

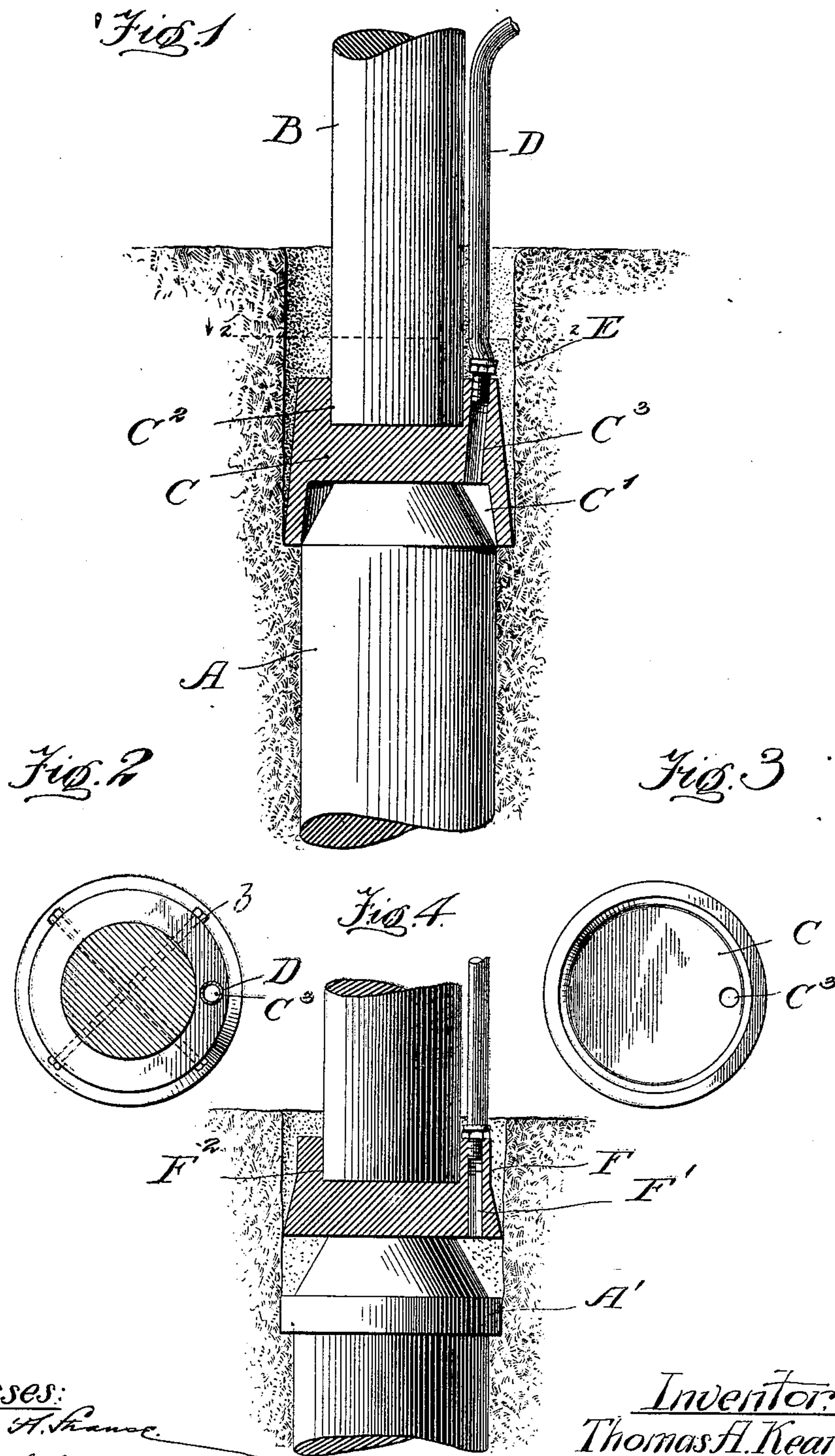
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Patented May 30, 1899.

T. A. KEARNS.
ART OF DRIVING PILES.

(Application filed Jan. 7, 1898.)

(No Model.)



Witnesses:

Edmund A. France.

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UNITED STATES PATENT OFFICE.

THOMAS A. KEARNS, OF CHICAGO, ILLINOIS.

ART OF DRIVING PILES.

SPECIFICATION forming part of Letters Patent No. 625,978, dated May 30, 1899.

Application filed January 7, 1898. Serial No. 665,881. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. KEARNS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Art of Driving Piles; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in the art of driving piles and the like below the surface of the ground and refers to an improved method of and apparatus for withdrawing the follower or part which communicates the blows of the hammer to the pile being driven after the latter has been sunk the required depth below the surface of the ground.

