Sept. 15, 1970 G. C. ALLEY ET AL 3,528,563

LIFTER AND SUPPORT APPARATUS FOR PILING AND THE LIKE

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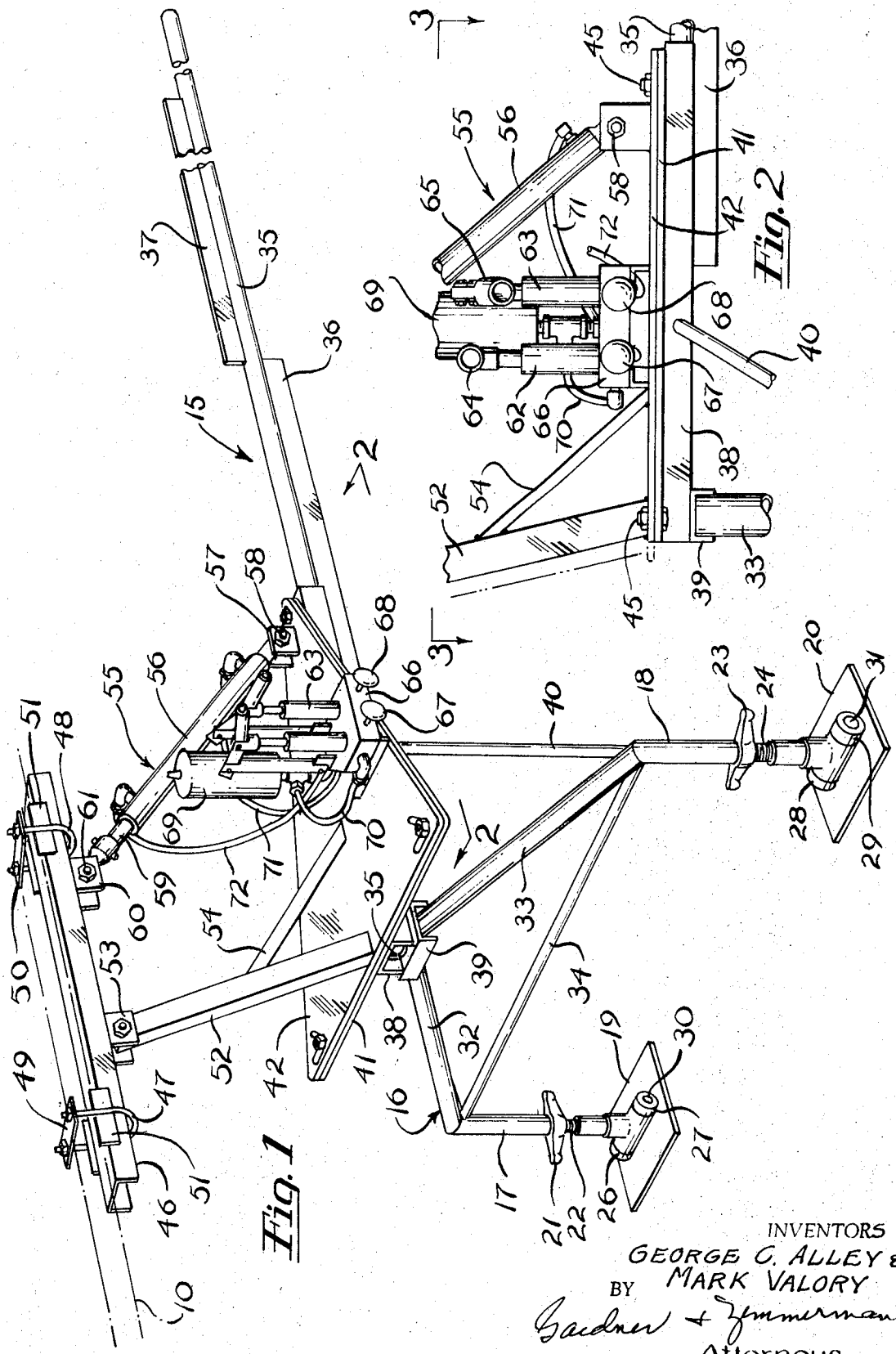


