Oct. 13, 1931. F. L. JENKINS 1,827,015

EXPANDING PILE CORE

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Fig. 1.

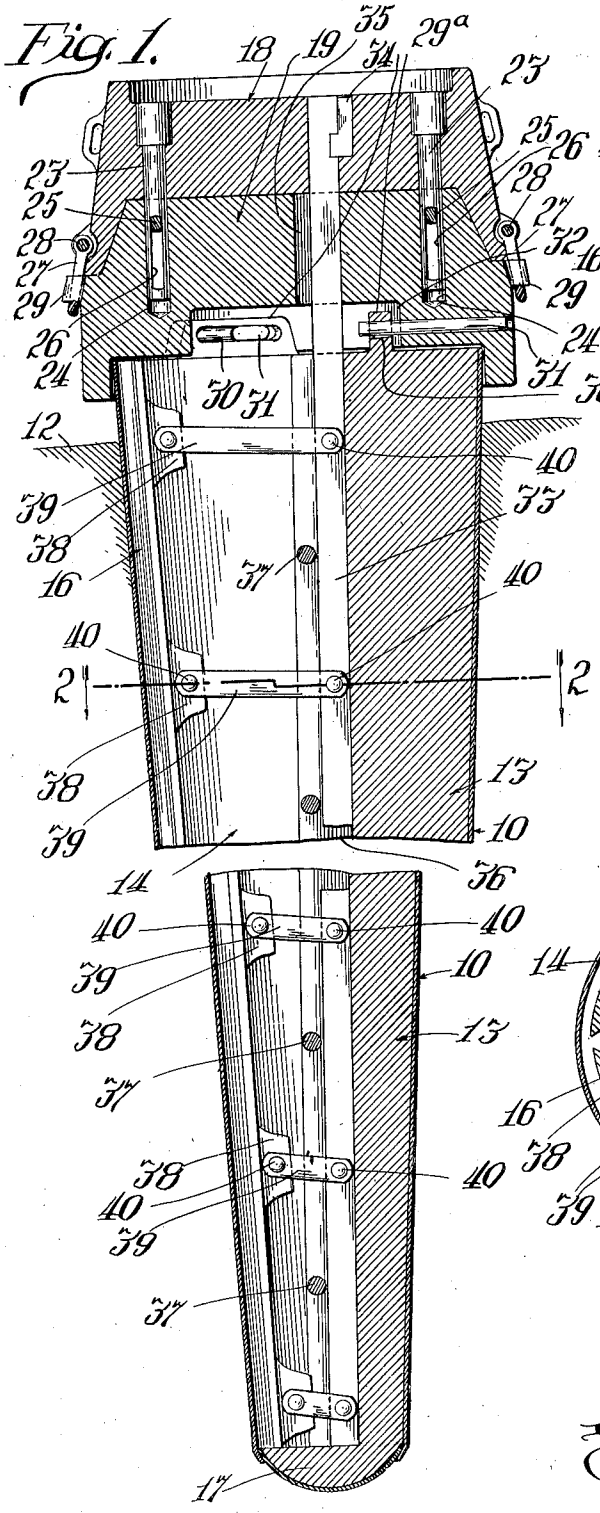


Fig. 2.

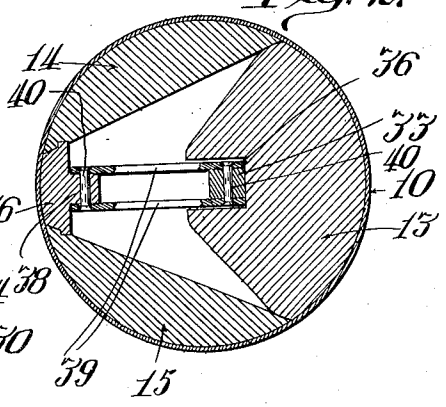
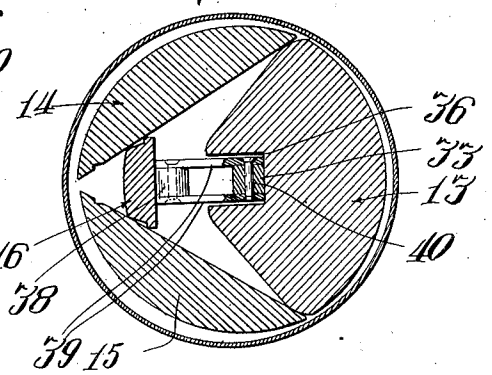


Fig. 3.



