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MacKinnon

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[54] **MECHANICAL SAFETY PILE MONKEY**

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[52] **U.S. Cl.** **173/112,** 61/53.5, 175/85, 308/3.9

[51] **Int. Cl.** **E02d 7/02**

[58] **Field of Search** ..... 173/90, 130, 22, 85, 86, 173/31; 61/53.5; 269/46, 55, 58; 214/25, 1 P; 24/263 PL

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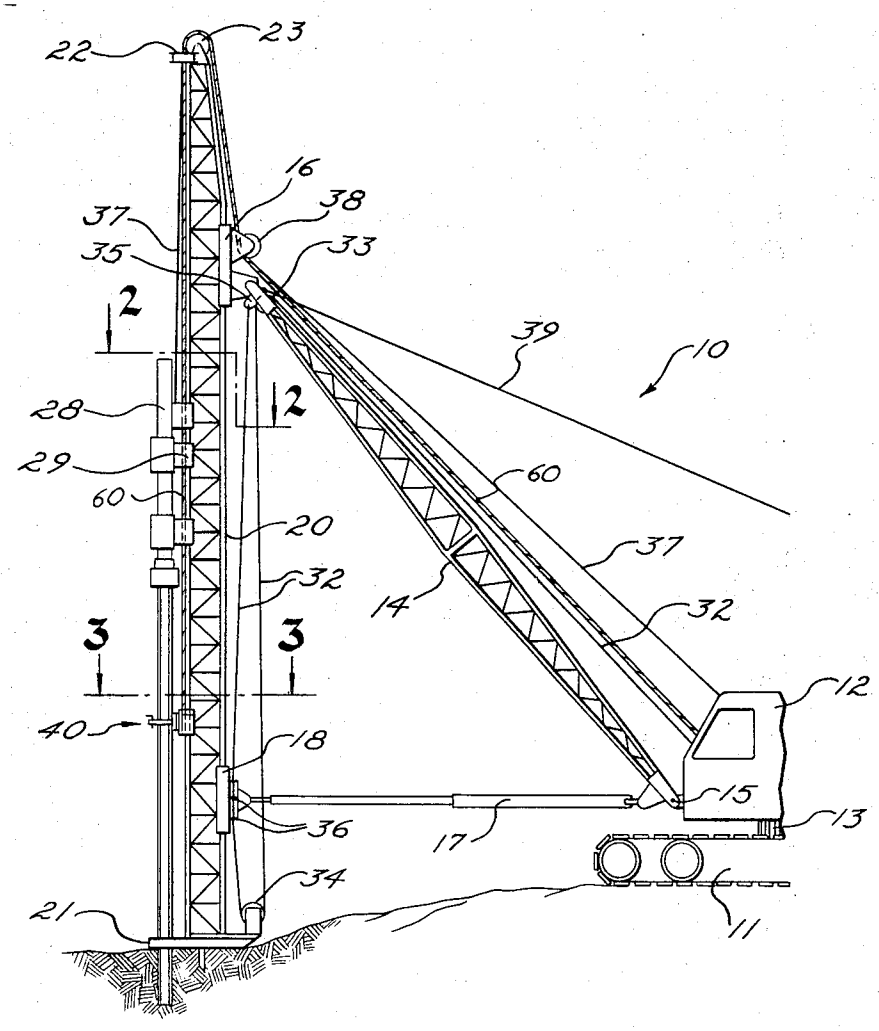
Primary Examiner—Henry C. Sutherland

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[57] **ABSTRACT**

There is disclosed herein a pile driver apparatus having a lead supporting said pile driver, and means mounting a pair of laterally closing jaws for sliding movement along the lead below the pile driver. The jaws close around the lower end of an undriven pile and upon upward movement thereof, the jaws slide with respect to the pile and pull the pile into alignment with the pile driver.

