No. 858,742. PATENTED JULY 2, 1907.

D. E. MORAN.

PILE AND METHOD OF FORMING AND SINKING IT.

APPLICATION FILED MAR. 4, 1907.

FIG. 1.

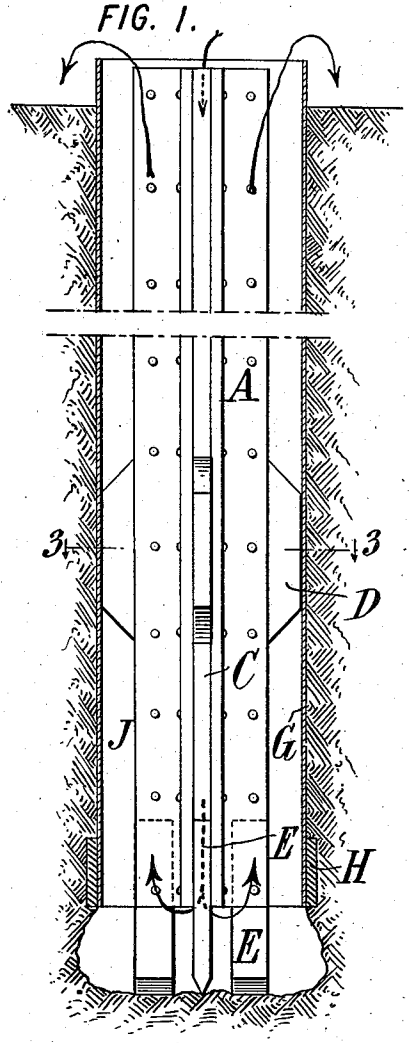


FIG. 2.

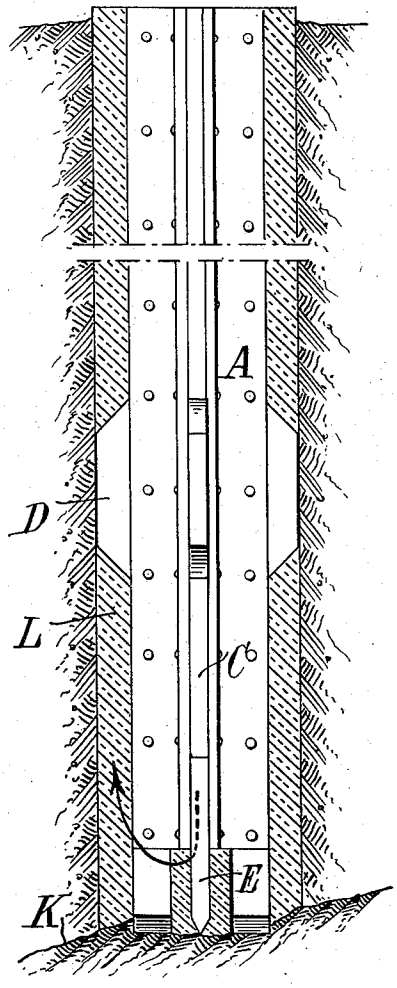


FIG. 4.

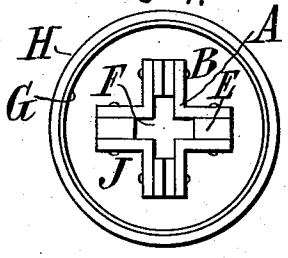


FIG. 3.

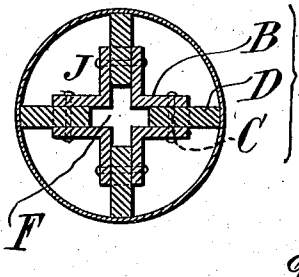
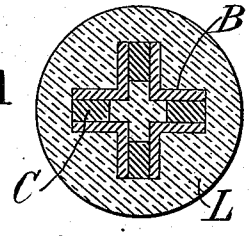


FIG. 5.



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UNITED STATES PATENT OFFICE.

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PILE AND METHOD OF FORMING AND SINKING IT.

No. 858,742. Specification of Letters Patent. Patented July 2, 1907.

Application filed March 4, 1907. Serial No. 360,447.

To all whom it may concern:

Be it known that I, DANIEL E. MORAN, a citizen of the United States, residing at Mendham, in the county of Morris and State of New Jersey, have invented certain new and useful Improvements in Piles and Methods of Forming and Sinking Them, of which the following is a specification.

This invention aims to provide an improved pile and certain new elements or sub-combinations thereof, and a method of forming and sinking the same.

The invention is especially advantageous where piles are to be sunk to a great depth.

According to the invention in its completest aspect, a shell of metal is driven or sunk by a water jet, and there is introduced into it not a mere reinforcing rod such as have been previously used in concrete piles, but a substantial column adapted to support a load such as the weight of the building or other superstructure, the column being afterwards surrounded with concrete chiefly to protect it from corrosion, and incidentally to stiffen it against buckling. It is not proposed however to utilize the resistance of the concrete to compression in the vertical direction, to the same extent as is done in ordinary concrete piles. The outside shell may be allowed to remain in place forming a further stiffening means, although one which is subject to corrosion. Or this shell may be withdrawn, leaving the pile to be composed only of its steel column and its concrete jacket.

A pile of this type may be designed with a much lower factor of safety than must be used for concrete piles. This, and the additional strength of the steel as compared with concrete, gives a pile of much greater bearing power. At the same time the objection previously existing against steel piles is obviated by the use of the concrete jacket.

The method of sinking is practically without limit as to depth, and if the depth be so great that the shell must be left in place, this may be of very light sheet metal so that the expense is not prohibitive.

Other advantages are referred to in detail hereinafter.