Fig. 1

Fig. 2

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LIFTER AND SUPPORT APPARATUS FOR PILING AND THE LIKE

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Fig. 3

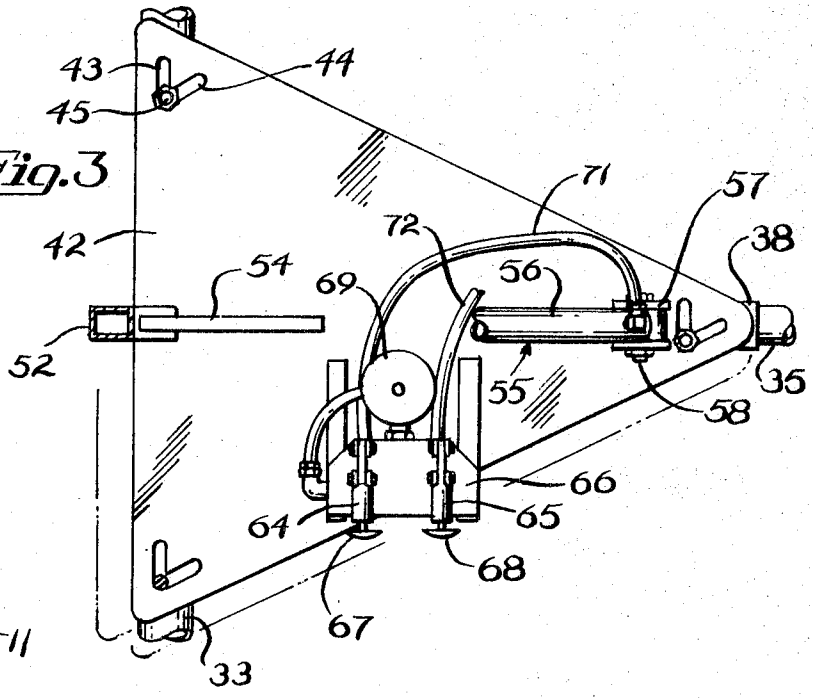
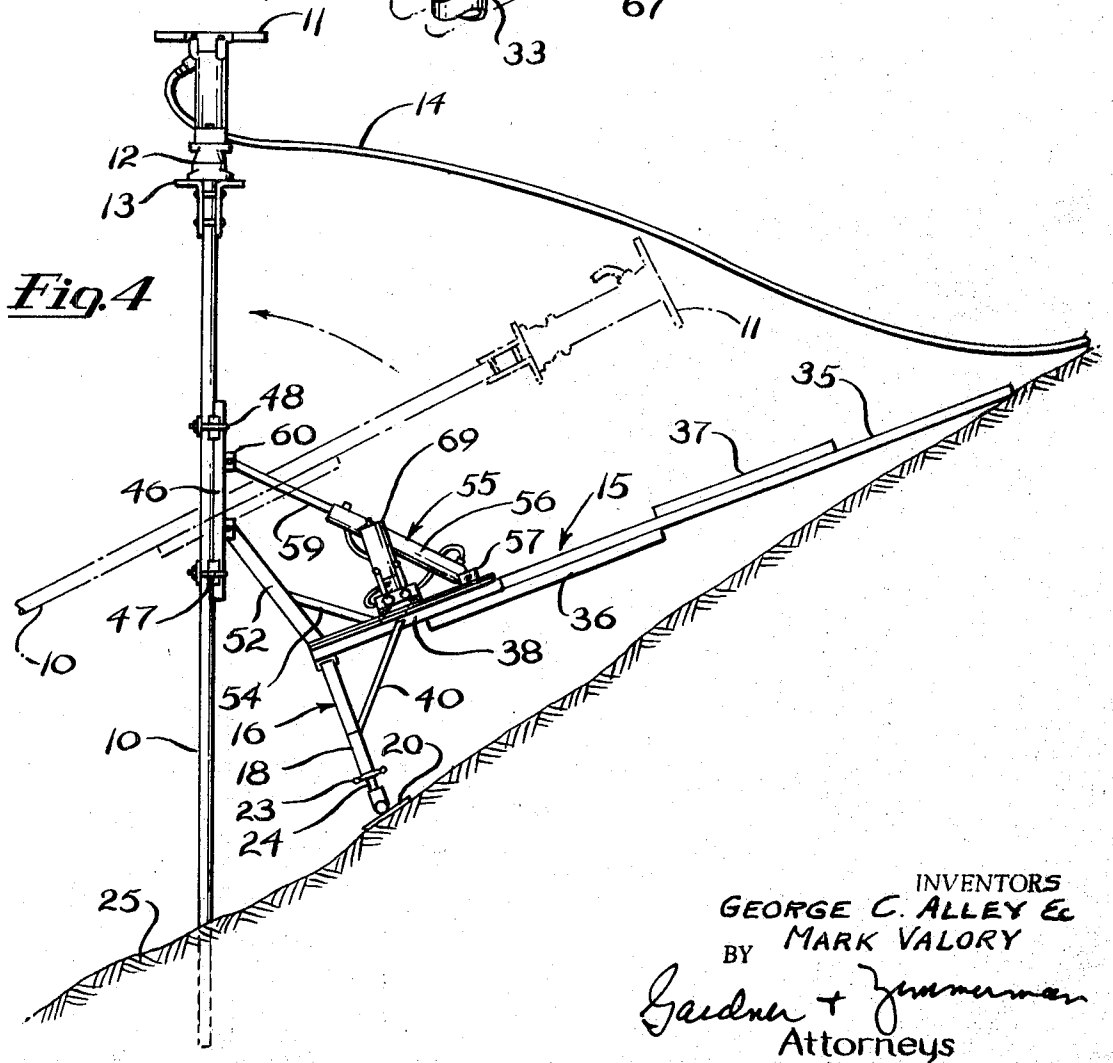


