May 12, 1964 J. M. OSTROWSKI 3,132,706

PILE BORING MECHANISM

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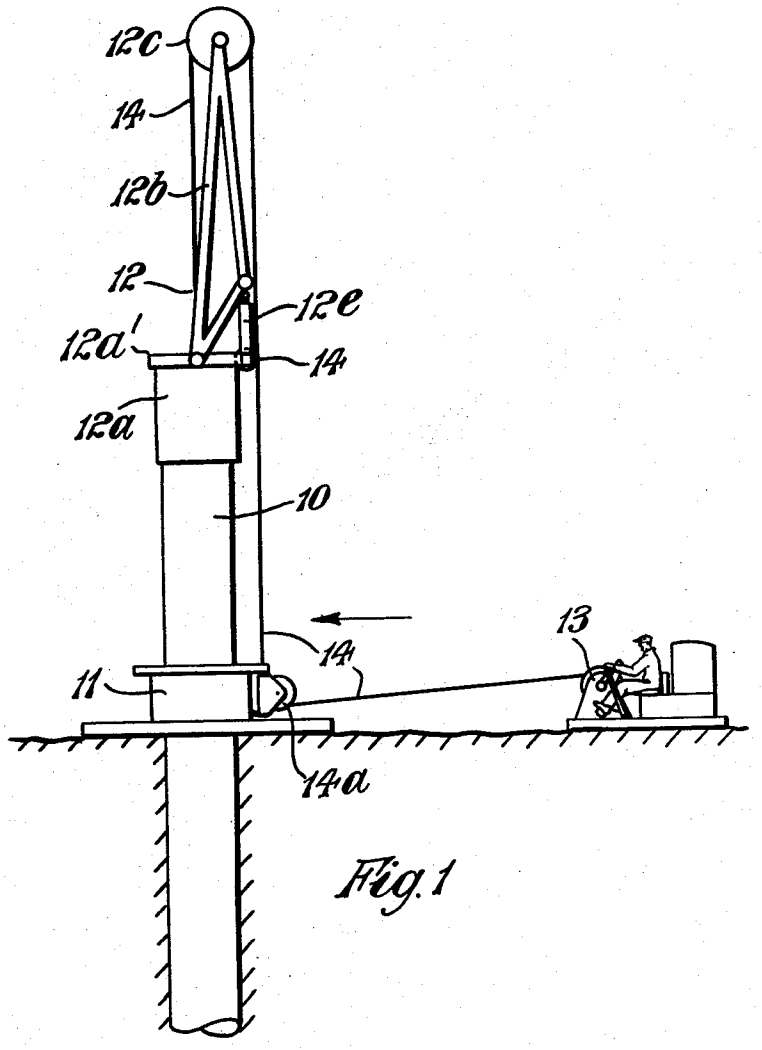


Fig. 1

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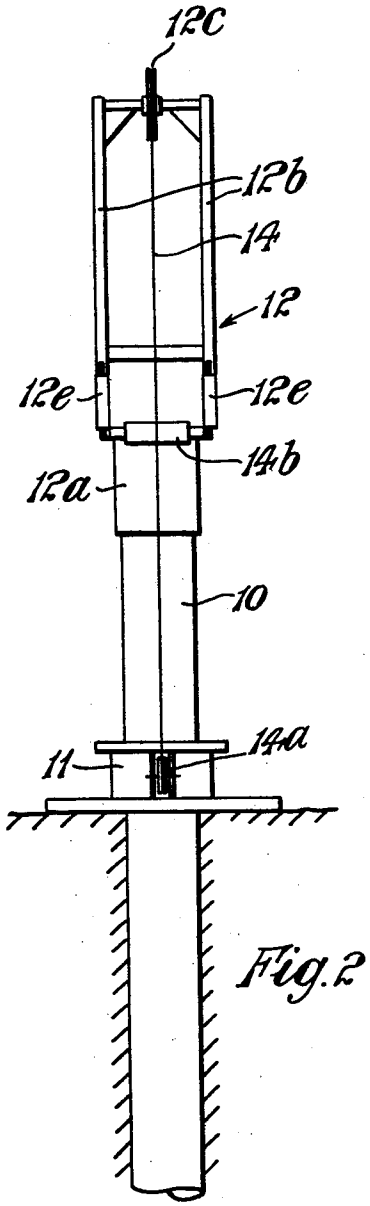


