Aug. 17, 1943. W. R. MARSDEN 2,326,872

APPARATUS FOR FORMING CAST-IN-PLACE CONCRETE PILES

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FIG. 1 FIG. 3 FIG. 2

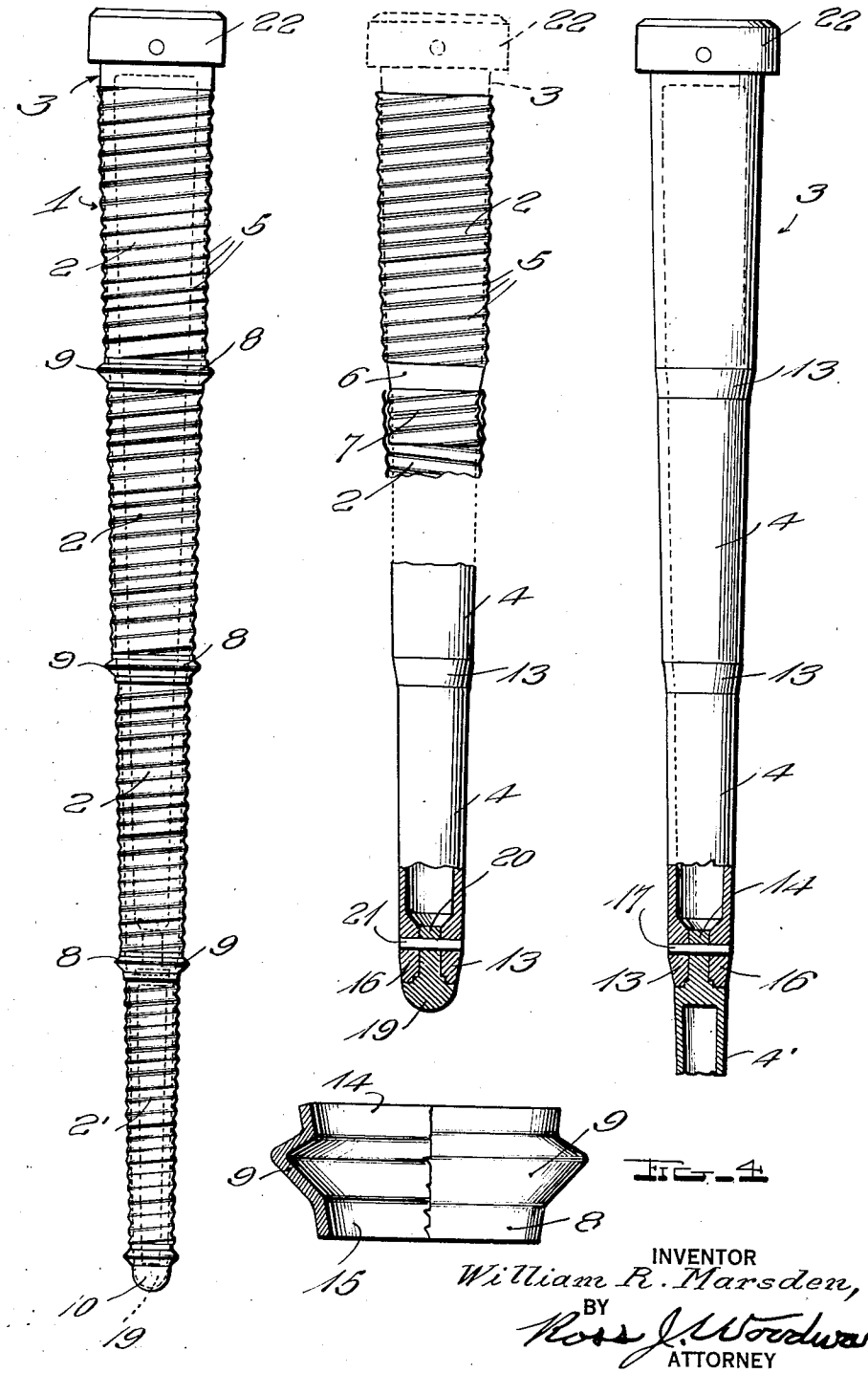


FIG. 4

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FIG. 5

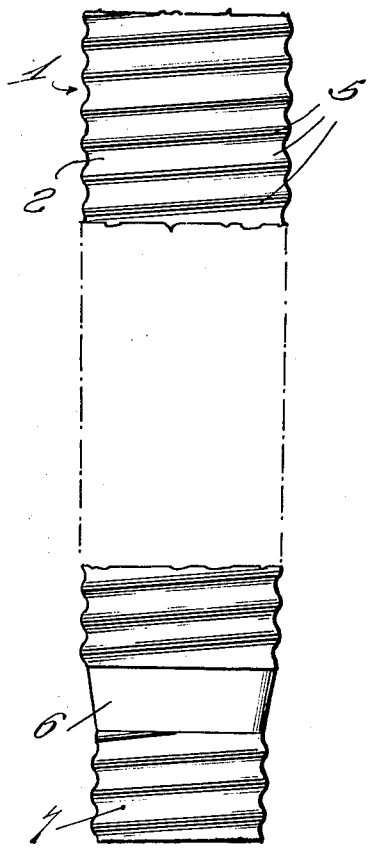
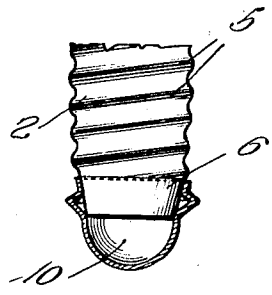