The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is a vertical sectional view at an intermediate stage of the process of sinking; Fig. 2 is a similar view of a completed pile with the jacket withdrawn; Fig. 3 is a cross-section on the line 3—3 of Fig. 1; Fig. 4 is an under side plan view of Fig. 1. Fig. 5 is a cross-section of a finished pile.

Referring to the embodiment of the invention illustrated, the column A constitutes the principal part of the pile. This column is provided with stiffening flanges, and preferably built up in the manner shown in Figs. 3 and 4, of angles B riveted together and spaced apart by means of spacers C, which throughout the principal part of their length preferably are flush with the outer edges of the angles, and which may be provided with projecting portions D to form guides in the surrounding shell. Such a built up column provides a hollow pile core having numerous advantages.

The lower end of the column A is preferably provided with a shoe consisting of four hard steel plates E, preferably extending in line with the spacers C, and leaving the central passage F of the column open clear from top to bottom. The outer shell G may be a plain cylindrical tube of thin metal, or may be made of stiff construction in case it is to be withdrawn after sinking. It is preferably reinforced by a ring H at its lower end. The construction and dimensions of the parts are such as to leave a space J between the column and the shell, and the wings D may be multiplied as many times as are necessary in the length of the column, and serve to guide it or center it in the shell.

The sinking may be very cheaply and quickly effected by means of a water jet passing down the central passage F of the column and up the intermediate passage J, or vice versa. The detailed construction shown provides passages of substantial area adapted to make very easy the carrying out of the work.

Where the columns are to rest on a rock or similar sub-foundation, the shoe blades E at the lower end of the column serve a valuable purpose. The column in such a case after being sunk to the rock K (Fig. 2) is lifted and lowered, working in the manner of a ram, and turned at the same time, so that it makes for itself a level bearing upon the rock, or even a socket in the rock which will hold the lower end of the pile from shifting laterally thereon.

After sinking to rock or to the desired depth in the manner described, concrete L is introduced in what I believe to be a novel and highly efficacious manner. The concrete is mixed quite fluid and is fed down one of the passages and up the other, preferably down the central passage F, first filling the bottom of the shell, and then as the introduction is continued under pressure rising in the space between the column and the shell. This method of introduction of the concrete by forcing it upward from the bottom, insures a much more perfect and well packed body of concrete than with the old method. After the concrete filling has been introduced, or during the filling operation, the shell may be withdrawn.

Though I have described with great particularity of detail certain specific embodiments of my invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiments disclosed.

Various modifications thereof in detail and in the arrangement and combination of the parts, may be made by those skilled in the art, without departure from the invention.

I claim as my invention:—

1. The method of forming a pile which consists in introducing concrete downward through a tubular passage and upward through another tubular passage.

2. The method of forming a pile which consists in sinking a hollow column with an open space outside of it and introducing concrete downward through said column and upward into said open space.

3. The method of forming a pile which consists in sinking an outer casing with a column therein, and surrounding said column with concrete.

4. The method of forming a pile which consists in sinking an outer casing with a column therein, and surrounding said column with concrete and withdrawing the outer casing.

5. The method of forming a pile which consists in arranging a hollow column with a surrounding casing to form a central passage and a surrounding passage, and sinking the two together by forcing water down one of said passages and up the other.

6. The method of forming a pile which consists in arranging a hollow column with a surrounding casing to form a central passage and a surrounding passage, and sinking the two together by forcing water down one of said passages and up the other, subsequently forcing concrete down one of said passages and up the other.

7. The method of forming a pile which consists in arranging a hollow column with a surrounding casing to form a central passage and a surrounding passage, and sinking the two together by forcing water down one of said passages and up the other, subsequently forcing concrete down one of said passages and up the other and withdrawing the surrounding casing.

8. The method of forming a pile which consists in sinking a column adapted to be used as a ram to a position of support upon a sub-foundation, by means of a water jet, and ramming said column down upon the sub-foundation to form a good bearing thereon.

9. The method of forming a pile which consists in sinking a column adapted to be used as a ram to a position of support upon a sub-foundation, ramming said column down upon the sub-foundation to form a good bearing thereon, and surrounding said column with concrete.

10. A pile comprising a tubular member having concrete inside and outside of it.

11. A sunken pile comprising a metal column adapted to support a load and surrounded by concrete throughout its length.

12. A sunken pile comprising a flanged and thereby stiffened member surrounded by concrete throughout its length.

13. A pile comprising a hollow metal column adapted to support a load and having concrete inside and outside of it.

14. A pile comprising a metal column adapted to support a load and resting directly on the sub-foundation and surrounded by concrete.

15. A pile comprising a hollow metal column adapted to support a load and resting directly on the sub-foundation and having concrete inside and outside of it.

16. A sunken pile comprising a casing, a tubular member therein, and concrete within said tubular member and within the space between said member and said casing.

17. A sunken pile comprising a casing, a metal column therein adapted to support a load, and concrete surrounding said column.

18. A pile comprising a casing, a hollow metal column therein adapted to support a load, and concrete within and around said column.

19. A pile comprising a concrete body and a tubular metal core.

20. A pile comprising a flanged tubular member having concrete inside of it.

21. A pile having a concrete body and a core, said core having a shoe at its lower end adapted to form a good bearing on the sub-foundation.

22. A sunken pile having a concrete body and a core, said core having stiffening flanges.

23. A hollow pile core having stiffening flanges.

24. A hollow pile core having stiffening flanges, and having at its lower end a shoe consisting of blades substantially in line with said flanges, said shoe having an opening communicating with the hollow space within the core.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

DANIEL E. MORAN.

Witnesses:
MAURICE DEUTSCH,
O. W. STANSBURY.