Fig. 2

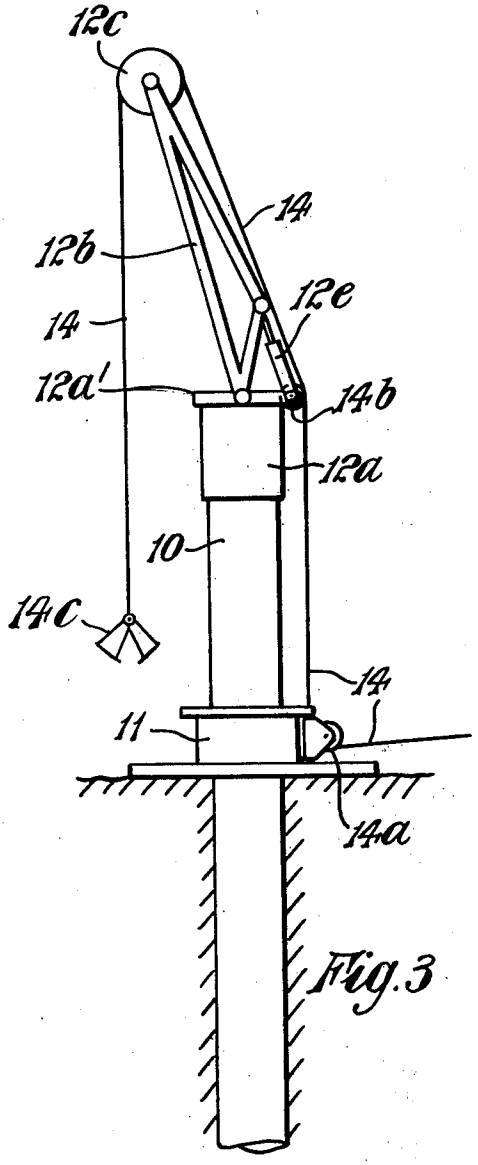


Fig. 3

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PILE BORING MECHANISM

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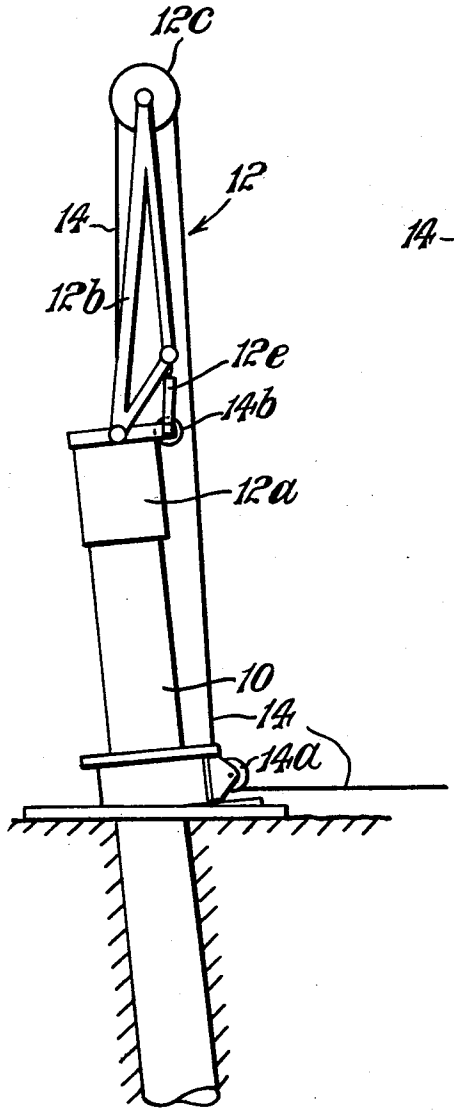


