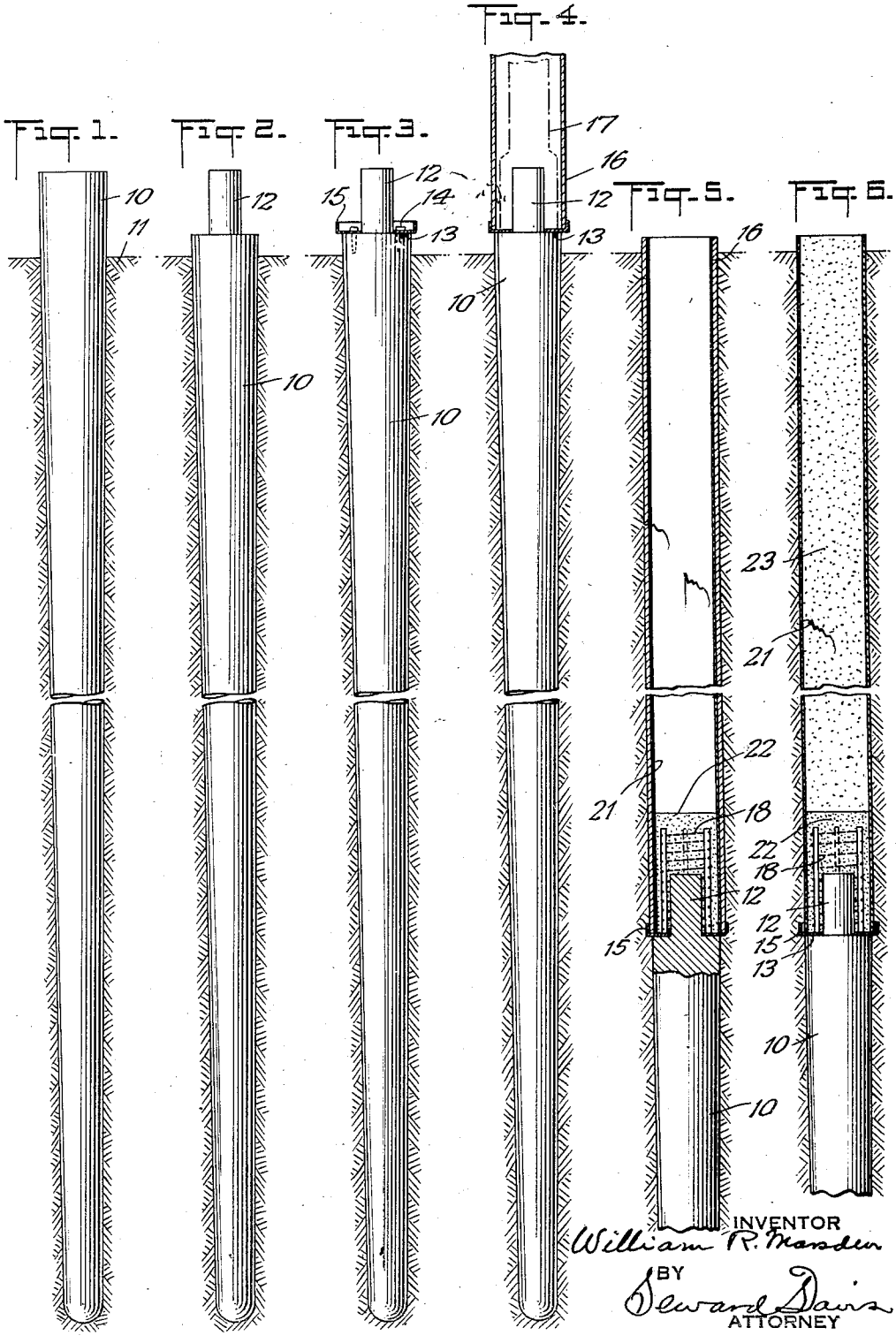
Nov. 17, 1931. W. R. MARSDEN 1,832,404

COMPOSITE PILE

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Fig. 7.