11 Claims, 7 Drawing Figures



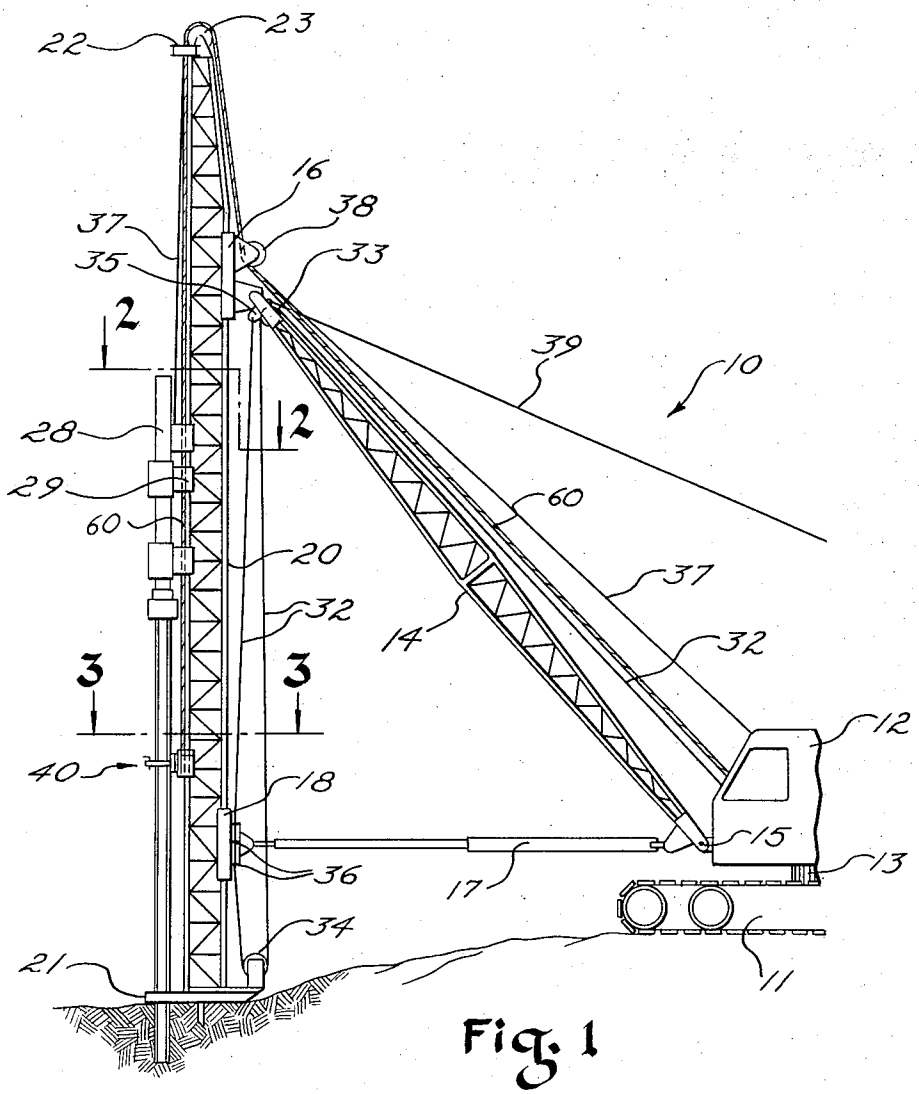


Fig. 1

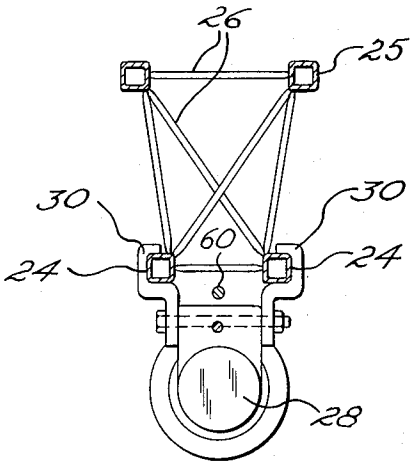


Fig. 2

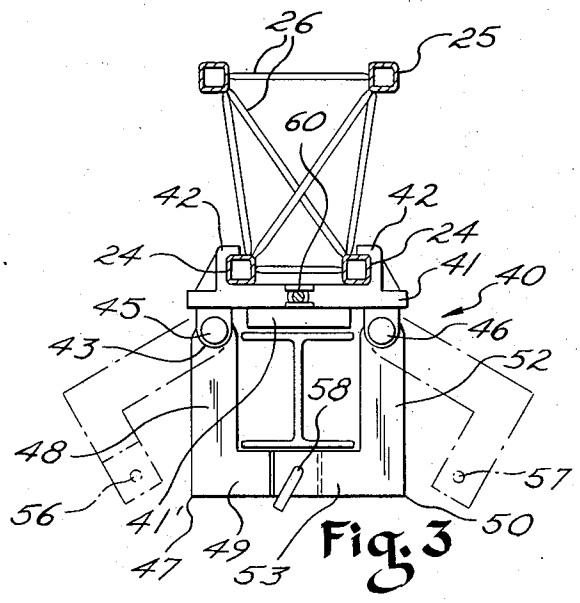


Fig. 3

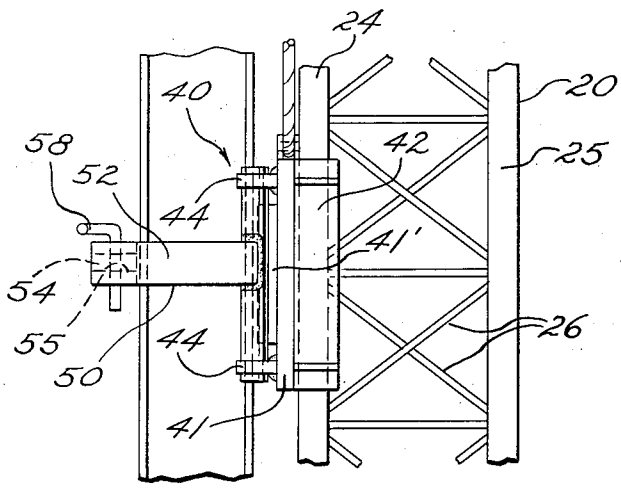


Fig. 4

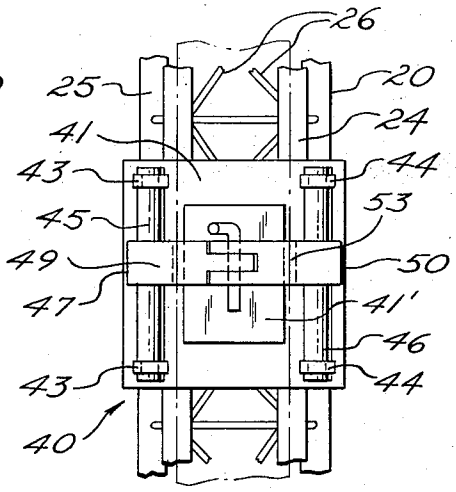


Fig. 5

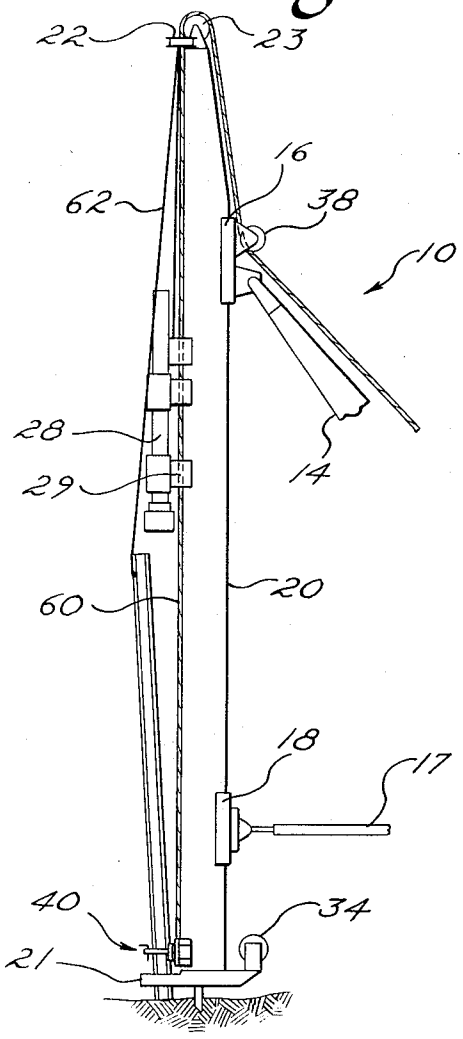


Fig. 6

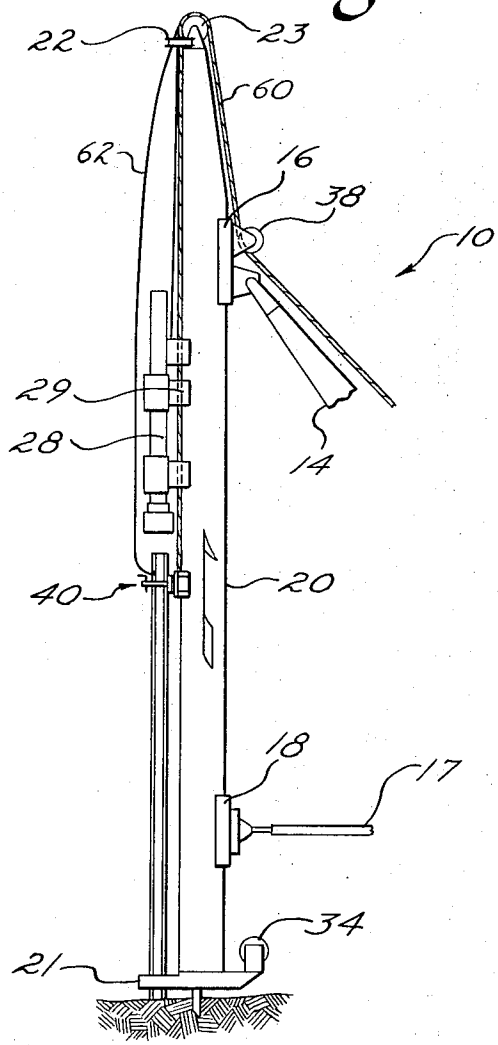


Fig. 7

MECHANICAL SAFETY PILE MONKEY

This invention refers to pile driving apparatus and particularly to a guiding device for aligning a pile with a pile driver and holding the pile in alignment while it is being driven.

In setting a pile preparatory to the driving operation, the pile is ususally suspended by a cable from the top of the lead whereby the lower end of the pile can be readily manipulated to the desired location. The upper end of the pile is disposed below the pile