Fig. 4

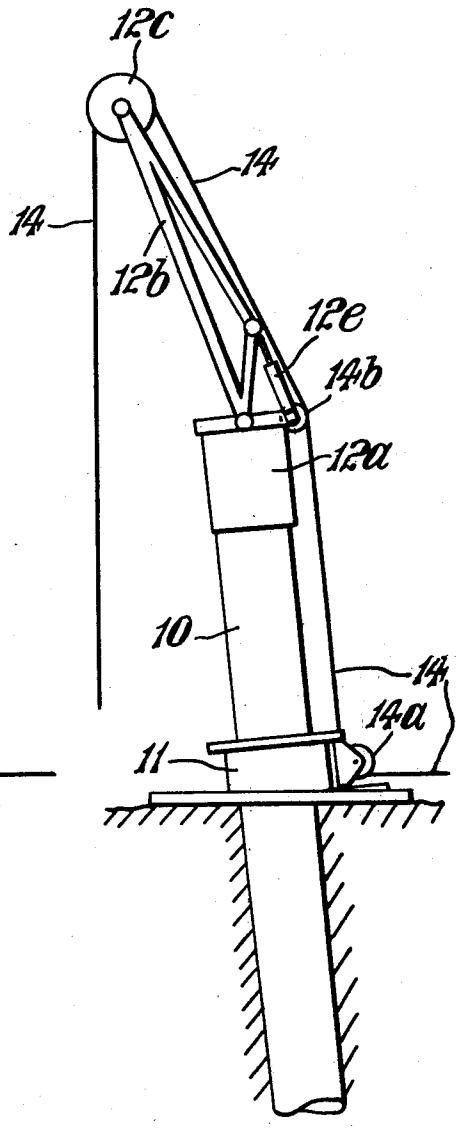


Fig. 5

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PILE BORING MECHANISM

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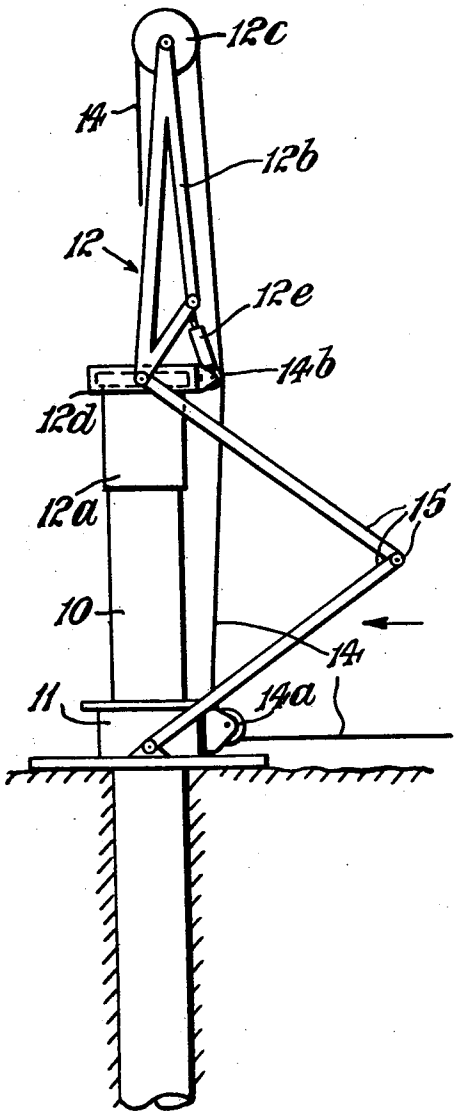


