June 4, 1929. O. J. WEST 1,715,808

COMPOSITE PILE

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Fig. 1.

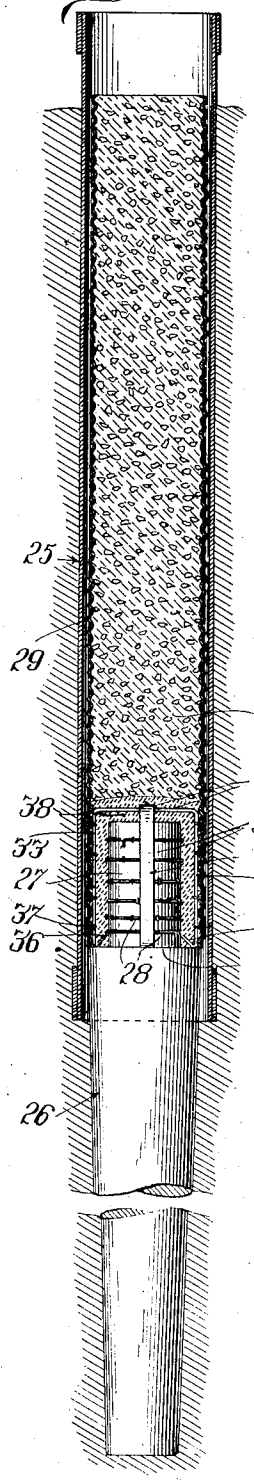


Fig. 2.

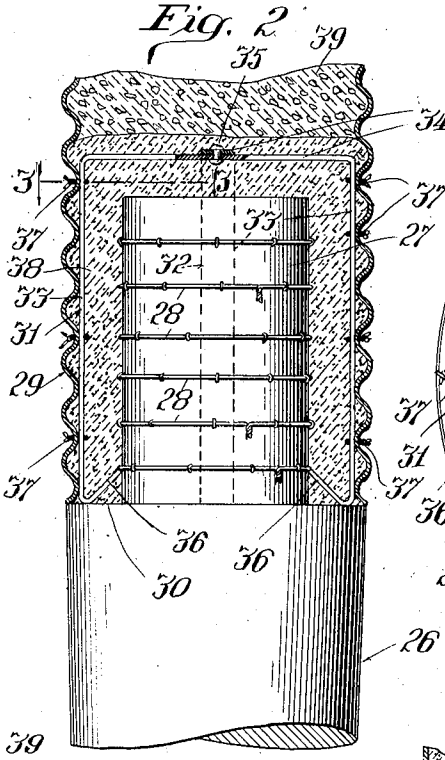


Fig. 3.

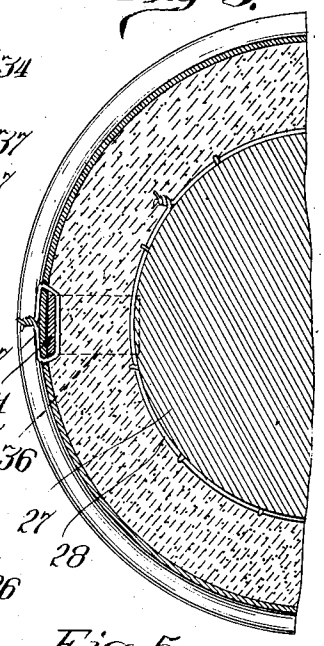


Fig. 4.

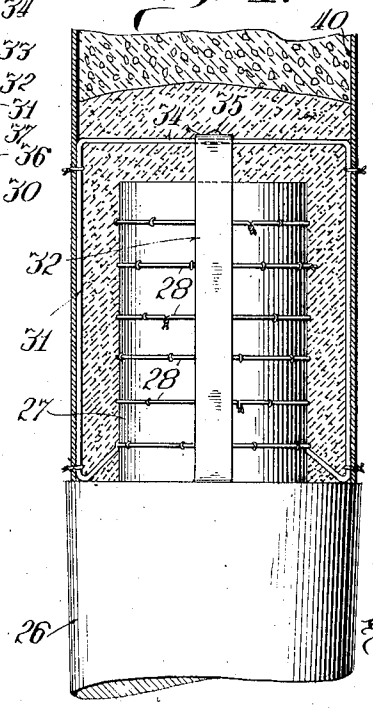


Fig. 5.