FIG. 6



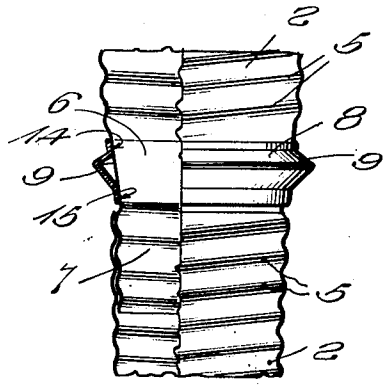


FIG. 7

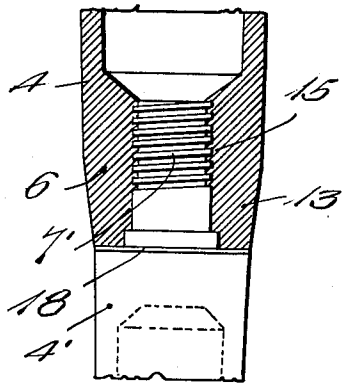


FIG. 8

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Patented Aug. 17, 1943

2,326,872

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2,326,872

APPARATUS FOR FORMING CAST-IN-PLACE CONCRETE PILES

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Application April 19, 1940, Serial No. 330,591

2 Claims. (Cl. 61—78)

This invention relates to improved apparatus for economically forming cast-in-place piles, wherein a sheet metal cylindrical casing composed of sectional lengths of varying diameters is so shaped that a specially adapted solid wall enclosed driving core may sink the casing into the earth to a required depth in a manner enabling the core to be withdrawn and the casing filled with fluid concrete.

One object of the invention is to provide a casing composed of a series of short cylindrical sections, each having a long upper section or portion terminating at its lower end in a conical portion below which is a stem for connection to the upper end of the casing section directly below it. Each casing section is forced into the earth independently of the other sections through frictional contact between the conical portion of the casing section and one of the isolated frustum cones located at intermediate points in the length of the driving core.

It is another object of the invention to provide slip-on bearing rings around the outside of the conical portions of the casing where they are held in position by conical friction at contact against the outer face of the casing, the outer diameter of the rings being predetermined to suit particular earth conditions, so as to provide additional bearing value against pile penetration. Their use is optional and their omission possible if desired.

Another object of the invention is to provide means whereby a solid wall driving core, as hereinafter described, is adapted to drive the casings into the earth so as to allow withdrawal of the core on completion of the driving operation, the driving core being increased in diameter progressively by frustum cones for conical frictional engagement with the conical portion of each casing section. The driving core is composed of an upper length having a fixed driving head, a lower length being added should it be required, and a removable driving point being provided at the bottom end of the driving core.

The invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevation of the casing with the driving core enclosed in place therein.

Fig. 2 is a view showing the core in side elevation with its lower portion in section.

Fig. 3 is a view partially in elevation and partially in section, showing the lower section of the core removed and the driving point applied to the lower end of an upper section.

Fig. 4 is an enlarged view showing one of the bearing rings partially in elevation and partially in section.

Fig. 5 is an enlarged view showing a section of the casing in elevation with the bearing ring omitted.

Fig. 6 is an enlarged sectional view of the lower end of the casing and showing the combined foot and bearing ring carried thereby.

Fig. 7 is a fragmentary view showing united end portions of two casing sections and a bearing ring about the same, the view being partially in side elevation and partially in section.

Fig. 8 is a view partially in section and partially in elevation showing core sections connected one to another.

This improved apparatus for forming cast in place concrete piles consists of a casing 1 composed of a plurality of sections 2 and 2' and a sectional solid wall driving core 3 composed of a plurality of sections 4 and 4'.

Each casing section 2 consists of a cylinder of light gauge metal preferably having taper with corrugations 5 winding spirally about the section. In spaced relation to its lower end, the section is formed with a conical portion 6. Below this conical portion of the casing section is a stem reduced in diameter and acting as a connecting collar 7 for engagement with the top of the next lower casing section. While the casing sections are shown and described as having spirally corrugated engagement with each other, it is to be understood that other types of conventional joining may be used if desired. When the casing sections are united at their ends, the conical part 6 of each section is disposed directly over the upper end of the next lower section and has face to face frictional binding contact circumferentially with the conical portion of the core, such isolated frictional binding contact between the inner face of each casing section and an intermediate frustrum cone on the core being alone instrumental in causing each casing section to penetrate the earth as the core is driven downward. Another function of the portion 6 is as follows:

On the outside of each portion 6 provision is made for attachment of a strong steel bearing ring 8 extending outwardly beyond the casing section to a diameter determined by the particular earth condition and having inner faces 14 and 15 formed to make parallel wedging contact with the conical portion 6 of the casing section, this bearing ring having an annular flange 9. The internal diameter of the smaller lower end of the ring 8 is such that it will fit into the threads of

the neck or collar 7 of the section 2. Therefore, the ring may be applied to the lower end of the neck and spun upwardly along the neck until it reaches the upper end of the neck where it is shifted upwardly along the shoulder and serves as a driving ring and also as a reinforcement for the shell when the inner surface of the shoulder is subjected to the force of a blow delivered upon the upper end of the core. This arrangement of parts, therefore, permits the driving ring to be easily applied or removed and also causes the ring to have tight wedging fit about the shoulder when in place. It will be seen from the drawings that since the rings 8 form circular steps on top of the earth surrounding the casing section as the pile is being driven, and as such earth is strongly compacted by the downward movement of each bearing ring, an additional resistance to pile penetration is thereby added to the resisting forces of pile wall friction and pile end point bearing. As will be seen by referring to the drawings, these bearing rings are possible of omission removal from around the casing without affecting the casing structurally, and, if so desired, one or all of the rings may be omitted should earth conditions determine their use unnecessary. It is to be understood that the bearing rings may be formed of pressed metal or they may be rolled or cast without departing from the spirit of the invention.

At the bottom of the casing, the section 2' is formed with the collar 7 omitted, as this section ends at the bottom of the portion 6 around which is placed a combined bearing ring and boot 10 which serves to close the bottom of the casing, the outer diameter of the ring being determined by the particular earth conditions where the pile is to be used.

The driving core 3 has frustrum cones located at intermediate points in its length so as to make frictional binding contact with the conical portions 6 of the casing. The core is hollow and has solid walls and is formed of a casting or forging. For operating use, it is necessary that this core be formed of sectional lengths 4 and 4' and although only two sections are shown in the drawings, it is to be understood that more than two sections may be employed. A connection between sections 4 and 4' of the core is shown in Fig. 2, wherein the thickened bottom end of the core 4 is bored to fit the stem 14 of core section 4', the sections being held together in abutting contact by cross pin 17 passed transversely through the prepared hole in the stem 14 and the wall 16. Another method of connecting core sections 4 and 4' is shown in Fig. 8. In this embodiment, the thickened bottom end of the core 3 is formed with a threaded bore 15 and the stem 17' is threaded so that it may be screwed into the bore. A gasket 18 fits about the base of the stem between confronting faces of the core sections 4 and 4' so that when the stem is screwed into the bore, the gasket will be compressed and a tight joint formed.

When the core section 4 only is used for driving a pile, the bottom of the driving core is closed by a detachable driving point 19 having a stem 20 which fits into the lower end of the core where it is secured by a pin 21 corresponding to the pin 17. The driving point has a semi-circular bottom so as to conform to the shape of the boot 10, into which it fits.

The upper end of the core 3 extends above the casing 1 and carries a fixed driving head 22 upon which the pile hammer strikes blows necessary to cause the apparatus to penetrate the earth. When such blows are struck, the casing which encloses the driving core is carried into the earth solely by frictional binding contact between the conical portions 13 of the core acting in face to face engagement with the companion conical portions 6 of the casing sections and since these driving forces are localized at the lower ends of the casing sections, it will be seen that the casing is by these means alone driven downwardly into the earth at a plurality of points spaced from each other longitudinally of the casing.

After the casing has been driven into place, the core is withdrawn and since it consists of a plurality of comparatively short sections, this can be very easily accomplished. The embedded casing left in the ground is then filled with concrete which is allowed to set and the pile is finished. The fact that the casing is provided with the conical portions carrying the outstanding bearing rings, causes the pile to be well supported and prevented from sinking into soft ground.

Having thus described the invention, what is claimed is:

1. In an apparatus for forming cast-in-place concrete piles, a casing having a plurality of longitudinal sections connected in end to end relation to each other, each section being crimped circumferentially to reinforce the same and provide threads leading from its upper end, the lower portion of the section being of reduced diameter to provide a neck and a frustro conical downwardly tapered shoulder between the upper end of the neck and the body of the said section, said neck being crimped circumferentially to form threads adapting the neck to be detachably screwed into the upper end of an adjoining section, and a collar tapered toward its lower end in conformity to the taper of said shoulder and intermediate its depth being provided with an outstanding flange and defining a driving ring for the casing, said collar having its lower end of a diameter adapting it to engage threads of said neck whereby the collar may be threaded upwardly along the neck from the lower end thereof and shifted into position about the shoulder in close fitting wedging engagement therewith.

2. In an apparatus for forming cast-in-place concrete piles, a casing having an upper section and a section therebelow, said upper and lower sections being in end to end relation to each other, each section being corrugated from its upper end to form threads and having a downwardly tapered portion defining a frustro-conical shoulder adjacent its lower end and below said shoulder having a neck corrugated to form threads and detachably screwed into the upper end of the adjoining lower section, and a removable collar fitting about said shoulder and constituting an outstanding driving ring for the casing, said collar conforming to the downward taper of the shoulder for tight wedging fit thereon and having its lower end of a diameter adapting it to be spun upwardly along the neck and into wedging fit about the shoulder.

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