Fig. 4



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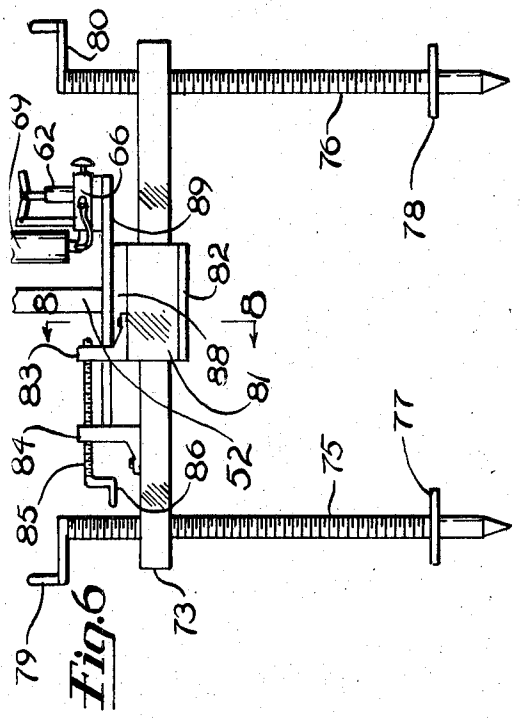


Fig. 6

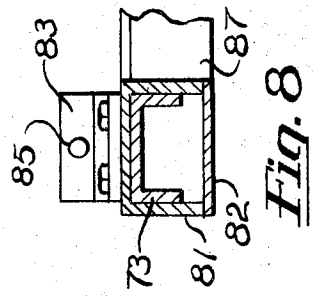


Fig. 8

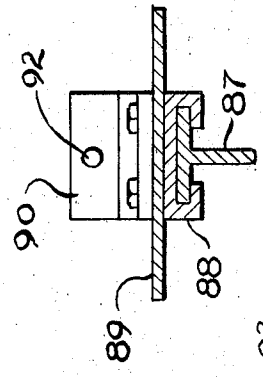


Fig. 7

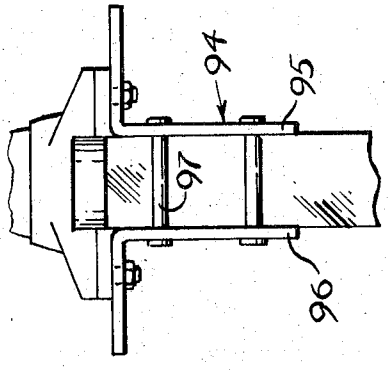


Fig. 9

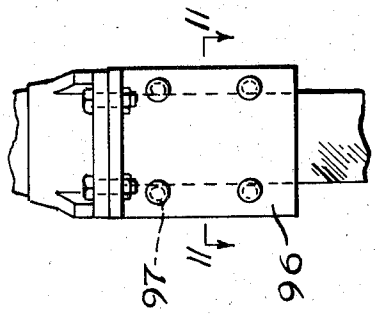


Fig. 10

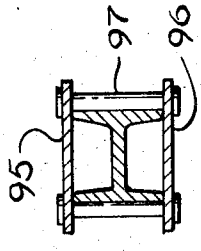


Fig. 11

Fig. 5

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3,528,563

LIFTER AND SUPPORT APPARATUS FOR PILING AND THE LIKE

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Int. Cl. B66f 11/00
U.S. Cl. 214—3 14 Claims

ABSTRACT OF THE DISCLOSURE

Lifter and support apparatus for placing or positioning a piling and for supporting the same as it is driven into the ground by a piledriver. The apparatus is especially useful along ground surfaces that are sloped, such as hillsides, and it includes leg structure adapted to provide a stable support for the apparatus along such surface. Guide structure adapted to have a piling secured thereto is supported by the leg structure through connector means enabling the guide structure and any piling secured thereto to be displaced into a predetermined orientation, ordinarily vertical, irrespective of the disposition of the ground surface. Power mechanism operative between the leg and guide structures permits such adjustable displacement of the guide structure and piling.

This invention relates to lifter and support apparatus for use in placing and supporting a variety of relatively heavy materials such as pilings and the like, and it relates more particularly to apparatus for positioning a piling along a ground surface and for supporting the piling as it is driven thereinto by a piledriver.

In the erection of large commercial buildings and another structures, it is common to drive massive pilings into the ground so as to support such structures on bedrock or otherwise provide a good foundation therefor. The equipment required for driving such pilings is often large and expensive and, therefore, its use is not economically justifiable for smaller construction projects. This is especially true, for example, in the erection of houses and similar residential buildings, and often such buildings are along hillsides where pilings