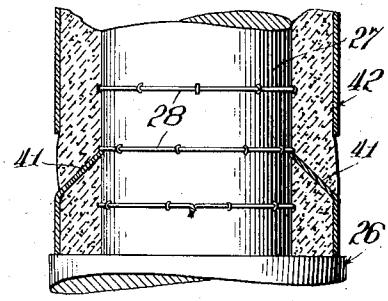
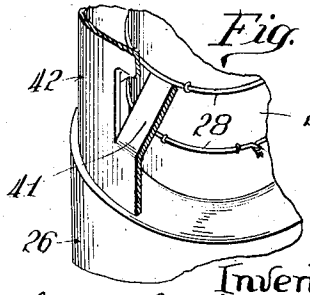


Fig. 6.



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Fig. 7.

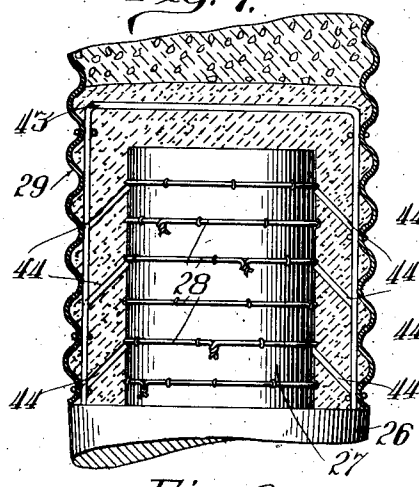


Fig. 8.

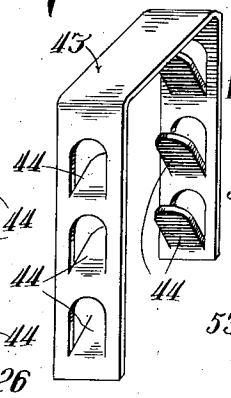


Fig. 12.

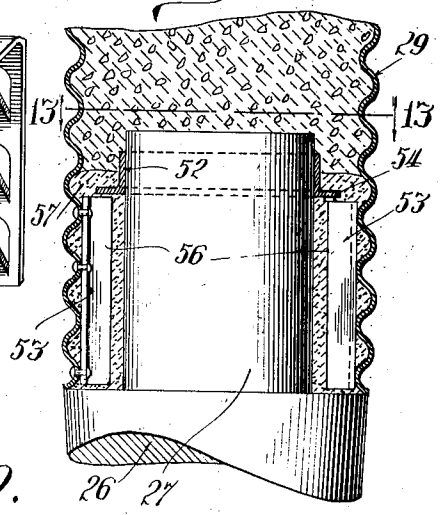


Fig. 9.

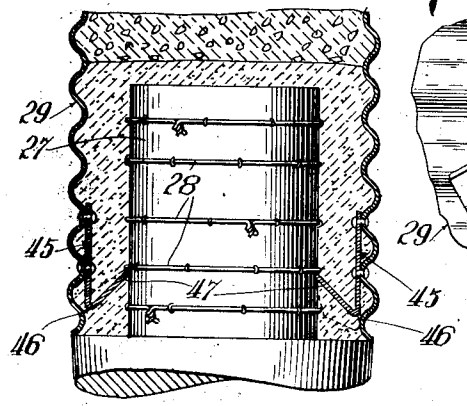


Fig. 10.

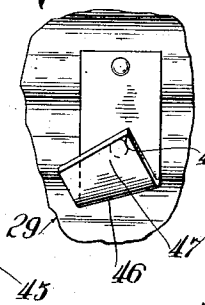


Fig. 13.

