Oct. 3, 1933. L. M. KING 1,929,280

COMPOSITE PILE

Filed July 29, 1932

Fig. 1

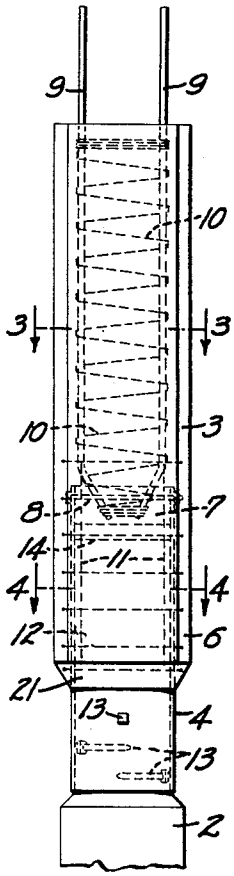


Fig. 2

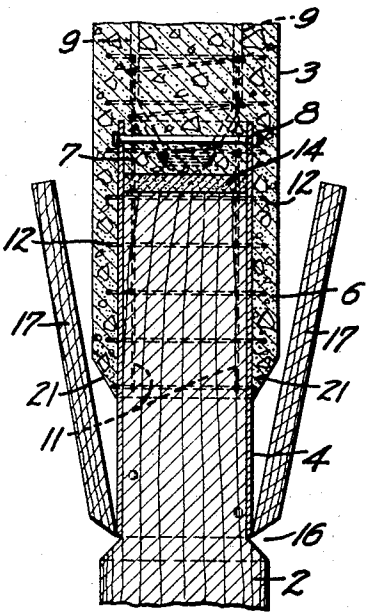


Fig. 5

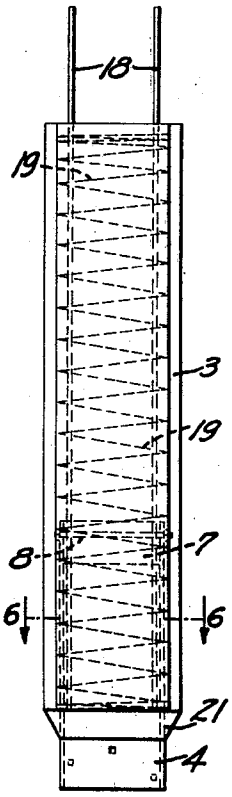


Fig. 3

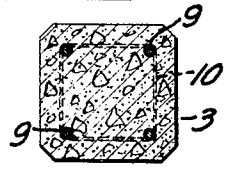


Fig. 7

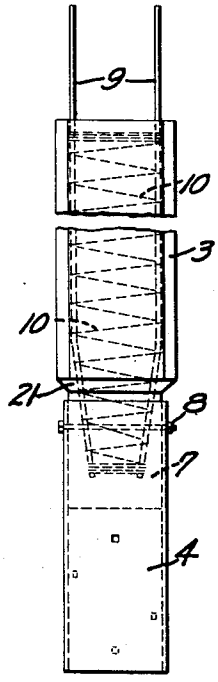


Fig. 6

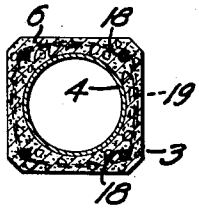
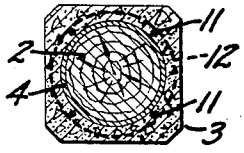


Fig. 4



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COMPOSITE PILE

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3 Claims. (Cl. 61—53)

My invention relates to a composite pile, and more particularly to such a pile having a wooden lower section and a concrete upper section.

It is among the objects of my invention to provide an improved coupling structure for joining the pile sections together.

Another object of my invention is to provide a composite pile in which the sections are connected by a structure which develops the full bearing strength in the lower wooden section thereof.

Another object of my invention is to provide a composite pile in which the sections are joined by a coupling structure capable of imparting the necessary lateral support for guiding the pile while driving, and to prevent buckling when other piles are being driven in the immediate vicinity.

A further object of my invention is to provide a composite pile in which the upper section cannot be upwardly displaced or pushed off the lower wooden section by the uplift of the ground which so often occurs when driving adjacent piles.

A still further object of my invention is to provide a method of driving composite piles which simplifies the joining of the pile sections together and improves the rigidity of the resulting pile structure.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of my invention. It is to be undestood that I do not limit myself to this disclosure of species of my invention, as I may adopt variant embodiments thereof within the scope of the claims.

