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R. A. CUMMINGS.
METHOD OF SINKING CONCRETE PILES.
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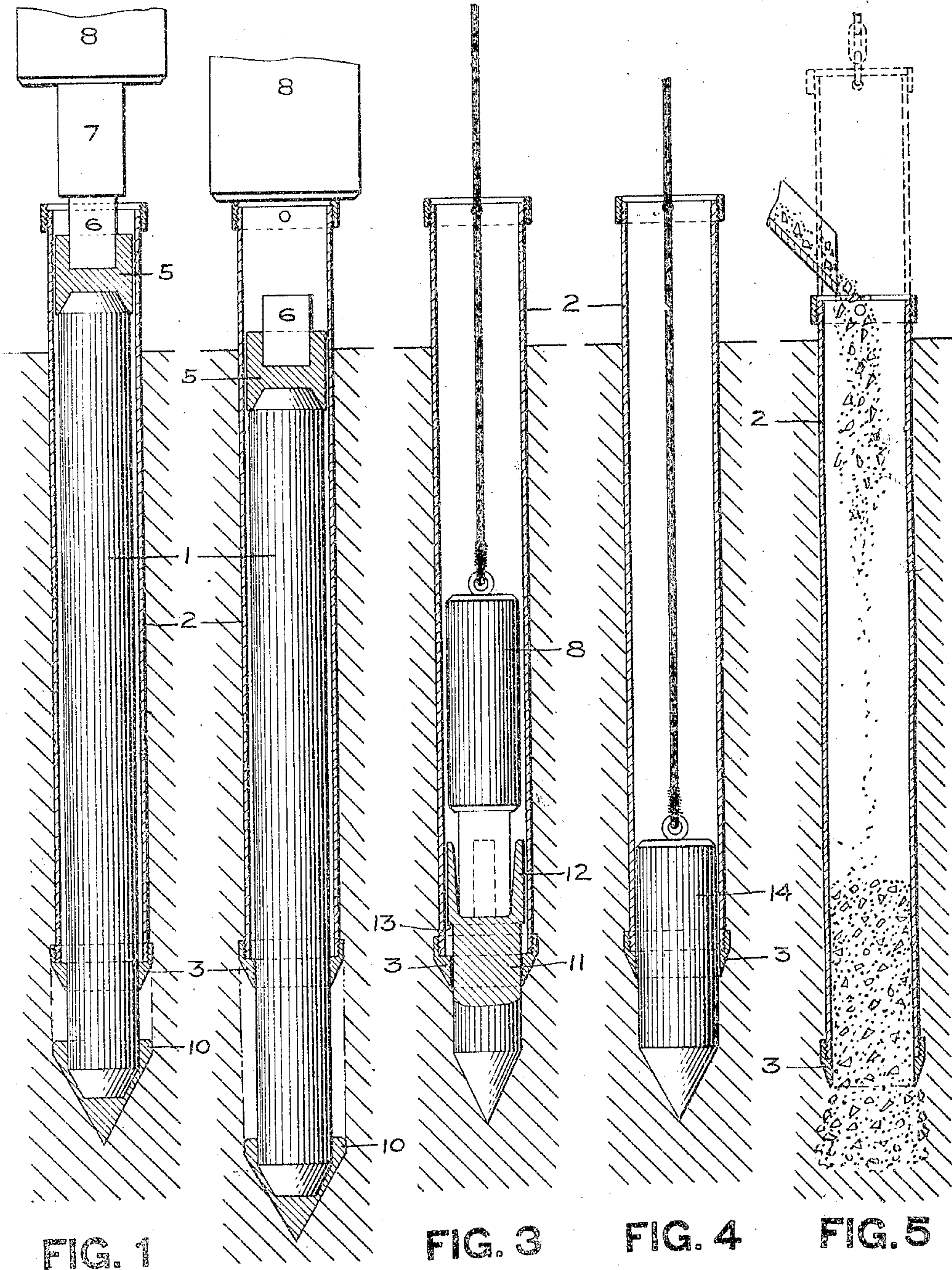


FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

WITNESSES.

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METHOD OF SINKING CONCRETE PILES.