Fig. 6

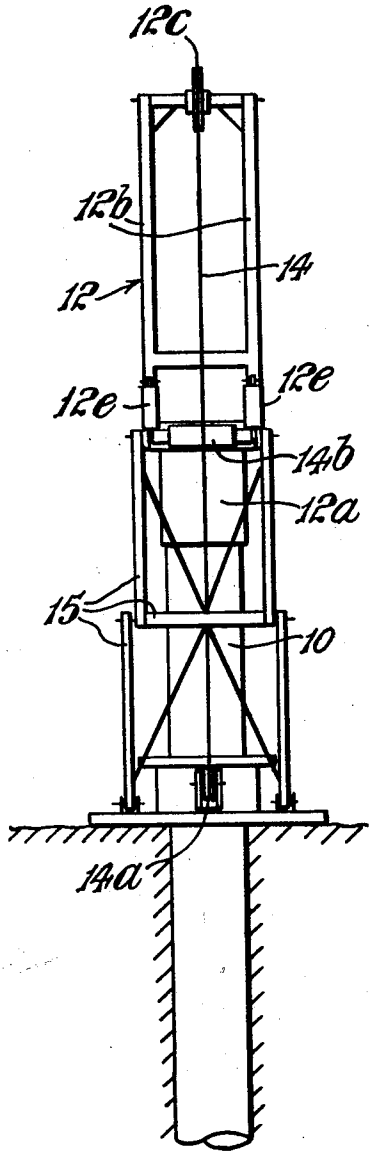


Fig. 7

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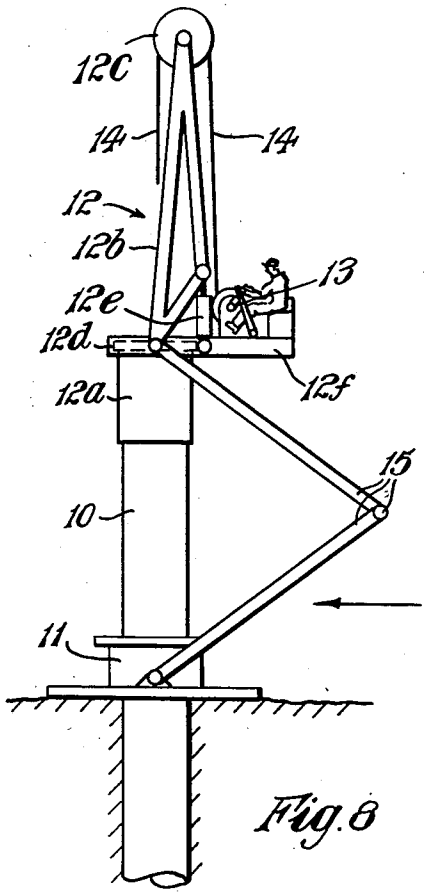


