Mar. 6, 1923. 1,447,609

P. ZUCCO

CONCRETE PILING OF INDEFINITE LENGTH

Filed Sept. 9, 1920

Fig. 1.

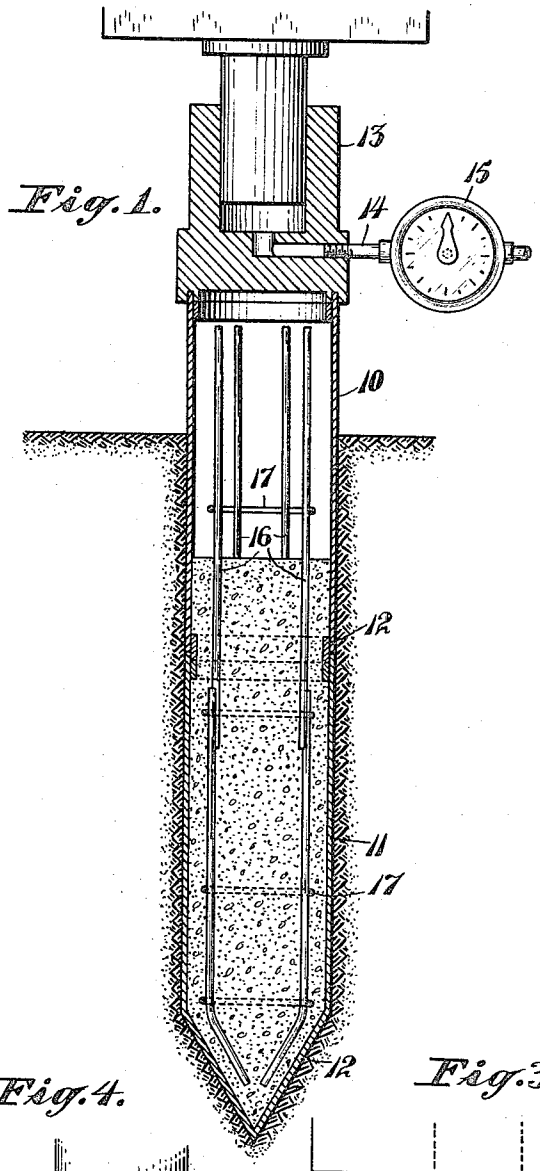


Fig. 2.

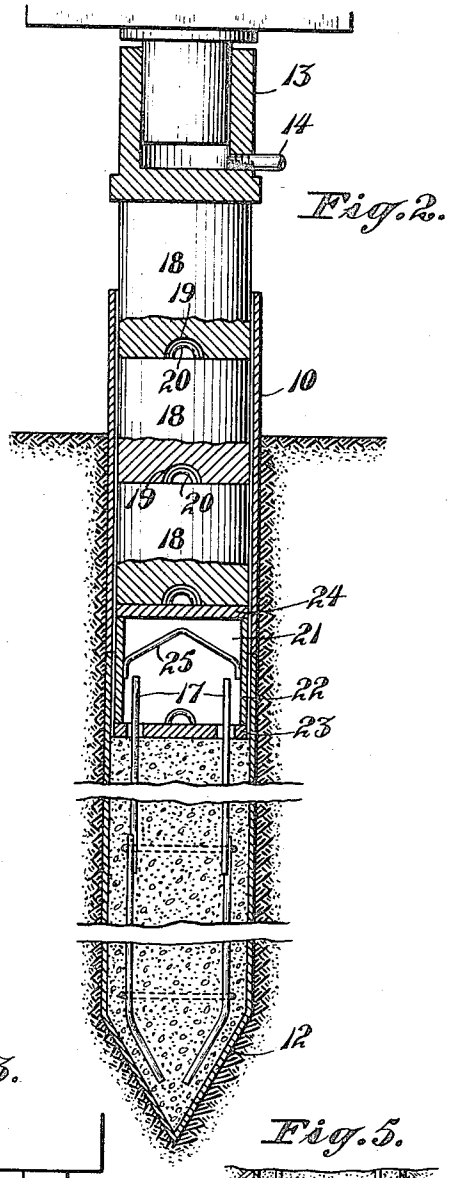


Fig. 4.

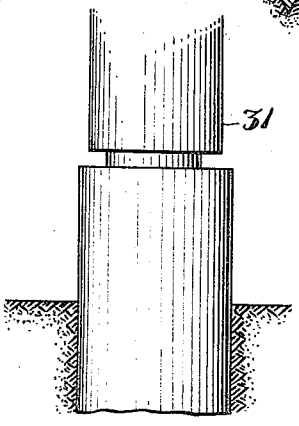


Fig. 3.