driver, but at this point the pile is seldom in alignment with the hammer. Therefore, it is necessary for a man to climb the lead and pull the upper end of the pile under the pile driver and then climb back down before starting the driving operation. The leads and piles are often of such length as to require as much as a 100-foot climb with the obvious attendant danger to the workman.

The present invention is directed to mechanical means for aligning the pile with the pile driver thereby obviating the dangerous climb by a workman and reducing the time taken to set the pile. A mechanical pile gripping means, known as a pile monkey, is slidably mounted on the lead and, in turn, slidably grips a lower end portion of a loose suspended pile. The pile monkey is then moved upwardly along the lead, meanwhile sliding with respect to the pile, whereby the pile is progressively pulled in under the pile driver. The monkey can then be positioned at any point along the pile to reduce whip or lateral buckling and generally stabilize the pile and insure positive alignment with the pile driver duringthe driving operation.

In view of the foregoing, it is the general object of this invention to provide a pile guiding device for aligning the undriven pile with a pile driver preparatory to the driving operation.

Another object of the invention is to provide means whereby the pile can be aligned with the pile driver in complete safety.

Still another object of the invention is to provide means obviating the need for a workman to climb a lead and manually align the pile with the pile driver.

Yet another object of the invention is to provide means for aligning the pile with the pile driver which results in substantial savings of time.