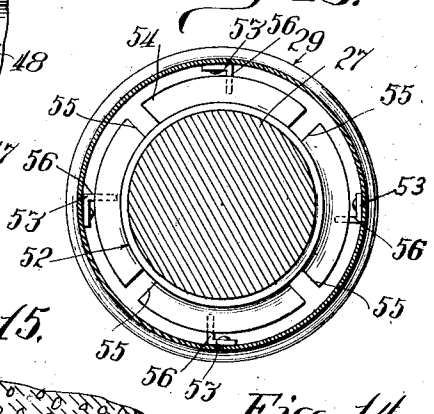


Fig. 11.

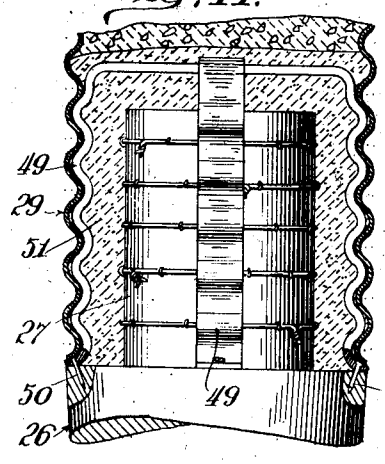


Fig. 15.

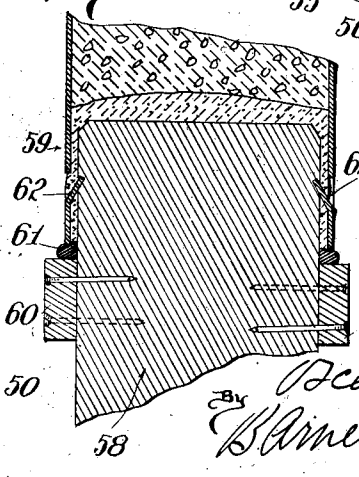
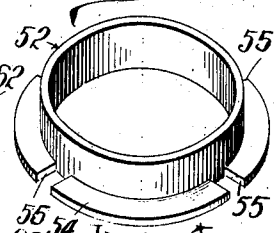


Fig. 14.



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Patented June 4, 1929. 1,715,808

UNITED STATES PATENT OFFICE.

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COMPOSITE PILE.

Application filed June 24, 1926. Serial No. 118,283.

My invention relates to composite piles and more particularly to piles which are composed, in each case, of a lower driven section, of wood, for example, and an upper section made of concrete, having a sheathing of metal or other suitable material.

In forming a pile of this character, the lower section is driven into the ground, usually through a casing, in which is placed a metal sheathing subsequently filled with concrete, suitably reinforced, if desired, with reinforcing bars, after which the casing is removed from the ground. The metal sheathing may serve the purpose merely of a form to hold the concrete in place until it has set, and, in such case, for reasons of economy, the sheathing is preferably of comparatively thin metal. A difficulty encountered in forming piles of this character, especially when the piles, as in foundation work, are close together and in soft ground, is that the earth is likely to be upheaved to a certain extent by the driving in of the removable casing and the wood section; and this upheaval of the ground tends to pull the upper concrete sections of the piles already formed away from their wood sections, which, if it occurs, may weaken the load carrying capacity of the piles very considerably.

The object of my invention is to provide novel means for effectually overcoming this defect in composite piles, the advantages of which in other respects are well recognized.

The invention is illustrated in certain preferred embodiments in the accompanying drawings, wherein

Fig. 1 is a fragmentary sectional view of a composite pile constructed in accordance with my invention, the removable metal casing used in forming the pile being shown as still in the ground.

Fig. 2 is a longitudinal sectional view of the middle portion of the pile of Fig. 1, but shown on a larger scale.

Fig. 3 is a fragmentary sectional plan on line 3—3 of Fig. 2, the scale being still larger.

Fig. 4 is a sectional view, similar to Fig. 2 illustrating a modified construction.

Figs. 5 and 6 are fragmentary views, one in longitudinal section and the other in elevation illustrating another form of the invention.

Fig. 7 is a fragmentary sectional view of another embodiment of the invention.

Fig. 8 is a view in perspective of the anchoring device employed in the pile illustrated in Fig. 7.

Fig. 9 is a view similar to Fig. 7 of another modification.

Fig. 10 is a view in elevation of one of the anchoring devices used in the last mentioned construction.

Fig. 11 is a fragmentary sectional view of another embodiment of the invention.