In driving piles which are designed to support the foundation of masonry of a building and which foundation is to be built so as to rest at the lower part thereof at a distance below the surface of the ground it is sometimes necessary or desirable in arranging the work to set or drive the piles before the earth has been excavated to the level to which the foundation of masonry is to be supported upon the piles, the earth being subsequently excavated to the level of the tops of the piles and the foundation built thereon in the usual manner. In driving piles by the use of the well-known types of trip or steam hammers it has been common to provide a cap which fits over the upper end of the pile and which directly receives the blows from the hammer, said cap being provided for the purpose of preventing the hammer from splitting or otherwise distorting the upper end of the pile.

When a pile is to be driven only to the level of the surface of the ground, such cap is usually supported from the frame of the pile-driver in a manner to be readily raised and lowered to correspond with the level of the upper end of the pile; but when the piles are to be sunk some distance below the surface of the ground it is necessary to provide a section of timber which is termed a "follower" of a length equal to or slightly greater than the greatest depth which the piles are to be

sunk below the surface of the ground. Said follower is adapted to rest at its lower end upon the upper end of the pile being driven and to receive at its upper end the blows from the hammer. When said follower is employed after the top of the pile has been sunk to the level of the surface of the ground, the cap which previously rested upon the upper end of the pile is transferred to the upper end of the follower, and a second cap is interposed between the lower end of the follower and the upper end of the pile. The pile-drivers in common use are so arranged as to enable the hammer to deliver the stroke at the level of the surface of the ground, so that the pile may be driven below the surface of the ground a distance equal to the length or depth of the cap. When said cap is driven below the surface of the ground, either with or without the employment of the follower, it has been found difficult to withdraw the same from the hole formed thereby after the pile has been driven to the required depth, for the reason that the air-pressure upon the upper side of the same greatly exceeds the pressure upon the lower side thereof, thereby creating a suction against which the cap must be lifted. When the follower is employed and the cap is therefore driven a considerable distance into the ground, the force required to withdraw the same will of course be greatly increased over that required to withdraw the cap when the follower is not used. The difficulty of withdrawing the cap is further increased when the pile is being driven into soft or sandy ground by reason of the particles of dirt dropping from the side of the hole made by the cap upon the latter, and thereby increasing the weight to be lifted in order to withdraw said cap.

My invention consists in providing means for introducing between the upper end of the pile and cap a suitable motive agent, which exerts pressure to separate the cap from the upper end of the pile and to lift said cap out of the hole formed thereby. For this purpose the cap will be provided with a suitable port or passage, which will be connected by any convenient means with a source of the motive agent employed and which leads at its inner end to the space between the upper

end of the pile and cap. Said motive agent will act when forced into the space between the cap and pile to lift said cap out of the hole formed thereby and leave it in position where it may be readily handled by the usual means for such purpose. The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings illustrating one particular means for carrying out my invention, Figure 1 illustrates, in side elevation, the upper end of a pile which has been driven below the surface of the ground, the lower end of a follower, and illustrates in section my improved cap interposed between said pile and follower. Fig. 2 is a cross-section taken on line 2 2 of Fig. 1. Fig. 3 is a bottom plan view of the cap. Fig. 4 illustrates a modified form of cap.

As shown in said drawings, A designates the upper end of a pile which has been driven some distance below the surface of the ground, B a follower which rests thereon in axial extension thereof, and C a follower-cap which is interposed between said follower and the pile. The cap C will preferably be made of cast metal and is shown as made of bell shape in exterior form in order to cover the upper end of the pile, which is of greater diameter than the follower. Said cap, as shown in Figs. 1 and 3 of the drawings, and as preferably formed, is provided on its under side with an annular recess C', which is commonly of conical or tapered form to prevent splitting or distortion thereof. Said cap C, as shown in the drawings, is provided on its side opposite the recess C' with an annular concentric recess C², which is adapted for the reception of the lower end of the follower B and is of such size that said follower fits closely therein. As a preferable construction and to facilitate the handling of said parts, said cap will be permanently attached to the follower, the means herein shown for this purpose consisting of securing-bolts b b, which pass through the flange surrounding the recess C² and through the adjacent end of the follower.

The annular recess C' on the inner side of the cap is made of such shape and size as to form between the same and the upper end of the pile an annular chamber designed for the reception of the motive agent by which the cap is to be lifted. Said chamber will preferably be of annular form, as shown, in order that the lifting power of the motive agent may be directed in the line of the central axis of the follower and to thereby avoid all possible friction against which the cap must be lifted. Said cap is provided with a port or passage C³, which extends from the outer end thereof to the recess C', and to the outer end of said port or passage is connected a flexible pipe D, which leads to the source of the motive agent. As the hammer by which the pile is driven is usually actuated from a steam-engine, the motive agent by which the

cap is raised out of the ground will usually consist of steam. I do not wish, however, to confine myself to this form of motive agent, as it is obvious that compressed air, water, or other fluids may be employed.