Fig. 8

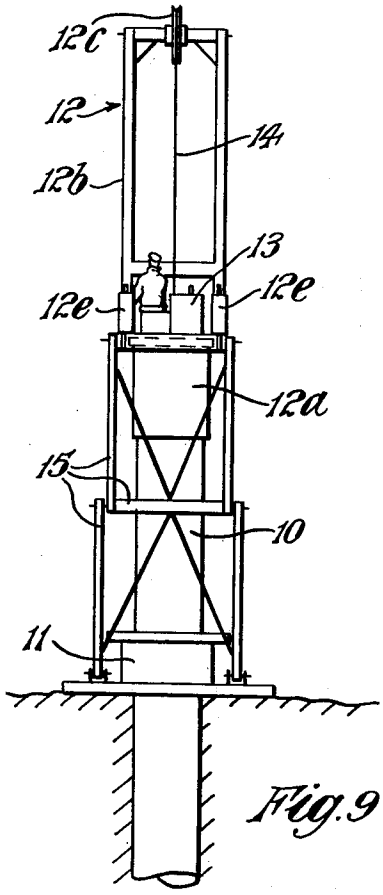


Fig. 9

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PILE BORING MECHANISM

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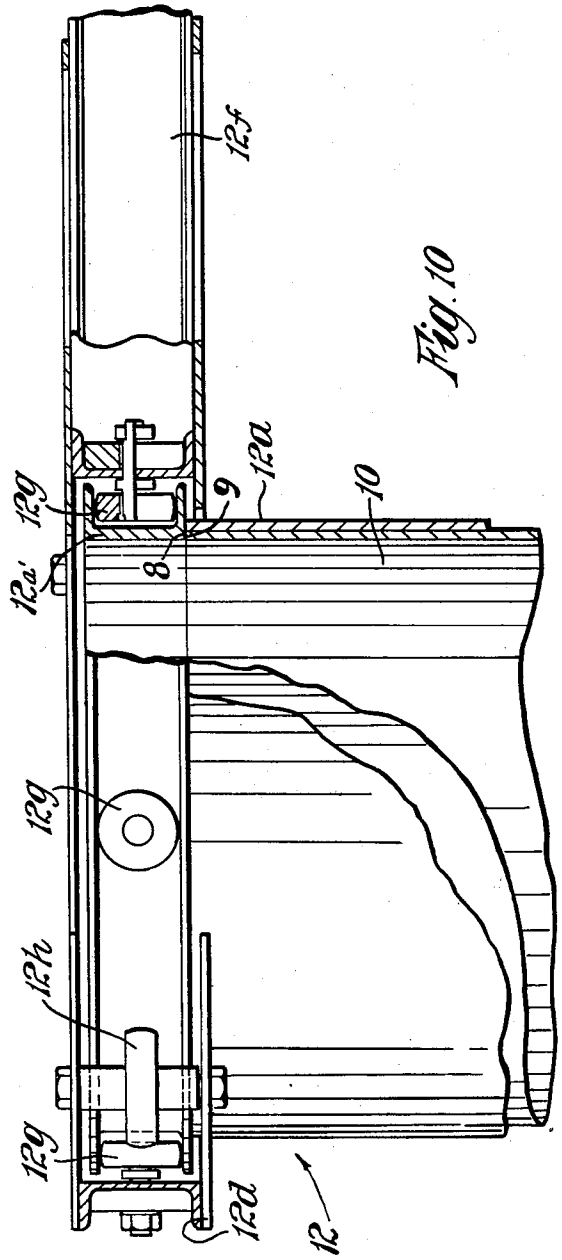


Fig. 10

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Patented May 12, 1964

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PILE BORING MECHANISM

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Filed Oct. 9, 1961, Ser. No. 143,795
Claims priority, application Great Britain Oct. 21, 1960
6 Claims. (Cl. 175—161)

This invention relates to foundation pile boring wherein the pile takes the form of a hollow tube or cylinder which is sunk by oscillatory or unidirectional rotation, in conjunction with a tool, such as an excavating grab, adapted to be raised and lowered in the bore of said pile when inserted therein and to be displaced laterally from the pile when withdrawn from said bore.

In rig for this purpose it is known to use a head structure including a pulley over which a cable passes from a winch or the like, with the tool depending therefrom, and to mount this structure adjacent to but independently of the pile with freedom for it to be turned sufficiently to permit the tool, when withdrawn, to be swung aside from the pile. Such a rig suffers from the disadvantage that it must provide a constant vertical clearance above ground level sufficient to accommodate the pile when projecting to the maximum required extent and to permit insertion and withdrawal of the tool when the pile is in that condition. Moreover it is also difficult to maneuver the tool thereby into an inclined pile.

According to the invention, these difficulties are overcome by means of a head structure for suspending and manipulating the tool, mounted directly on the pile itself while this is being sunk. Where the tool is thus suspended by a cable from a pulley of said structure, this pulley can thus be kept at a substantially constant height above the pile sufficient to allow the tool to be lifted therefrom, and then being displaced clear thereof by appropriate movement of the pulley from above the pile opening, as by tilting of a boom whereby the pulley is supported.