A further object of the invention is to provide aligning means as set forth above which assures positive alignment between the pile and the pile driver at all times.

A still further object of the invention is to provide means for both initially aligning the pile with the pile driver and stabilizing the pile during the driving thereof.

Other objects of the invention and the invention itself will be readily understood from the following description thereof and the accompanying drawings, in which said drawings:

FIG. 1 is a side elevation of a portable crane having pile driver apparatus carried thereby, including the mechanical pile monkey of this invention, the same being shown in the driving stage;

FIG. 2 is an enlarged transverse section taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged transverse section taken along the line 3—3 of FIG. 1 showing a top view of the pile monkey of this invention;

FIG. 4 is an enlarged side elevational detail of the pile monkey;

FIG. 5 is an enlarged front elevational detail of the pile monkey;

FIG. 6 is a simplified side elevation of the pile driver apparatus shown in FIG. 1, the pile monkey and pile being shown in the hookup stage before th pile is aligned with the pile driver; an

FIG. 7 is a view similar to FIG. 6 showing the pile monkey and pile in the set stage prior to driving the pile.

Referring now to the drawings in all of which like parts are designated by like reference numerals, FIG. 1 shows a portable crane 10 comprising a tractor portion 11 upon which is mounted the usual control cab 12, said control cab being mounted upon a turntable 13. A forwardly and upwardly projecting boom 14 is pivotally mounted to the control cab 12 by means of a pivot 15 and carries a slide member 16 at the forwardly and upwardly projected end thereof. The lower end of the boom 14 adjacent to the cab 12 carries a kicker 17 which projects forwardly and carries a slide member 18 on the forwardly projecting end thereof.

The slide members 16 and 18 engage an upright, skeletal lead 20 having an earth penetrating lower foot section 21 and an upper head block 22 having pulley means 23. As shown in FIG. 2, the lead 20 comprises front corner frame members 24 and relatively more widely laterally spaced rear corner frame members 25, the corner frame members as herein disclosed comprising rectangular tubing. The front and rear corner frame members are connected together in any suitable manner by horizontal and angled brace members 26. Although the lead 20 is shown in the vertical position, it will be understood that it can be operated at various tilted, generally upright positions.

Again referring to FIG. 2, a pile driver 28 is slidably mounted to the front corner frame members 24 by slide members 29 having U-shaped gripping portions 30 adapted to engage said front corner frame members. It will be understood that the slide members 16 and 18 at the forward ends of the boom 14 and kicker 17, respectively, are similarly slidably mounted for movement with respect to the rear corner frame members 25.

The lead 20 is adapted to be moved longitudinally by means of a lead rope 32 which passes from suitable winch means (not herein illustrated) in the cab 12 over a pulley 33 at the forward and upwardly directed end of the boom 14 and then passes downwardly to a pulley 34 carried by the foot section 21. From the pulley 34, the lead rope 32 extends upwardly to a fixed bracket 35 on the forward end of said boom, an intermediate portion of said lead rope being secured to adjustable cable grips 36 carried by the lower slide member 18. Thus, when the lead rope 32 is pulled, the lead 20 will move upwardly and when said lead rope is paid out, said lead will move downwardly.

The pile driver 28 is raised and released to drop downwardly in a known manner by means of a pile driver rope 37 which also extends from the cab 12 to engage a pulley means 38 carried by the upper slide 16 and then extends upwardly over the pulley means 23 and downwardly to said pile driver.

The boom 14 is held at any desired angle by a support cable 39 connected to the upper end of the boom at its forward end and secured to suitable, known adjustable

means (not herein illustrated) adjacent to the rear of the portable crane **10.**

When setting a pile preparatory to driving the same into the earth, the pile must be carefully aligned with the pile driver **28** to prevent tilting or buckling of the pile. FIG. **1** of the drawings shows a typical pile P aligned with the pile driver **28** and stabilized in such aligned position by the mechanical safety pile monkey of this innvention generally indicated by the numeral **40.** The construction of the pile monkey will be best understood by referring to the enlarged detailed views of FIGS. **3–5.**

The pile monkey **40** may take various forms and as herein disclosed comprises a base slide **41** having U-shaped gripping portions **42** slidably engaging the front corner frame members **24.** The front of the base slide **41** is provided with a centrally located wear plate **41'** and laterally disposed pairs of journals **43** and **44** pivotally mounting a pair of laterally spaced, vertically directed, parallel pivot shafts **45** and **46,** respectively.