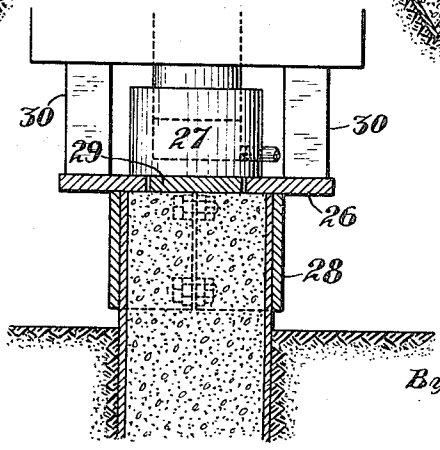
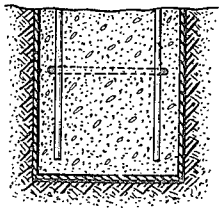


Fig. 5.



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UNITED STATES PATENT OFFICE.

PIERRE ZUCCO, OF SAN FRANCISCO, CALIFORNIA.

CONCRETE PILING OF INDEFINITE LENGTH.

Application filed September 9, 1920. Serial No. 409,100.

To all whom it may concern:

Be it known that I, PIERRE ZUCCO, a citizen of the United States, residing at the city and in the county of San Francisco and State of California, have invented a new and useful Improvement in Concrete Piling of Indefinite Length, of which the following is a specification.

This invention relates to concrete piling and particularly pertains to piling of indefinite length and a method of forming the same.

It is the principal object of the present invention to provide a concrete piling which may be progressively formed and sunk to an indefinite depth, at the same time insuring that a continuous reinforcing will be incorporated within the piling as driven, irrespective of the length of the pile; the invention having also in mind the provision whereby ferro concrete piling may be formed and driven to a desired depth without previously sinking test piles and without reference to the firmness of the soil sub-strata, thus making it possible to form and sink the pile until it has reached a solid foundation, either due to the firmness of the soil or the action of skin friction upon the surface of the piling, the driving action being directly delivered to the mass of concrete of which the pile is being constructed.

The present invention contemplates the use of a series of tubular casing members, preferably formed with thin metal walls and of convenient length, the lowermost of said casing lengths being fitted with a driving end and a suitable joint being provided between the various superimposed casing lengths, said casing being further adapted to receive reinforcing rods, binders, and a concrete mixture which is compressed into place by virtue of the driving process resulting in a true monolithic reinforced concrete pile of any length desired.

The invention is illustrated by way of example in the accompanying drawings, in which—

Figure 1 is a view in vertical section disclosing the first sections of one form of my concrete pile and further illustrating one manner in which it may be sunk.

Fig. 2 is a view similar to Fig. 1, disclosing means for compressing the concrete within the casing, irrespective of the presence of reinforcing members.

Fig. 3 is a view in section and elevation illustrating the manner in which the piling may be held against a rebounding action while a superstructure is applied thereto.

Fig. 4 is a fragmentary view in side elevation illustrating the upper end of the finished piling as supporting a weight.

Fig. 5 is a fragmentary view in section and elevation showing the driving end of a casing as formed without a point.

Referring more particularly to the drawings, 10 indicates a tubular cylindrical casing member, a plurality of which are used to form the outer wall of a pile. 11 indicates the lower casing member, one of which is used in the construction of each pile and which member is here shown as having downwardly extending conical end 12, for use under certain conditions and made blunt, as shown in Fig. 5, when the soil may be easily penetrated. This end is provided for the double purpose of penetrating the soil and to retain the concrete mixture within the casing structure. The various sections of the casing are of substantially the same length and are preferably arranged in superimposed abutting relation to each other. In the present instance an inner slip ring 12 is provided to overlap the joints of the adjacent ends and hold the casing in alignment as well as seal its walls. One manner in which the casing may be driven is shown in Fig. 1, where a hydraulic jack 13 is provided to exert pressure upon the upper end of the casing and force it downwardly against the succeeding lower casing sections, this jack is supplied with an incompressible liquid through a pipe 14, the pressure of this liquid is registered by a gage 15 for a purpose which will be hereinafter set forth. It will be understood that the piling may be of ferro-concrete construction and that longitudinal extending reinforcing rods 16 may be placed within the piling and held in line against expansion by tie wires 17.