Inventor

Forrest L. Jenkins

Barnett & Truman

By

Attorneys.

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Fig. 4.

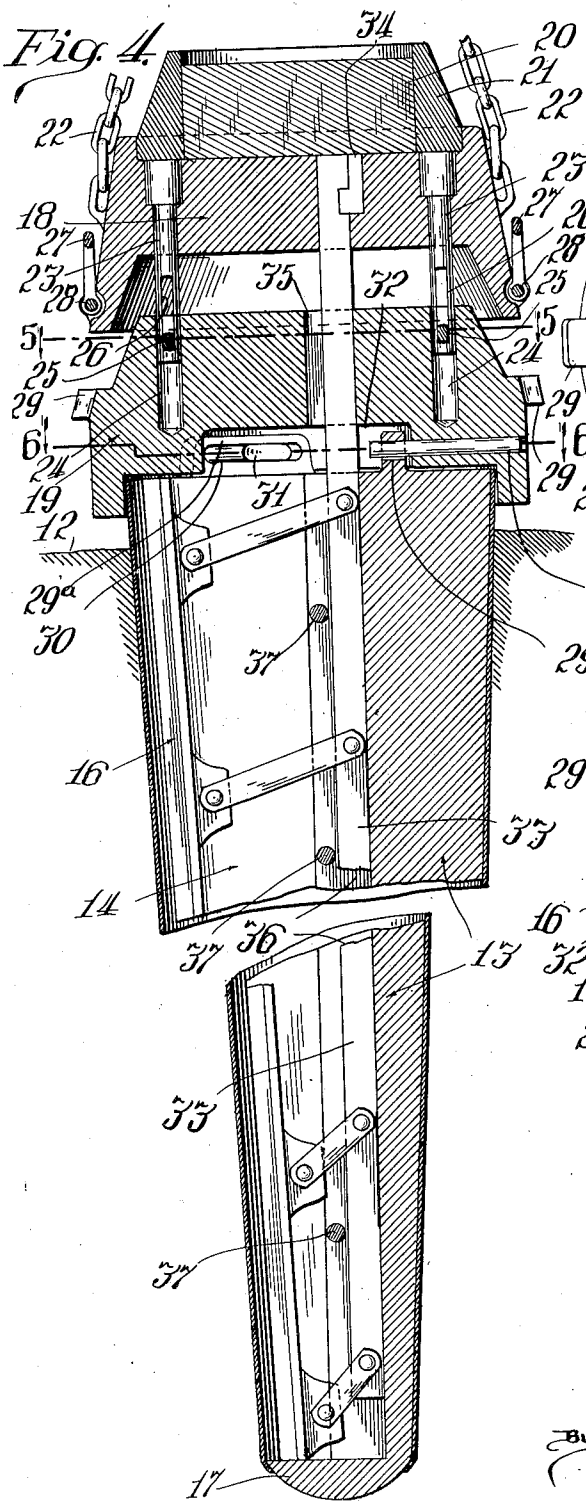


Fig. 5.

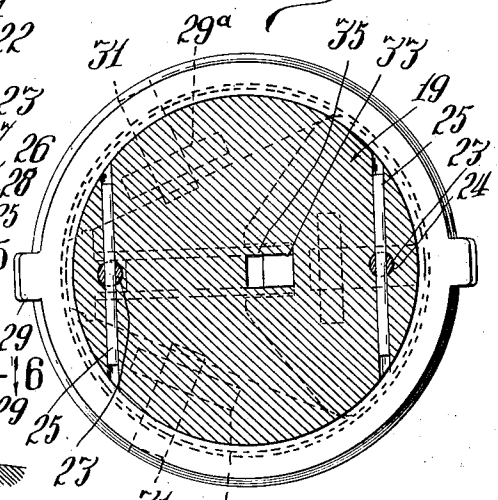
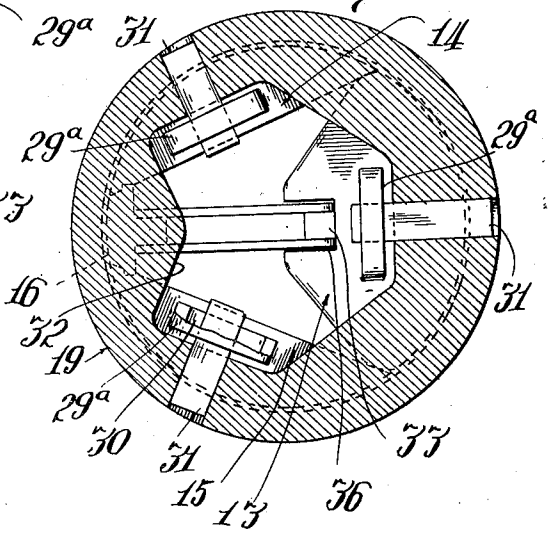


Fig. 6.