Referring to the drawing:

Figure 1 is a side elevational view showing a composite pile embodying my invention; portions of the wooden pile section being omitted to shorten the view.

Figure 2 is a detail vertical sectional view showing the coupling structure and the manner in which the socket of the upper concrete section is driven in place over the lower wooden section.

Figure 3 is a horizontal sectional view taken in a plane indicated by the line 3—3 of Figure 1, and showing the arrangement of reinforcing in the concrete section.

Figure 4 is a horizontal sectional view showing the arrangement of reinforcing in the concrete about the socket, taken in a plane indicated by the line 4—4 of Figure 1.

Figure 5 is a side elevational view showing a modified form of the concrete section for the composite pile embodying my invention.

Figure 6 is a horizontal sectional view of the same showing the arrangement of reinforcing; and

Figure 7 is a side elevational view showing another variant form of concrete section.

In terms of broad inclusion, the composite pile embodying my invention comprises a lower wooden section, and an upper section of indestructible material, preferably of reinforced concrete, having a socket in the lower end thereof into which the upper end of the wooden section engages. The socket is preferably formed by a metallic sleeve cast into and suitably locked in the concrete section. The end of the wooden pile section engaging in the socket is preferably spaced from the base of the socket, and a suitable material, such as cement, is interposed between the base of the socket and the engaging section and is formed to fill the space therebetween.

Means penetrating the wooden section is also provided for locking the sleeve thereto. The socket in the upper pile section preferably has an inside diameter less than the diameter of the lower wooden section, and the method of driving the composite pile includes cutting an annular groove or incision in the wooden pile to approximately the diameter of the socket; the groove being spaced below the top of the wooden pile section so as to register approximately with the edge portions of the socket in its final position of engagement. In my improved method of driving the composite pile, the wooden section is preferably first partially driven and then the upper section is aligned thereover so that its socket rests on the top of the wooden section.

The first driving on the upper section operates to split off the portions of the wooden section above the groove and to force the socket with a driving fit on the lower section. Continued action of the pile driver hammer then operates to drive both sections of the pile to grade.

In greater detail, and referring particularly to Figures 1 to 4, the composite pile embodying my invention preferably comprises a lower untreated wooden section 2 and an upper section 3 of a suitable indestructible material, such as concrete, having a socket in the lower end thereof into which the upper end of the wooden pile section 2 is adapted to engage. The socket is preferably formed by a sleeve 4, preferably of a suitable metal such as steel or wrought iron. This sleeve is preferably cast in the upper concrete section 3 so that a jacket portion 6 of concrete surrounds

the upper portion of the sleeve 4, and a plug portion 7 of concrete extends for a distance within the upper end of the sleeve. A bolt 8, passing thru the sleeve and concrete plug portion 7, is provided for securely locking the sleeve in position.

The concrete column of the upper pile section is preferably reinforced by a plurality of longitudinal bars 9 projecting from the top of the column and extending downwardly therethrough; the lower ends of these bars being preferably bent inwardly and terminating in the plug portion 7 below the locking bolt 8. A wrapping of wire 10 is preferably provided and is helically wound about the longitudinal bars 8 to further reinforce the column structure. A plurality of shorter longitudinal bars 11 are also preferably provided for reinforcing the jacket portion 6 of the concrete pile section, and a wrapping of wire 12 is provided about these bars.

The coupling sleeve 4 is driveably fitted on the upper portion of the wooden pile section 2, and is preferably locked in its position of final engagement by a plurality of spikes 13. The top of the wooden section 2 is preferably spaced from the base of the socket formed by the coupling sleeve 4, and this spacing is filled with a suitable cushioning material 14. This interposed layer is preferably of a material having a plastic state, but which will set or harden into a rigid body. I have found that ordinary cement serves well for this purpose and is preferably employed.

The coupling sleeve 4 preferably has an inside diameter less than the diameter of the wooden pile section 2, and the method of driving the composite pile embodying my invention includes cutting an annular ring 16 adjacent the upper end of the wooden pile section. This notch is cut to the diameter of the coupling sleeve 4 and is spaced below the top of the wooden pile so that it registers approximately with the lower edge of the sleeve when the latter is in its finally engaged position, as is clearly shown in Figure 2. I have found that it is convenient to first partially drive the wooden pile section, that is, drive the section until the point where the groove is to be cut is just above the ground, and then "ring" the pile with a suitable tool, such as an axe, to form the groove 16. It is understood however that the wooden sections may be "ringed" prior to their being driven. It is also understood that, instead of a groove, an annular incision may be provided.