The pivot shaft **45** carries an L-shaped jaw **47** comprising integral, right angularly disposed arms **48** and **49.** The pivot shaft **46** is similarly provided with an L-shape jaw **50** comprising right angularly disposed integral arms **52** and **53.** The distal ends of the arms **48** and **52** are suitably secured, as by welding, to the pivot shafts **45** and **46,** respectively, and the arms **49** and **53** are so angled toward each other as to overlap in front of a pile P which, as shown in FIG. **3,** may be of I-section. The L-shaped jaws **47** and **50** may be pivoted to the open position as shown in broken lines in FIG. **3** to initially receive the pile after which said jaws are pivoted inwardly to the closed position shown in full line to slidably engage said pile.

Means are provided for locking the jaws **47** and **50** in the closed position, the form herein shown comprising a clevis connection between the ends of the arms **49** and **53.**

As best seen in FIG. **5,** the arm **49** of the jaw **47** is provided with a tongue **54** which is adapted to engage a mating slot **55** in a bifurcated end of the arm **53** of the other L-shaped jaw **50.** Aligned apertures **56** and **57** (see FIGS. **3** and **4**) are provided in the tongue **54** aand bifurcated end portion of the arm **53,** respectively, in such manner as to receive a suitable pin **58** for securing the jaws in the closed position.

The pile monkey **40** is suspended from and controlled by a monkey rope **60** which is secured to the top of the base slide **41** and extends upwardly over the pulley means **23,** downwardly under the pulley means **38,** and downwardly to the cab **12** and the winch means thereof. The monkey rope **60** is here shown in double lines and greatly oversize for emphasis due to its importance with respect to the present invention. The pile monkey **40** is disposed below the level of the pile driver **28,** the monkey cable **60** extending downwardly between the slide members **29** which carry said pile driver.

Operation of the mechanical safety pile monkey of this invention is best understood by reference to FIGS. **6, 7,** and **1** in that order. FIG. **6** shows the first or hookup stage wherein a pile P is raised to an upright position by a suitable pile rope **62** attached adjacent to the upper end of the pile whereby the lower end of said pile can be readily manipulated to a selected spot on the ground. Said pile rope may descend from the pulley means **23,** as shown, or from any other suitable means. The pile monkey **40** is lowered to a position adjacent to the lower end of the pile P and the jaws **47** and **50** are closed, the pin **58** securing the clevis. At this point, the upper end of the pile P will not normally be in alignment with the pile driver **28** but rather will tilt or sag forwardly or laterally of the pile driver or will tend to lean back against the lead **20.**

During the next or set stage, the pile monkey **40** is raised by the monkey rope **60,** the jaws sliding with respect to the pile and progressively straightening the pile up to the position shown in FIG. **7** wherein said pile is in alignment with the pile driver **28.** At this point, or at any point during the driving of the pile, the pile monkey **40** may be lowered to any position for stabilizing the pile and controlling whip or lateral buckling thereof during the final driving stage as shown in FIG. **1.** FIG. **1** shows the pile partially driven into the ground and the pile monkey **40** lowered to a medial point for controlling the pile during the remaining part of the driving stage.

It will be readily appreciated that the present invention eliminates the dangerous task of climbing the lead and that the mechanical pile monkey can align the pile with the pile driver very rapidly, requiring only that it be attached to the bottom of the pile. Further, it will be seen that once the aligning task is completed, the monkey continues to be useful throughout the driving stage by stabilizing the pile.