Inventor

Forrest L. Jenkins

By Barnett & Truman

Attorneys

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Fig. 9.

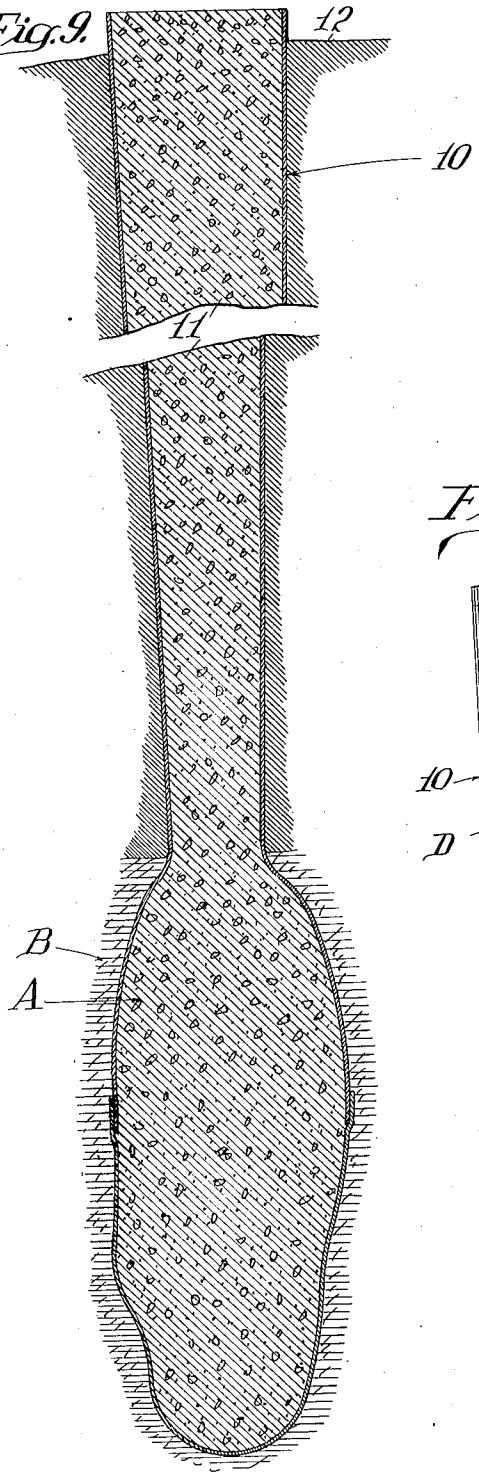


Fig. 8.

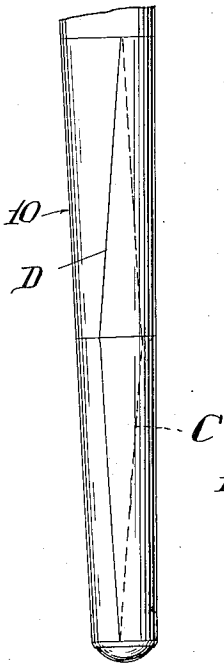
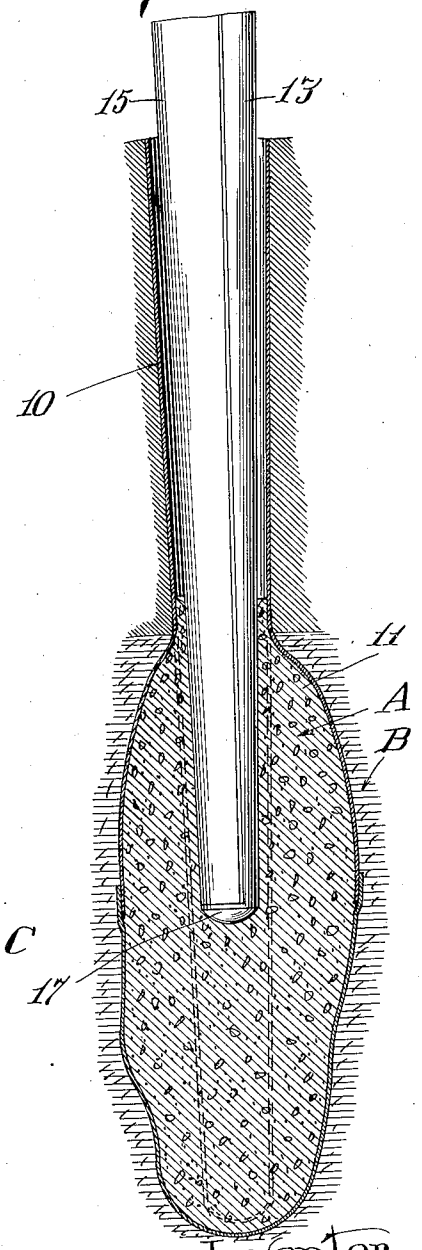