The presence of tie rods within the concrete enclosed by the casing presents a difficult problem in sinking the structure and one method of overcoming this difficulty is shown in Figure 2 of the drawings. Here it will be seen that cylindrical blocks 18 are provided to telescope within the casing 10. These blocks have a recess 19 formed in their lower faces for accommodating a staple or stirrup 20 by which they may be removed. The lower of said cylindrical blocks rests upon a pressure member 21 of different

construction. This member is hollow and has a cylindrical wall 22 bearing against a tamping plate 23. This plate rests directly upon the mass of concrete within the casing and is formed with openings to accommodate the reinforcing rods 17, the upper end of the block 21 is covered by plate 24, upon which the lowermost block 18 rests. Suitable tie rods 25 connect the opposite sides of the wall 22 to prevent expansion of the member within the case. The upper block 18 is borne against by the jack mechanism previously described without acting upon the tubular casing. This transfers the pressure from the casing as shown in Fig. 1 to the concrete within the casing as shown in Fig. 2 and thus compresses the concrete mass at the same time acting against the lower end of the casing to sink it.

After the casing has been driven to a desired depth, a load is superimposed upon it. This operation is usually accompanied by a rebound of the pile when the pressure of the jack is relieved. In the present instance this rebound is eliminated by the use of a top plate 26, which is positioned over the end of the pile and against which the movable head 27 of the jack bears. During this operation the upper end of the casing is reinforced by a split sleeve 28, which is clamped around it and prevents splitting of the casing. The top plate 26 is preferably formed with a central opening of smaller dimensions than those of the jack head. This opening is normally closed by a removable plate 29. When the pressure of the jack is relieved from the plate the rebound of the casing is prevented by interposing blocks 30 between the plate and the solid support against which the jack normally acts, thus holding the pile while the head of the jack is removed, after which a superstructure 31 may be built upon the upper end of the casing and allowed to project through the opening in the plate 26 normally closed by the block 29.

In sinking a pile of the present type the initial length 11 may be sunk by pressure exerted by the jack directly upon it after which it may be filled with concrete and the first casing length 10 secured thereto. The successive lengths of casing may be forced downwardly by direct pressure upon the top of the casing wall as indicated in Fig. 1 or by pressure upon the mass of concrete within the casing as shown in Fig. 2. In either instance it is desirable to use the gage 15. This gage indicates the pressure of the liquid acting within the jack and when a greater pressure is indicated than that which would be required by the load to be carried by the piling, the sinking operation may be discontinued irrespective of the depth to which the piling has been driven.

It will be understood that as the casing lengths are driven and successively filled with concrete, they may be supplied with reinforcing rods, the ends of which overlap and are held together by tie wires. The concrete will be thoroughly packed around the reinforcing rods by the pressure block 22 as it is forced downwardly by the filler blocks 18 interposed between it and the jack. This downward force will compress the concrete and at the same time be unresisted by the reinforcing rods in the mass as they will project through the openings in the plate 23. When the piling has been sunk to a desired depth, the plate 26 is applied with the sleeve 28 and is blocked by the interposed block members 30, the jack head is then removed, as well as the cover plate 29, after which a superstructure may be built up to rest directly upon the concrete of the pile as permitted by the removal of the cover plate 29 and thereafter built up upon the plate 26, when the weight of this load is sufficient to prevent rebound of the pile, the blocks 30 and the jack is removed, thus providing a solid support. It will thus be seen that the pile here disclosed and the method of sinking it afford an economical means for providing proper, stable support for superstructures, and at the same time will insure that the piles may be readily driven and formed in a workmanlike manner as driving progresses.

While I have shown the preferred form of my invention as is now known to me, it will be evident that various changes in the combination, construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as claimed.

Having thus described my invention what I claim and desire to secure by Letters Patent is—

1. A method of forming and sinking concrete piling which consists in providing an outer metallic casing of relatively thin material closed at its lower end, thereafter placing concrete within the casing and then applying pressure directly upon the concrete to sink the casing.

2. A method of forming and sinking concrete piling of indefinite length which consists in providing a tubular end section having a closed lower end and other open ended tubular sections adapted to be successively connected to the first named section and intermediate sections, thereafter placing concrete within the first named section, then applying pressure to the concrete within the section whereby force will be delivered directly to the closed end of the section to drive the casing and then connecting successive sections thereto and further sinking the piling thus formed by pressure upon the top of the concrete within the uppermost section.

3. A method of forming and sinking reinforced concrete piling of indefinite lengths

which consists in providing a tubular casing member having a pointed closed end, said casing member being of relatively thin gage material, thereafter placing reinforcing rods within the casing to extend longitudinally thereof, then pouring concrete within the casing, thereafter applying downward pressure exclusively upon the mass of concrete and directly against the pointed end of the casing and thereafter securing successive lengths of tubular casing to the first length, then fixing reinforcing rods therein, after which concrete is poured into the casing and the extended piling further driven by pressure exclusively upon the top of the concrete poured into the casing section.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PIERRE ZUCCO.

Witnesses:
JOHN H. HERRING,
W. W. HEALEY.