As herein illustrated, the safety pile monkey of this invention is shown applied to a semifixed lead; that is, one in which the lead is slidably held thereby allowing vertical movement thereof and positive control of lateral movement. However, it will be readily understood that the same could be applied to a completely fixed lead or to a nonfixed or swinging lead suspended from the end of the boom. Also, the pile monkey shown is provided with pivoted jaws specifically adapted to slidably engage a pile having a generally rectangular effective outer countour. Thus it is particularly adapted for I-beams, H-beams, channel shaped members, box beams, and rectangular solid posts. However, it will be readily appreciated that the invention is not limited to this shape and could be readily adapted for any suitable shape.

It will be further understood that many changes in the details of the invention as herein described and illustrated may be made without, however, departing from the spirit thereof or the scope of the appended claims.

I claim:

1. In a pile driving apparatus: an elongated upright lead; a pile driver longitudinally slidably mounted upon said lead for driving a pile; means for placing a pile adjacent to said lead in a generally upright position whereby the lower end of the pile can be positioned at a selected spot adjacent to the bottom of said lead; a pile guiding device slidably mounted for longitudinal movement along said lead below said pile driver; means for longitudinally moving said guiding device relative to said lead; and said pile guiding device having means for slidably engaging a lower end portion of the pile adjacent to the selected spot whereby upon upward movement of said guiding device, said guiding device slides longitudinally along the pile and progressively moves the pile into alignment with said pile driver while the lower end of the pile remains at the selected spot.

2. In a pile driving apparatus as set forth in claim 1: said means for slidably engaging the pile comprising a pair of laterally closing, pivoted jaws which close on the pile and provide an opening larger than the pile shaped to slidably engage and guide the pile into alignment with said pile driver; and means for detachably securing said jaws in the closed position.

3. In a pile driving apparatus as set forth in claim 1: said pile guiding device being movable to an intermediate position on the pile during the driving thereof to stabilize the pile and reduce whip and buckling thereof.

4. In a pile driving apparatus: an elongated, upright lead of skeletal frame construction having a pair of laterally spaced front corner frame members; a pile driver disposed in front of said lead and longitudinally slidably mounted on said corner frame members for driving a pile; means for suspending a pile adjacent to said lead in a position only approximately aligned with said pile driver whereby the lower end of the pile can be positioned at a selected spot adjacent to the bottom of said lead; a mechanical pile monkey longitudinally slidably mounted on said corner frame members below said pile driver; means for raising and lowering said pile monkey; and said pile monkey including means for detachably slidably engaging a lower end portion of the pile adjacent to the selected spot whereby upon upward movement of said pile monkey, said pile monkey slides longitudinally along the pile and progressively moves the pile into alignment with said pile driver while the lower end of the pile remains at the selected spot.

5. In a pile driving apparatus as set forth in claim 4: said means for slidably engaging the pile comprising a pair of laterally closing, pivoted jaws which close on the pile and provide an opening larger than the pile shaped to slidably engage and guide the pile into alignment with said pile driver; and means for detachably securing said jaws in the closed position.

6. In a pile driving apparatus: an elongated, upright lead of skeletal frame construction having a pair of laterally spaced front corner frame members; a pile driver disposed in front of said lead and longitudinally slidably mounted on said corner frame members for driving a pile; means for suspending a pile adjacent to said lead in an upright position whereby the lower end of the pile can be positioned at a selected spot adjacent to the bottom of said lead; a mechanical pile monkey longitudinally slidably mounted on said corner frame members below said pile driver; means for raising and lowering said pile monkey; said pile monkey including means for detachably slidably engaging a lower end portion of the pile adjacent to the selected spot whereby upon upward movement of said pile monkey, the upper end of said pile is pulled into alignment with said pile driver; pulley meaans mounted adjacent to the top of said lead; and said means for raising and lowering said pile monkey comprising a rope disposed over said pulley means and extending downwardly past said pile driver and connected to said pile monkey.