Long or short sections of piling are thus enabled to be employed as may be most convenient, entirely without regard to any imposed limits of vertical clearance, so that for example, by using as long sections as possible, considerable economics can be achieved because of the consequent reduction in the number of jointed connections required in a finished pile, and the use of short sections permits operation in circumstances where the available head room is insufficient for the known form of rig.

The proposed head structure may be rotationally fixed to the pile, as when used in conjunction with a winch which is separate and stationary and the extent of rotation of the pile is relatively small, as when its drive is oscillatory. If, however, the rotation is considerable as when the pile is driven unidirectionally, the mounting of the structure may be such as to permit such rotation while the structure itself is held constantly oriented with respect to the winch. Alternatively the structure may include the winch to form a combined assembly, which is again preferably held against rotation.

The extent of the movement of the boom for displacing the tool clear of the pile should be sufficient, in the case of a grab, to allow of effective discharge of its spoil, or to enable the tool to be lowered to ground level for inspection or replacement. Moreover, where the pile is inclined and excavator movement is brought about by tilting of a boom in the manner already mentioned, this movement must take place in the plane of the pile incline in order to permit the tool to be suspended directly over the pile opening.

The invention will now be further described with reference to the accompanying drawings, whereof:

FIGURES 1 to 5 are of a typical arrangement in which

the head structure is rotationally fixed on the pile, the latter is sunk by rotational oscillation and the structure is operated from a separate winch beside the pile, FIGURE 1 showing such an arrangement in side elevation with a vertically driven pile, and the boom raised so that the cable to the tool hangs vertically down into the pile opening, FIGURE 2 being an elevation at right angles to that of FIGURE 1 in the direction of the arrow of the latter, FIGURE 3 being a view corresponding to that of FIGURE 1 with the boom tilted forwardly so that the cable depends externally of the pile, and FIGURES 4 and 5 showing the arrangement in use with an inclined pile, in positions corresponding to those of FIGURES 1 and 3 respectively;

FIGURES 6 and 7, which correspond to FIGURES 1 and 2 respectively, are of an alternative arrangement in which the pile is sunk by a unidirectional drive, the mounting of the head structure permits of the consequent rotation of the pile and a lever system is provided to maintain the required orientation of the head structure with respect to the winch;

FIGURES 8 and 9, also corresponding to FIGURES 1 and 2 respectively, are of an alternative arrangement in which the winch is mounted on a platform of the structure itself, instead of alongside the pile, the structure again being shown constantly oriented by the same form of mounting and lever system as in FIGURES 6 and 7; and

FIGURE 10 is a detail view of the turn-table of FIGURES 6 to 9 in side elevation (part section), showing also the winch platform extension of said turn-table for the FIGURE 8 and 9 arrangement.

Throughout these drawings the same reference numerals are as far as possible used for the same or equivalent parts. Thus, the pile itself is denoted **10** and the driving means, used for rotating it just above ground level **11**. Whether the rotation is oscillatory or unidirectional, this driving means may be of any known type permitting axial movement of the pile through it and calls for no detailed description in connection with the present invention. The head structure, generally denoted **12**, comprises a sleeve **12***a* which fits around the top of the pile and is fixed thereto to provide the required mounting as, for example, by an inwardly extending annular shoulder **8** which engages the upper annular edge **9** of the pile as shown in FIGURE 10. The sleeve carries support means **12***a*′ and a boom **12***b* pivoted diametrically to said support means on said sleeve and carrying a pulley **12***c* at its upper end. The support means is secured directly to said sleeve in the FIGURE 1 to 5 arrangement, but in the other arrangements the support means comprises an annular turn-table **12***d* rotatably mounted on the sleeve to permit relative rotation between the turn-table and the pile. Tilting of the boom in the manner already described is effected by the power cylinder **12***e*. Finally, the winch **13** is used for winding in any paying out the cable **14** over the pulley **12***c* to a grab or other excavating tool (shown schematically at **14***c* in FIG. 3) either first around a pulley **14***a* secured to the driving means and then over a roller **14***b* on the head structure, where the winch is on the ground alongside, as in FIGURES 1 to 7, or directly to pulley **12***c* from the winch where the latter is raised onto the head structure platform, as in FIGURES 8 and 9.