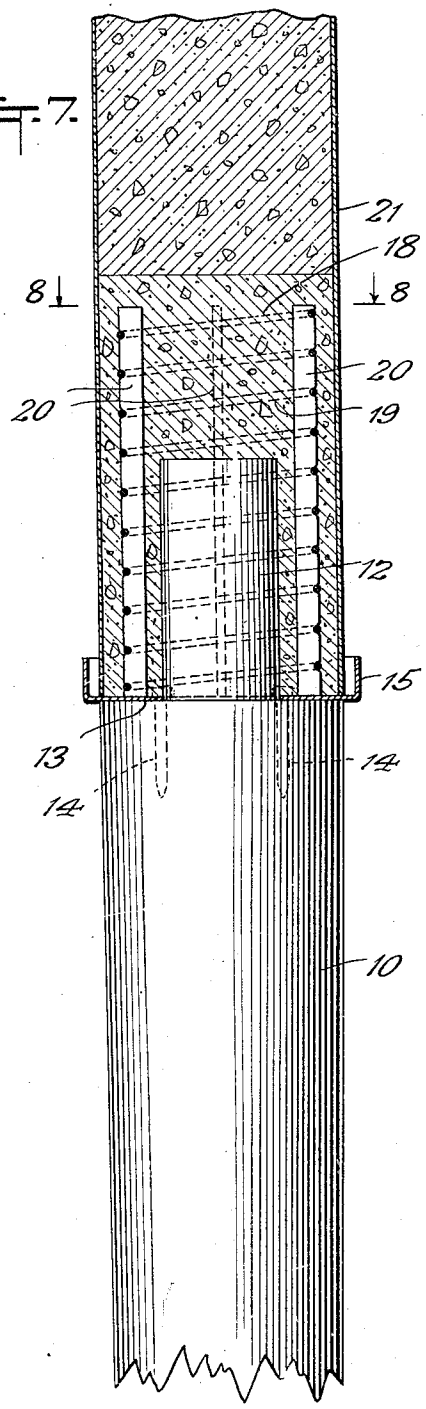


Fig. 8.

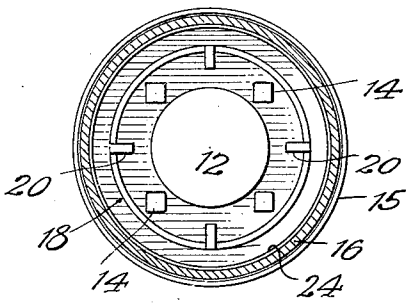
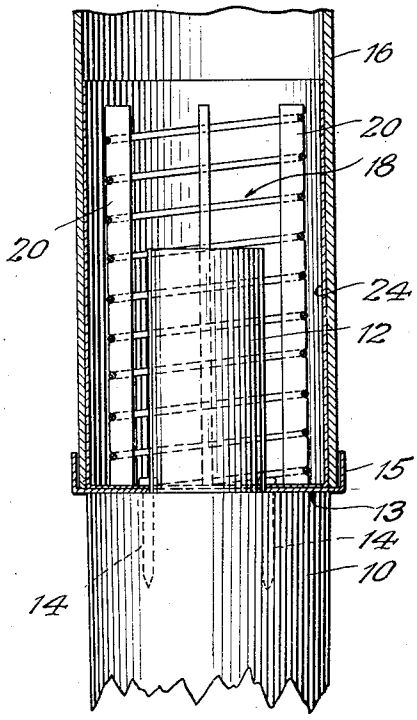


Fig. 9.



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UNITED STATES PATENT OFFICE

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COMPOSITE PILE

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This invention relates to improvements in piles, and to a novel method of manufacturing composite piles while they are driven.

One of the objects of the invention is to provide a pile consisting mainly of a lower portion of wood or the like, and an upper portion of concrete or the like, these portions or sections being so combined that the upper portion will remain permanently connected to, and in alinement with, the lower portion.

A further object is to furnish a pile manufacturing and driving method, in which a number of wood piles or lower sections are first driven so as to confine any earth upheavel caused by the pile driving to be limited to this part of the operation, whereby when the upper or concrete section of the pile is driven, the hole has already been made in the earth and no harm is caused to an adjacent concrete pile, as there is no new appreciable side pressure of the earth brought into action by the driving of the upper part of the pile, which means that the concrete section of the pile is true and uniform.

Another object is to provide a pile-forming method in which a wooden pile is first driven into the earth; second, a metal boot is attached to the upper exposed end of this wood pile; third, a pile-driving shell and core are used to force the wood pile or section into the earth to the desired depth; fourth, the core is withdrawn from the shell and a permanent inner casing inserted into the shell; fifth, this casing is filled with concrete, and sixth, the driving shell is withdrawn so as to leave an upper cased concrete portion fastened to and resting on the lower wood portion of the pile.

In such a method, all of the wood portions of the piles are preferably driven before the concrete portions are to be attached thereto; consequently, when the driving-shell and core are used to force each wood portion into the earth to the desired depth, there is no increased upheaval or side pressure to affect the concrete upper portions of adjacent piles.

Another object of this invention is to furnish novel means for permanently joining the concrete and wood portions of the pile.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

Referring to the drawings:

Fig. 1 is a side elevation of the wood section of the pile, showing the latter in the position it occupies after being driven into the earth to such a depth that its upper end is exposed above the ground surface.

Fig. 2 is a similar view of the same after the upper end of the pile has been cut away to provide an upwardly projecting tenon.

Fig. 3 is a view after a metal boot ring has been secured to the upper end of the wood pile.

Fig. 4 is a view similar to Fig. 3, but showing a driving-shell and core engaging the upper end of the wood pile for the purpose of driving the latter into the earth to the desired depth.

Fig. 5 is an elevation, partly in vertical section, of the upper portion of the wood pile, after it has been driven to the desired depth into the earth, and showing the driving-shell still attached thereto, the permanent casing in the shell, the metal reinforcement for reinforcing the concrete around the wooden tenon, and a part of the concrete in which the reinforcement and tenon are embedded.

Fig. 6 is a view similar to Fig. 5, after the permanent casing has been filled with concrete, and the driving-shell has been withdrawn.