No. 822,589.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed August 18, 1905. Serial No. 274,764.

To all whom it may concern:

Be it known that I, ROBERT A. CUMMINGS, a resident of Beaver, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Methods of Sinking Concrete Piles; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to a method of sinking concrete or other piles and the like, and also to a method of forming or sinking holes for piles and other purposes.

The object of the invention is to provide a method whereby the piles can be sunk or holes formed with greater expedition or with less power than by methods heretofore practiced.

Piles and the like are ordinarily sunk by driving them by means of drop or steam hammers known as "pile-drivers." Most piles are formed of wood; but recently piles have been formed of concrete and driven in the same manner as wooden piles. When these piles reach a considerable depth, the friction of the earth thereon is so great as to make the driving thereof difficult. The driving either consumes a considerable time or else if very heavy blows are used there is danger of fracturing the pile, this being especially true of concrete piles. It is also the practice to construct concrete and similar piles *in situ*, this being done by first sinking into the ground a hole of the proper size and depth and then filling the same with concrete and allowing the latter to set. Heretofore these holes have been sunk either by driving into the ground an open-ended tube and then excavating or removing the earth from the interior thereof or by driving into the earth a tube closed at its lower end. The first method is quite expensive and slow, (except where the water-jet method is applied to quicksand,) due to the necessity of removing the earth from the interior of the tube. The second method is objectionable because of the large amount of power necessary to drive the tube into the ground, this being especially difficult in hard or firm ground and with piles of considerable length and large diameter. The friction of the earth against a long pile is such as to require a large amount of power to overcome, so that it frequently happens that the greater portion of the power or blow ap-

plied to the tube is consumed in overcoming this friction. As a consequence the driving is either very slow or else requires an amount of power which is frequently prohibitive.

The object of the present invention is to provide a method of sinking piles or forming holes for piles or other purposes wherein the foregoing objections are overcome.

The invention consists, essentially, in driving or forcing into the earth the pile or a preparatory pile or other hole-forming implement in such a manner as to relieve all except the lower end thereof of the friction of the earth, thus expediting the sinking thereof or at least decreasing the strength of the hammer-blow necessary to drive the same. This I accomplish by inclosing the pile, preparatory pile, or other hole-forming implement within a tube or casing which extends down so as to inclose the entire pile or implement except its lower working end, thus greatly reducing the earth friction on said pile or implement. This tube or casing will remain stationary while the pile is being driven a given distance and will then be itself driven down approximately the same distance, after which the pile will be again driven. This alternate and independent driving of the pile and tube will continue until the pile is fully sunk. By this method of driving the blows given to the pile will have to overcome only the friction upon the portion of the pile which projects below the tube. Consequently the pile can be either much more rapidly driven or can be driven by means of lighter blows.

In the accompanying drawings I have illustrated in vertical section my improved method, Figure 1 showing the driving of a pile or preparatory pile according to my method, Fig. 2 showing the sinking of the inclosing tube, Fig. 3 showing the driving of a modified form of implement, Fig. 4 illustrating another modified form of implement, and Fig. 5 illustrating the manner of filling the hole with concrete and the withdrawal of the casing or tubing.

In driving a pile according to my method I provide the pile 1 of the desired size and shape and suitably pointed or otherwise shaped at its lower end so as to penetrate the earth with ease. This pile I inclose in a tube or casing 2 of suitable length and of such a diameter as not to frictionally bear against

the pile except so far as may be necessary to guide the latter. The lower end of this tube or casing is either slightly contracted or preferably provided with a sharpened driving 5 thimble or ring 3, which forms a fairly tight fit around the pile and prevents entrance of the earth between the pile and casings. The pile so inclosed in the tube or casing will be driven into the earth by any suitable means, 10 such as a drop or steam hammer, such as ordinarily used for this purpose.

The pile may be of any suitable material, either concrete, wood, or metal. Its upper end may be suitably shaped to receive the 15 driving-cap 5, which is provided with the ordinary cushioning-block 6. Preferably the usual wooden follower 7 will be employed for receiving the impact of the pile-driving hammer 8. The latter will be raised and 20 dropped in the usual manner, thus driving the pile into the earth.