Fig. 7.



Inventor

Forrest L. Jenkins

By Barnett & Truman

Attorneys

Patented Oct. 13, 1931

1,827,015

UNITED STATES PATENT OFFICE

FORREST L. JENKINS, OF WHEATON, ILLINOIS, ASSIGNOR TO WESTERN FOUNDATION COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

EXPANDING PILE CORE

Application filed November 3, 1928. Serial No. 317,055.

This invention relates to improvements in concrete piles or like structures and to the formation of such piles by a method involving driving a form or casing into the ground by means of a mandrel or core which is made collapsible so that it may be withdrawn to leave the form in the ground to be filled with concrete.

It has been customary to construct the core for operations of this kind of a plurality of sections divided in longitudinal lines which when expanded to fit the core leave gaps between the edges of the sections. This is objectionable because the pressure of the earth may be sufficient to bend the form, usually a thin metallic structure, into the gaps between the core sections making the removal of the core difficult. Also in this type of apparatus the driving impacts are against mechanism used for expanding the core sections which results not infrequently in injury to this mechanism and in any case puts a limit on the force which can be safely exerted against the core to drive this form through obstruction.

One object of the invention is to provide an improved pile, the lower portion of which may be formed with an enlargement so as to reinforce the lower portion of the pile and thereby provide a more substantial bearing.

Another object is to so form the enlarged lower portion of the pile that its formation compresses the surrounding earth so as to increase its holding power.

Another object of my invention is to so construct the core that there will be no appreciable gaps between the core sections when the core is expanded and so that it will not deform the shell during the driving thereof and which may be readily employed to drive the soft concrete into the surrounding earth and thereby form an enlargement on the pile and stiffen the surrounding soil, the core being so formed that when expanded it will prevent entrance of concrete or any foreign matter into the interior of the core. The invention also contemplates in this connection, the provision of an improved core whereby the driving impacts will be imposed directly against the upper ends of the core sections instead of against the expanding mechanism or devices interposed between said sections.

The invention is illustrated in a preferred embodiment in the accompanying drawings, in which

Fig. 1 is a fragmentary vertical sectional view of the form, sectional core and driving head with the form shown as driven into the earth.

Fig. 2 is a cross sectional view on line 2—2 of Fig. 1.

Fig. 3 is a similar view showing the core collapsed for removal.

Fig. 4 is a view similar to Fig. 1 showing the core collapsed.

Figs. 5 and 6 are cross sectional views on line 5—5 and 6—6, respectively of Fig. 4.

Fig. 7 is a fragmentary sectional view of the lower portion of a pile illustrating the manner in which the enlargement at the lower end thereof is formed, the core member being shown in this figure in elevation.

Fig. 8 is a view in elevation of the lower sections of one form of metallic shell adapted to be used in the pile construction illustrated in Fig. 7, and

Fig. 9 is a sectional view illustrating the finished pile.

The method of forming the pile consists in driving a relatively thin form 10 into the ground to the desired depth and then filling the form with concrete. The form 10 is preferably, though not necessarily, conical so that it may be readily driven into the ground, the ground line being indicated at 12. If the soil into which the form is driven is sufficiently hard and compact to support the desired load, the pile may be completed by merely filling the form with the concrete 11. However, when forming piles in locations where the earth at the lower end of the pile is relatively soft, or when it is for any reason desirable to increase the area of the lower portion of the pile, the form, after being driven into the ground, is only partly filled with concrete and this body of concrete is then forced laterally into the lower stratum of earth by driving a core member into the said body of concrete (see Fig. 7). This method, in addition to forming an enlarge-