When the pile, follower, and cap are in the position shown in Fig. 1 and in the relation herein shown to the surface of the ground and steam or other motive agent is delivered through the pipe D and port or passage C³ to the annular recess or chamber C', such motive agent will act to forcibly drive the cap out of the hole formed thereby. Steam will be delivered behind said cap until the lower end of the latter has reached the surface of the ground, when the same may be easily withdrawn by the means usually employed for such purpose. It will be understood that the side walls E of the hole formed by the cap will be compressed to such an extent that the steam will not escape therethrough, but will act with its full force to drive the cap outwardly.

With the construction and arrangement of the parts described it will be seen that the sides E of the hole formed by the driving of the cap into the ground constitute, in effect, the sides of a cylinder, while the end of the cap constitutes one end thereof and the cap itself forms, in effect, a piston which moves outwardly under the impulse of the steam or other motive agent which is delivered behind the same through the port C³.

In Fig. 4 I have shown a modified form of cap in which the recess C' of the previously-described figures is omitted. In said figure the pile and follower are designated by the same reference-letters hereinbefore referred to. F designates the cap, which consists of a circular metallic plate having a flat inner end, which engages the upper end of the pile. Said pile may or may not be made of tapered or conical form in its upper end and will usually be provided when such form of cap is employed with an annular band or strap A' to prevent said upper end from being split or distorted under the blows of the hammer. The cap is provided with a port or passage F', which leads from the outer end thereof to the inner end, which engages the upper end of the pile and which opens into the space between said pile and cap. Said cap is provided on its upper end with an annular concentric recess F², in which the lower end of the follower fits, as in the previously-described construction.

The method herein disclosed may also be employed when the follower B is not used and when the cap C will only be driven below the surface of the ground a depth equal to the length thereof. In such cases it will be understood that the cap usually employed when the piles are being driven only to the level of the surface of the ground will be used or one in which the recess C² is not present.

I am not aware that it has heretofore been proposed to lift or force a follower-cap and follower from the hole formed thereby when

driven into the ground by the use of a suitable motive agent delivered between said cap and the upper end of the pile, and I do not wish, therefore, to be limited to the particular form of apparatus which is here disclosed, but wish to have included within the broad spirit of my invention any means for effecting this result.

I claim as my invention—

1. As a new article of manufacture, a follower-head for use in driving piles, comprising a plate or disk provided in its outer side with a socket adapted to receive one end of a follower and with a port or passage which extends therethrough to the side which engages the pile.

2. An apparatus for use in driving piles comprising a follower-head adapted to rest at its inner side upon the upper end of a pile and provided with a port or passage extending therethrough to the side which engages the pile, and a follower engaging the outer side of said head adapted to transmit the blows of the hammer thereto.

3. An apparatus for use in driving piles comprising a follower-head provided in its inner side with a recess adapted to fit over the upper end of a pile and with a port or passage extending therethrough and in open communication with said recess and a follower engaging the outer side of said head.

4. An apparatus for use in driving piles comprising a follower-head adapted to rest upon the upper end of a pile, provided in its outer side with a socket and with a port or passage extending therethrough to the side which engages the pile and a follower fitting at one end in said socket.

5. An apparatus for use in driving piles comprising a follower-head adapted to rest on the upper end of a pile and provided with a port or passage extending therethrough to the side which engages the pile and a follower per-

manently attached to the outer side of the follower-head.

6. An apparatus for use in driving piles comprising a follower-head adapted to rest on the upper end of a pile and a follower engaging the outer side of said head adapted to transmit the blows of the hammer thereto, said follower-head being provided with a port or passage located in the periphery of the head radially outside of the follower and extending therethrough to the side which engages the pile.

7. An apparatus for use in driving piles comprising a follower-head adapted to rest at its inner side upon the upper end of a pile and provided with a port or passage extending therethrough to the side which engages the pile, a pipe connected at one end with said port and adapted to be connected at its opposite end with a source supplying motive agent, and a follower engaging the outer side of said head adapted to transmit the blows of the hammer thereto.

8. An apparatus for use in driving piles comprising a follower-head provided on its inner side with a recess adapted to fit over the upper end of a pile, a follower permanently attached to the outer side of said follower-head, said head being provided with a port or passage extending therethrough and in open communication with said recess, and a pipe connected at one end with said port and adapted to be connected at its opposite end with a source supplying motive agent.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 3d day of January, A. D. 1898.

THOMAS A. KEARNS.

Witnesses:

TAYLOR E. BROWN,
WILLIAM L. HALL.