After these operations the upper pile section 3 is aligned in position over the section 2 with the sleeve 4 centered on the top of the lower section. Prior to bringing the sleeve to rest on the lower section however, a shovel full of cement is placed on top of the wooden pile to form the filling layer 14. The upper section is then driven to split off the wood portions 17 above the groove 16, the lower edge of the sleeve 4 serving as the cutting edge, and to force the sleeve 4 on to the wooden pile. By this method it is unnecessary to previously shape or frame the upper end of the wooden pile to fit the socket, yet it insures a secure and tight fit between the socket and the wooden section. This forms a composite pile which is rigid along its entire length and prevents lateral deflection or buckling at the joint when the pile itself is being driven or when piles are being driven in the immediate vicinity. After the portions 17 have been split off, the spikes 13, as shown in Figure 1, are driven to lock the sleeve in position to prevent the upper section 3 from being vertically displaced or pushed off the lower section by the uplift of the ground caused when adjacent piles are being driven.

The plastic cement grout which is placed on top of the wooden pile section just prior to driving on the concrete section serves a plurality of purposes: First, the grout flows out to form a layer which conforms to irregularities in the surfaces of the adjacent pile sections and brings to full bearing the concrete section upon the wooden section. This is particularly important because of the difficulties experienced in getting workmen to cut the heads of the timber sections exactly true and perpendicular to the axis of the pile. Second, the plastic grout acts as a cushion and protects the head of the timber pile from damage during the final driving of the pile to grade. This final driving of the last few feet to obtain the required bearing power in the pile is the most severe, and if the head end of the lower section is not protected, considerable damage to the wood fibre results. With the metal sleeve acting as a ring reinforcement and the grout as a cushion, the top fibres of the timber pile section will withstand severe driving without damage. Third, the grout under the heavy blows of the driving hammer is forced into and fills any voids or spaces that might otherwise exist between the sleeve, wooden section and the concrete section, and when the cement of the grout sets it insures a continuity of rigid material throughout the length of the composite pile.

The composite pile is designed so that the metallic sleeve 4 will be carried below the permanent water level when the pile is driven, so as to exclude air from the sleeve and thus prevent oxidation or corrosion.

Figure 6 shows a variant form of concrete section for the composite pile embodying my invention. This construction is similar to that shown in Figures 1 and 2 but in this case the longitudinal reinforcing bars 18 which extend through the column are positioned outside the sleeve 4 so that they project downwardly through the jacket portion 6 of the concrete section. A suitable wrapping 19 is helically wound about the longitudinal bars to further reinforce the structure. The lower edges of the jacket portion 6 may be beveled, as at 21, to aid in splitting off the portions 17 of the wooden pile section.

Figure 7 shows another variant form of concrete section embodying my invention, and is similar to the structure shown in Figures 1 and 2, except that the jacket portion 6 is omitted and the plug portion 7 is considerably lengthened. I have found that this simplified structure is sufficiently rigid for many purposes.

I claim:

1. A section of a composite pile comprising a concrete column and a metallic sleeve cast in the column and providing a cutting edge at the lower end thereof, a portion of the column extending into an end of the sleeve and another portion extending about the outside thereof, and reinforcing means in the column and projecting into both of said extending portions.

2. A section of a composite pile comprising a concrete column, and a metallic sleeve cast in and projecting from the column and providing a cutting edge at the lower end thereof, a portion of the column extending into an end of the sleeve and another portion extending about the outside thereof, reinforcing means in the column and projecting into both of said extending portions, and a securing pin passing transversely through

the sleeve and column and past said reinforcing means.

3. The method of driving a composite pile having a lower wooden section and an upper section with a socket at the lower end thereof for engaging the wooden section, the socket having an inside diameter less than the diameter of the wooden section and having a cutting edge at the lower end thereof, which comprises partially driving the wooden section, cutting an annular incision in the wooden section to approximately the diameter of the socket and so that the incision is arranged to register approximately with the edge portions of the socket in its final position of engagement, depositing a mass of plastic material on the top of the wooden section, aligning the upper section over the wooden section so that the cutting edge of the socket rests on the top of the latter section, driving on the upper section to split off the outer portions of the wooden section above the incision and to drive the socket onto the wooden section, said driving on the upper section operating to force the plastic material into spaces and crevices between the socket and the wooden section and form a cushioning layer therebetween to protect the wood fibers at the top of the lower section during the final driving, and then driving both sections.

LOCHIEL M. KING.