ment A on the pile, compresses the surrounding soil B so as to provide more holding power. This operation may be repeated several times, if so desired. Preferably, the lower sections of the form 10 are formed with suitable lap seams C—D, which permit the form to expand without rupture under the lateral pressures of the plastic concrete. While the use of expansible sections may be preferable, in some situations it is not always desirable, since a very satisfactory enlargement can be formed by making one or more of the lower sections of the form relatively thin, so that they will be ruptured by the lateral pressure of the concrete when the core is driven into the concrete. When it is desired to reinforce the enlarged portion of the pile, I preferably fit one or more sections of the form 10 over the lower portion of the core and drive the said form into the body of concrete A. After the enlargement A is formed, the remaining portion of the form 10 is filled wih concrete so as to form a concrete pile of the configuration shown in Fig. 9. The pile, it will be seen, tapers in diameter toward its lower end so as to provide the maximum surface friction and is formed at its lower end with the enlargement, above described.

In carrying out my method I preferably employ a collapsible core over which the conical form is fitted before it is driven into the ground. The core consists of a plurality of sections divided on longitudinal lines. Preferably there are four such sections designated 13, 14, 15 and 16. When the core is expanded to fit the form 10 the core sections are in contact along their longitudinal edges. One of the sections, section 13 for example, is preferably formed with a rounded nose piece 17 to fit the bottom of the form. The form may be made of sheet metal, reticulated metal fabric or other suitable material.

The core, surrounded by form 10 is driven into the ground preferably by the usual two part driving head, which is modified in certain respects, to be described, for the purposes of this invention. The upper head member is designated 18 and the lower head member 19, 20 designating a wood striking block within a metal ring 21 on the upper head 18. The chains for raising the heads are shown at 22.

The heads are guided for relative vertical movement one on the other by slotted guide members 23 on the upper head which extend into recesses 24 in the lower head which is provided with cross pins 25 extending through the slots 26 in the guide members. Any other suitable means might be employed for permitting the upper head to be raised to a certain extent and then causing it on further upward movement to raise the lower head. The heads may be secured together by links 27 pivoted at 28 to the upper head and adapted to engage lug 29 on the lower head.

The core sections are formed at their upper ends with lugs 29ª transversely slotted as indicated at 30 for supporting pins 31 which are fixed in the lower head 19 the bottom of which is recessed as shown at 32 to give space for the lugs.

An actuating rod 33 is secured for example by key 34 in the upper head 18 and extending slidably through an opening 35 in the lower head 19 and through a guide slot 36 in core section 13, the forward edge of the rod bearing against pins 37 extending across slot 36. The inner face of core section 16 is formed with lugs 38 which are connected to the actuating rod 33 by pairs of links 39 pivoted to the rod and lugs by pins 40.

Operation.—The form 10 is fitted over the sectional core 13, 14, 15, 16, with the sections expanded (Figs. 1 and 2) and the form driven into the ground by a steam hammer, for example, the impacts of which are received on the wood block on the upper head 18 and transmitted directly through the lower head to the upper faces of the core sections. When the form has been driven into the ground as far as desired links 27 are disengaged from lugs 29 and the upper head is raised by chains 22 the lower head 19 remaining on the core sections. This raises the actuating rod 33 which through links 39 draws the core section 16 inwardly allowing sections 14 and 15 to collapse toward each other, the sections all sliding on their supporting pins 31. The core is thus freed from the form and will be withdrawn therefrom when with continued upward movement of this upper head the lower head is raised because of the connections 23, 25.

Modifications will readily occur to those skilled in the art. Hence I wish to be understood as covering by patent all embodiments of the invention within the scope of the appended claims.

I claim:

1. A collapsible core for driving forms for concrete piles comprising two pairs of longitudinally divided sections, the sections of one pair being of substantially equal size and the sections of the other pair being of unequal sizes and arranged opposite to each other between the sections of the first described pair, and means for drawing the sections of the last described pair together to bring about the collapsing of the core.

2. A collapsible core for driving forms for concrete piles comprising two pairs of longitudinally divided sections, one section of which is smaller than each of the other three sections, one pair of said sections arranged opposite to each other and between the other pair with the edges of adjacent sections in contact without substantial gaps, and means for drawing the sections of the first pair to-

gether to bring about the collapsing of the core.

3. A collapsible core for driving forms for concrete piles comprising two pairs of longitudinally divided sections, one section of which is smaller than each of the other three sections, one pair of said sections arranged opposite to each other and between the other pair, and pivoted links for drawing the sections of the first pair together to bring about the collapsing of the core.

FORREST L. JENKINS.