Fig. 12 is a similar view of another form of the invention.

Fig. 13 is a sectional plan on line 13—13 of Fig. 12.

Fig. 14 is a view in perspective of the anchoring device on the wood section of the pile shown in Figs. 12 and 13, and

Fig. 15 is a fragmentary sectional view of another modification.

Referring first to Figs. 1 and 2, 25 designates a cylindrical casing which is driven into the ground, together with a core (not shown) in a manner familiar to those skilled in this art. The lower section of the pile is preferably wood and is designated 26 on the drawing. This wood section is placed in the casing 25 and is then driven into the ground. Preferably the upper end 27 of the wood section is of smaller diameter than the portion just below it and is wire bound, as indicated at 28. A sheathing is then placed in the casing 25, this sheathing consisting, in the form of the invention shown in Figs. 1 and 2, of a corrugated tubular structure 29, the lower end of which rests upon the shoulder 30 of the wood section.

In order to provide for an engagement of the sheathing 29 with the wood section to prevent upheaval of the earth from lifting the concrete section of the pile from the wood section while the concrete is in an unset condition, the sheathing has secured thereto one or more strips of metal with turned-in ends adapted to engage the wire bound upper end of the wood section. I have shown two of such strips 31 and 32, each consisting of a pair of vertical legs 33—33, connected by a cross-member 34, the cross-members lying above the end of the wood section and being preferably riveted together, as indicated at 35. Each of the strips 31 and 32 is formed with an inwardly and upwardly extending end 36 adapted to bear against the upper end of the wood section and to engage one of the wires 28. These end prongs 36 are more or less flexible and the intention is that they

should be formed so as to be bent back when the sheathing is put in place upon the wood section. The strips 31, 32 are secured to the sheathing 29 in any suitable manner. For example, they may be wired to the sheathing by wires 37, as shown in Fig. 3.

When the sheathing is in place and engaged with the reduced end of the wood section, as just described, a concrete material, preferably a sand grouting is tamped into the space between the sheathing and the upper end of the wood section. This grouting 38, even before it has set, helps to maintain the engagement of the anchoring strips 31, 32 with the wood section. The space in the sheathing above the grouting is filled, preferably, with a cement and stone concrete, as indicated at 39, on the drawing.

In Fig. 4 the pile is constructed as shown in Figs. 1, 2 and 3, except that a smooth sheathing 40 is used instead of the corrugated sheathing 29 of the other form of the invention.

In Figs. 5 and 6 the anchoring devices are formed by cutting tongues 41 from the sheathing 42 and bending the tongues inwardly so that they will have a spring engagement with the reduced upper end 27 of the wood section when the sheathing is put into place.

In Figs. 7 and 8, an anchoring strip 43 secured to the sheathing 29 is formed, by cutting and pressing with a plurality of lips or prongs 44, which bear against the reduced end 27 of the wood section.

In Figs. 9 and 10 the sheathing 29 has secured thereto on the inside a plurality of angular clips 45, which are bent on oblique lines 46 so that the bent over ends 47 present corners or points 48 to engage the reduced end 27 of the wood section.

In Fig. 11, the wood section 26 is provided with a transversely corrugated strip 49, the ends of which are nailed at 50 to the shoulders 30 of the wood section, which strip is engaged by the corrugations of the sheathing 29. When the space between the reduced end of the wood section and the sheathing is filled with grouting, as indicated at 51, the engagement between the sheathing and wood section will be sufficient to prevent separation between the pile section through upward movement of the ground.

It will be understood that in all of the forms of the invention herein shown, it is the intention to grout the space between metal sheathing and the upper end of the wood section of the pile. This material is closely packed around the locking or engaging devices and helps to maintain the engagement between the metal sheathing and the wood section.

In Figs. 12, 13 and 14 a positive interlock is provided between the sheathing and the wood section. The upper reduced end 27 of the wood section has attached thereto a ring 52, angular in cross section, and the sheathing 29 has secured thereto, on the inside, a number of vertically arranged angle bars 53. The horizontal flange 54 of the ring 52 is cut away to form slots 55 corresponding in number to the angle bars 53 and correspondingly spaced. The outstanding webs 56 of the angle bars 53 pass through the slots 55 when the sheathing 29 is put in place. The sheathing is then turned on its longitudinal axis and the space between the sheathing and the upper end of the wood section filled with a fine grout, as indicated at 57.