When the follower-block 7 is employed, the pile may be driven down into the earth a suitable distance and until the hammer 8 con- 25 tacts with the upper end of the tube 2. Then the follower can be lifted out and the hammer permitted to strike directly on the upper end of the tube itself, thus driving the latter down until its lower end approaches the 30 lower end of the pile, after which the follower will again be used and the pile driven down independently of the tube. In this manner the pile and tube will be alternately and independently driven. According to this 35 method only a comparatively short portion of the pile extends below the lower end of the tube 2, and consequently the blow of the hammer on the pile need overcome only the friction of the earth on such projecting lower 40 end. As a consequence the pile can either be driven very rapidly or such light blows employed as will not injure or fracture its upper end. The casing 2 entirely relieves the main portion of the pile from earth friction.

45 If desired, the pile 1 may be only a preparatory implement for forming the hole and after being driven can be withdrawn and the hole filled with concrete, which is permitted to set to form the pile. If the pile is a 50 permanent one, it may have its lower end larger than the tube, as shown at 10, in order to facilitate driving.

In Fig. 3 I have illustrated a modified implement much shorter than the pile 1, but 55 being driven in substantially the same way. In this case the hammer 8 of the pile-driver will be made sufficiently small to enter the tube 2. The implement 11 (shown in this figure) is of sufficient length or provided with 60 suitable wings 12, contacting with the inner face of the tube 2, so as to be guided and kept from turning sidewise. A portion of the implement will be slightly enlarged or otherwise provided with shoulders 13, so as

to prevent the same from being driven en- 65 tirely out at the lower end of the tube or casing. After this implement has been driven down until its shoulder 13 comes into contact with the ring 3 at the lower end of the tube said tube will be driven down suffi- 70 ciently far so that the further driving of the implement 11 can be continued. This can be done by placing a block over the upper end of the tube and permitting the hammer to strike the same. After the hole has been 75 sunk to the required depth the implement 11 can be withdrawn by means of a suitable fishing-tool or by the hammer-line.

In Fig. 4 I have shown a slug-shaped pointed weight 14, which can be connected directly 80 to the hammer-line of the pile-driver. It is in effect a modified form of pile-driver hammer, being pointed at its lower end, so that when dropped it will form a hole in the earth. With all forms of piles and imple- 85 ments described the inclosing tube 2 relieves the same from the greater portion of the earth friction, so that either a lighter hammer 8 can be employed or else more of the energy of said hammer will be available for 90 sinking the pile or implement.

If a permanent pile is used, after it has been sunk to the proper depth the casing 2 can be withdrawn, if desired, leaving the pile in place. When a preparatory pile or one of 95 the implements shown in Fig. 3 or Fig. 4 is used, after the same has been sunk to the required distance it will be withdrawn and the hole thus formed filled with concrete, as shown in Fig. 5. While the filling pro- 100 gresses the tube 2 is continuously or intermittently withdrawn. When the hole is filled to the desired extent, the concrete is allowed to set, thus forming a pile. The concrete can be filled into the hole in any suit- 105 able or desired manner.

What I claim is—

1. The method of sinking piles or hole-forming members, which consists in forcing said member into the earth and independ- 110 ently thereof and progressively therewith sinking a tube which incloses said member and relieves the same of earth friction.

2. The method of sinking piles or hole-forming members, which consists in driving 115 said member into the earth and independently thereof and progressively therewith sinking a casing or tube which at its lower end has a close fit on said member.

3. The method of sinking piles or the like, 120 which consists in driving the same into the earth and independently thereof and progressively therewith sinking an inclosing tube which at its lower end has a close fit with said member, and then withdrawing 125 said tube.

4. The method of sinking and constructing concrete piles, which consists in forcing

into the earth a pointed member independ-
ently thereof and progressively therewith
sinking a tube which incloses said member
and relieves the same of earth friction, with-
5 drawing said member, and then filling the
hole with concrete and withdrawing said
tube.

In testimony whereof I, the said ROBERT
A. CUMMINGS, have hereunto set my hand.

ROBERT A. CUMMINGS.

Witnesses:

G. C. RAYMOND,

ROBERT C. TOTTEN.