7. In a pile driving apparatus: an elongated, upright lead of skeletal frame construction having a pair of laterally spaced front corner frame members; a pile driver disposed in front of said lead and longitudinally slidably mounted on said corner frame members for driving a pile; means for suspending a pile adjacent to said lead in an upright position whereby the lower end of the pile can be positioned at a selected spot adjacent to the bottom of said lead; a mechanical pile monkey longitudinally slidably mounted on said corner frame members below said pile driver; means for raising and lowering said pile monkey; said pile monkey including means for detachably slidably engaging a lower end portion of the pile adjacent to the selected spot whereby upon upward movement of said pile monkey, the upper end of said pile is pulled into alignment with said pile driver; pulley means mounted adjacent to the top of said lead; and said means for suspending the pile comprising a rope disposed over said pulley means and fastened to an upper end portion of the pile whereby the pile is normally tilted out of alignment with said pile driver prior to said pile monkey being moved upwardly.

8. In a pile driving apparatus: an elongated, upright lead; pulley means mounted at the top of said lead; a pile driver slidably mounted on the front of said lead and suspended from a rope passing over said pulley means; a pile rope disposed over said pulley means for suspending a pile therefrom whereby the lower end of the pile can be positioned at a selected spot on the ground adjacent to the bottom of said lead; a mechanical pile monkey longitudinally slidably mounted on the front of said lead and suspended below said pile driver by another rope disposed over said pulley means; said pile monkey comprising a base slide member slidably engaging the front of said lead; a pair of laterally closing pivoted jaws carried by and projecting forwardly from said base slide member, said jaws adapted to close on a lower end portion of the pile and provide an opening shaped to slidably engage and guide the pile whereby when the pile monkey is raised, the upper end of said pile is pulled into alignment with said pile driver, said pile monkey being adapted to be disposed at an intermediate point on the pile during the driving thereof to stabilize the pile and reduce whip and buckling thereof.

9. A mechanical pile monkey for aligning a pile with a pile driver carried by an elongated, upright lead wherein the pile is initially suspended below the level of the pile driver out of alignment with said pile driver and with its lower end resting on a selected spot adjacent to the bottom of the lead, said pile monkey comprising: a member having means for slidably engaging the lead for movement longitudinally thereof; guiding means for detachably embracing the pile carried by said member and in one position thereof providing an opening larger than the pile shaped to slidably engage the pile, said member adapted to be mounted upon the lead below the pile driver with said guiding means slidably engaging the pile adjacent to the bottom of the pile whereby said pile monkey can be raised and slid upwardly along the pile to pull the pile progressively into alignment with the pile driver while the lower end of the pile remains on the selected spot.

10. A mechanical pile monkey for aligning a pile with a pile driver carried by an elongated, upright lead wherein the pile is initially suspended below the level of the pile driver out of alignment with said pile driver and with its lower end resting on a selected spot adjacent to the bottom of the lead, said pile monkey comprising: a base slide member; a pair of laterally closing jaws pivotally mounted on said slide member which when closed provide an opening larger than the pile and shaped to slidably engage the pile; means for detachably securing said jaws in the closed position; said base slide member adapted to be slidably mounted

upon the lead below the pile driver and said jaws adapted to slidably engage the pile adjacent to the bottom thereof with said jaws secured in closed position whereby said pile monkey can be raised and slid upwardly along the pile to pull the pile progressively into alignment with the pile driver while the lower end of the pile remains on the selected spot.

11. In a pile driving apparatus: an elongated upright lead of fixed length in use thereof; a pile driver longitudinally slidably mounted upon said lead for driving a pile; means for placing a pile adjacent to said lead in a generally upright position normally out of alignment with said pile driver whereby the lower end of the pile can be positioned at a selected spot adjacent to the bottom of said lead; a pile guiding device slidably mounted for longitudinal movement along said lead separately from and below said pile driver; means for longitudinally moving said guiding device relative to said lead; said pile guiding device havinng means for slidably engaging a lower end portion of the pile adjacent to the selected spot whereby upon upward movement of said guiding device, said guiding device slides longitudinally along the pile and progressively moves the pile into alignment with said pile driver while the lower end of the pile remains at the selected spot.

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