In Fig. 15 I have shown a wood section 58 with its upper end of full diameter. The sheathing 59 fits down over the ends of the wood section, resting on blocks 60 nailed to the wood section, a rope grommet 61 being arranged so as to prevent leakage of the concrete betwen the sheathing and wood section. The sheathing is formed with cut and pressed-in tongues 62 arranged to bear against and bite into the wood section.

I claim:

1. A composite pile comprising a lower section, an upper concrete section, a sheathing for the upper section, and means attached to said sheathing and engaging the lower section to prevent upheaval of the earth from separating the upper from the lower section.

2. A composite pile comprising a lower driven wood section, an upper concrete section, a metal sheathing for the upper section, and means attached to said sheathing and engaging the wood section to prevent upheaval of the earth from separating the upper from the lower section.

3. A composite pile comprising a lower section, an upper concrete section, a sheathing for the upper section, and engaging means on the sheathing for gripping the lower section and which permits the sheathing to be placed over the lower section, but resists the separation of the sections in case of upward movement of the surrounding earth.

4. A composite pile comprising a lower section having an upper end of reduced diameter, an upper concrete section, a sheathing for the upper section and means attached to the sheathing and providing an engagement between the sheathing and the upper reduced end of the lower section.

5. A composite pile comprising a lower section, an upper concrete section, a sheathing for the upper section, and upwardly and inwardly inclined holding devices on the sheathing to engage the lower section.

6. A composite pile comprising a lower wood section having an upper end of reduced diameter, an upper concrete section, a sheathing for the upper section, and obliquely arranged anchoring devices on the sheathing

and extending across the space between the sheathing and the reduced end of the lower section.

7. A composite pile comprising in combination a lower wood section having an upper end of reduced diameter, an upper concrete section comprising an annular body of concrete which surrounds and encloses the upper end of the wood section, a metal sheathing enclosing the lower end of the concrete section, and coengaging means on said sheathing and the upper end of the wood section and embedded in the annular body of concrete for anchoring the sheathing to the wood section.

8. A composite pile comprising in combination a lower wood section having an upper end of reduced diameter, an upper concrete section comprising an annular body of concrete which surrounds and incloses the upper end of the wood section, a metal sheathing enclosing the lower end of the concrete section, and a metal strip which is secured to the inside of the sheathing with its end turned upwardly to engage the upper end of the wood section.

9. A composite pile comprising in combination a lower wood section having an upper end of reduced diameter, an upper concrete section comprising an annular body of concrete which surrounds and incloses the upper end of the wood section, a metal sheathing enclosing the lower end of the concrete section, and a metal strip secured to the inside of the sheathing with its end turned upwardly to engage the upper end of the wood section, the upper end of the wood section being wire bound for the purpose described.

10. A composite pile comprising in combination a lower wood section having an upper end of reduced diameter, an upper concrete section and a sheathing for the concrete section provided with inturned tongues embedded in the concrete section and adapted to bear against the wood section.

11. A composite pile comprising in combination a lower wood section having an upper end of reduced diameter, an upper concrete section, a sheathing which surrounds the upper section and engaging means between the sheathing and upper end of the wood section comprising a metal strip secured to the inside of the sheathing and provided with an upwardly and inwardly extending tongue to bear against the wood section.

12. A composite pile comprising in combination a lower wood section having an upper end of reduced diameter, an upper concrete section, a metal sheathing surrounding the upper section and a plurality of angle clips secured to the inside of the sheathing and formed so as to flex to permit their engagement with the wood section and so that their corners bite into the upper end of the wood section.

13. In a composite pile, the combination with a lower wood section, an upper concrete section and a form for retaining the concrete of the upper section when poured which extends over the upper end of the wood section, of means for preventing the concrete section from separating from the wood section comprising a detent arranged obliquely between and engaging said form and wood sections.

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