Fig. 7 is an enlarged view of a detail, and more clearly showing the construction of the means which joins the concrete and wooden portions of the pile.

Fig. 8 is a horizontal sectional view on the line 8—8 of Fig. 7, but with the concrete eliminated to facilitate illustration.

Fig. 9 is a view similar to Figure 7, but showing a modification in which a permanent steel sleeve is riveted to the boot to confine the concrete when the driving-shell is withdrawn, (used in that type of concrete pile where the concrete upper section is not enclosed in a permanent casing).

In the drawings, 10 designates an ordinary wood pile which is driven by the conventional pile driver into the earth 11. This pile may be of any desired length, in view of the fact that it is to form the lower portion of my composite pile. It may be also stated that while the part 10 is preferably of wood, it might be of any other suitable material.

After the member 10 has been driven into the earth to the point where only its upper end is exposed, such end is cut away as shown in Fig. 2, to provide a tenon 12, and then a metal boot ring 13 is attached to the upper portion of the part 10 by any suitable means, such as spikes 14. This ring surrounds the tenon and is provided with an upwardly extending annular flange 15 to receive the lower end of a rigid metal driving shell 16, as shown in Fig. 4. This shell co-operates with a rigid driving core 17 that is adapted to engage the tenon, and when the parts 16 and 17 are driven by some suitable apparatus, the member 10 is forced below the surface of the earth to any desired depth.

When such depth is reached, the core 17 is withdrawn, but the shell is left in place for the time being, as shown in Fig. 5. Now, the metal reinforcement 18 is dropped into the driving shell in such manner that when it lands on the wooden portion of the pile, it will surround the tenon 12. This metal reinforcement may be of any desired construction, but I preferably form the same of a spiral piece of wire 19 which is secured in notches in the edges of vertical bars 20 which are radially arranged relatively to one another, as shown in Fig. 8.

Before or after the reinforcement has been inserted, a permanent casing 21 of thin metal is lowered into the driving shell, so as to form a liner therefor, as illustrated in Fig. 5, and after the reinforcement and liner have been positioned, a deposit of rich concrete grout 22 is poured into the shell up to a line where this grout encloses all of the spiral reinforcement 18, as well as the tenon 12. Afterwards, the casing 21 is filled with concrete 23 composed of standard mix and finally the driving shell is withdrawn, leaving the composite pile in the form shown in Fig. 6.

In some cases, I may omit the permanent casing 21, and use instead a permanent steel sleeve 24 (Fig. 9), secured to the boot by any suitable means, and adapted to confine the concrete around the tenon when the driving-shell is withdrawn.

Special attention is called to the joint between the wood and concrete portions of the pile. This joint, composed of concrete grout, confined in a permanent steel casing, and reinforced with spiral column hooping, provides a strong and permanent connection, the grout being richer in cement and of finer composition than the standard mix of concrete of which the portion of the concrete pile above it is composed.

The use of the steel flanged boot 13 around the tenon provides a seat for the lower edge of the driving shell, and in conjunction with the upwardly extending flange 15 seals the pile form against the entrance of mud and water while the concrete pile section is being poured.

My method of driving the wood sections first, as before stated, confines any earth upheaval caused by the pile driving, to be limited to this part of the operation. Therefore, when the pile is driven further to take care of the concrete section, the hole has already been made, and no harm is caused to the adjacent concrete pile, as there is no new side pressure of the earth, brought into action by the driving of this part of the pile, which means that the concrete section of the pile is true and uniform.

While I have disclosed what I now consider to be preferred embodiments of the invention in such manner that they may be readily understood by those skilled in the art, I am aware that changes may be made in the details disclosed, without departing from the spirit of the invention, as expressed in the claims.

What I claim and desire to secure by Letters Patent is:

1. A composite pile comprising a lower wooden section, an encased upper concrete section and an intermediate section uniting them, said intermediate section being composed of externally and internally reenforced concrete of richer mix than that of the upper section, the external reenforcement consisting of a cylindrical member vertically disposed within the casing of the concrete section, an annular horizontally disposed ring with an upstanding circumferential flange within which the said member and casing are seated on said ring, the internal reenforcement being intermediate said member and the wooden section and spaced apart from both and free from contact with either.

2. A composite pile comprising a lower wooden section, an upper concrete section, and an intermediate section of reenforced grout constituting an interlocking joint therebetween; a casing surrounding said concrete section; an upper end of reduced diameter constituting a tenon upon said lower section, an annular metal driving boot surrounding said tenon and seated on the shoulder thereof and held to said shoulder by a plurality of spikes, the said boot having an upwardly extending annular flange at its outer edge, a metal tubing seated on said boot within said casing, and adapted to confine the concrete constituting the said upper section and to form with said tenon a cylindrical chamber; a metallic reenforce positioned in said cham-

ber upon said boot, said reenforce consisting of vertical bars radially disposed extending above said tenon and supporting a spiral winding of wire thereabout, and a filling of grout within said chamber embedding said reenforce and extending over said tenon.

WILLIAM R. MARSDEN.