In the arrangement of FIGURES 1 to 5, as the extent of the angular rotation caused by an oscillatory drive is relatively small, the orientation of the head structure, and more particularly of its pulley **12***c*, always stays sufficiently closely related to that of pulley **14***a* to keep the run of the cable between these pulleys within the length (tangentially of the pile) of roller **14***b*, so as not to interfere with effective operation of the winch in any relative angular position. When the pile is inclined as in FIGURES

4 and 5, it is necessary for the plane of tilting of the boom to be substantially the same as that of such incline in order to avoid lateral tilt of the boom such as would make it impossible in particular to bring pulley **12***c* directly above the pile opening.

In the FIGURE 6 and 7 arrangement, orientation is similarly maintained, in spite of the unidirectional rotation of the pile, by engagement of the turn-table **12***d*, to which the boom is here pivoted, by the lazy-tongs type lever system **15** which is adapted to prevent rotation of said turn-table while accommodating the descent thereof with the pile.

Where the winch is on a platform **12***f* of the head structure, as shown in FIGURES 8 and 9, this platform may form a lateral extension of the turn-table and a similar lever system **15** to that of FIGURES 6 and 7 be used for preventing rotation, in this instance so as to avoid subjecting the winch operator to the rotary movement, as is usually preferable whether the drive is oscillatory or unidirectional, and in the latter case especially if the pile is inclined. If, however, the pile is substantially vertical and/or the drive is sufficiently slow, such restraint may be unnecessary, in which circumstances the turn-table and lever system can be omitted and the platform secured directly to the sleeve **12***a*.

A suitable construction on the turn-table **12***d* and mounting thereof on sleeve **12***a* are clearly shown by FIGURE 10, the required rotation being permitted by the horizontally pivoted rollers **12***g* under the axial guidance of the rollers **12***h* (only one of which appears) which are pivoted vertically. For use in the FIGURE 6 and 7 arrangement, the platform extension **12***f* is of course omitted.

Where hereinafter in the claims the phrase "rotary movement" is used this is intended to mean not only continuous rotation of the pile in one direction but is also intended to include back and forth or oscillating rotation whereby the pile has limited rotational movement in opposite directions.

What is claimed is:

1. Foundation pile boring mechanism for sinking tubular piles having a hollow bore extending longitudinally therethrough, said mechanism including a cable and an excavating tool adapted to be raised and lowered in the bore of said pile when inserted therein and to be displaced laterally from the pile when withdrawn from said bore, in combination therewith, head structure adapted to be received atop the pile so as to descend therewith during sinking thereof, said structure comprising a sleeve adapted to fit around said pile, means mounting said sleeve adjacent the top edge of said pile, boom means pivoted at its lower end to said sleeve diametrically thereof, pulley means including a pulley pivotally fixed to the upper end of said boom means for supporting and guiding said cable, and power means carried by said sleeve and operatively connected to said boom means for tilting the same about the pivot thereof.

2. The mechanism of claim 1 including winch means carried by said sleeve for controlling the movement of said cable.

3. The mechanism of claim 1 including winch means separate from said pile and stationary relative thereto for controlling the movement of said cable.

4. The mechanism of claim 1 wherein the axis of the boom means pivot is normal to a vertical plane through the angle of tilt when said pile is in a tilted position.

5. The mechanism of claim 1 wherein said support means comprises a turn-table and includes pivotal means interconnecting said turn-table and said sleeve to permit relative rotation there between.

6. The mechanism of claim 5 including retaining means for preventing rotation of said turn-table about the axis of said pile comprising a lever system having a part fixed to a stationary position clear of said pile and another part movably connected to said turn-table.

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