could be used advantageously to prevent landslides and slippage or other movement of the buildings especially when the ground is softened by rain. So far as is known, no generally suitable apparatus for lifting, placing and supporting pilings at such construction sites is available, and as a consequence the use of pilings thereat is often neglected.

It is, accordingly, an object of the present invention to provide apparatus for use in lifting and supporting relatively heavy materials and especially in lifting, placing and supporting pilings and the like along a surface into which they are to be driven irrespective of whether such surfaces are flat, irregular, or inclined such as the slope of a hillside. Another object of the invention is that of providing apparatus of the character described that is structurally simple, relatively light-weight, and portable so as to enable it to be moved conveniently from one site to another.

Still another object is in the provision of apparatus enabling a heavy piling and the like to be mounted thereon and then swung upwardly into the generally vertical orientation ordinarily required by it for insertion into the ground—a piledriver being attached to such piling at one end thereof prior to its erection, if desired. A further object is to provide apparatus of the type explained having means enabling it to automatically compensate for the inclination or slope of any surface along which it is positioned, having means for adjusting at least certain

components of the leg structure thereof to enable a firm footing to be effected, and having means affording translational displacements of a piling so as to facilitate accurate alignment thereof with the location at which it is to be driven into a ground surface. Additional objects and advantages of the invention, particularly as concerns detailed features and characteristics thereof, will become apparent as the specification develops.

Embodiments of the invention are illustrated in the accompanying drawing, in which:

FIG. 1 is a perspective view of apparatus embodying the invention;

FIG. 2 is an enlarged, broken side view in elevation of a portion of the apparatus taken generally along the line **2—2** of FIG. 1;

FIG. 3 is a broken top plan view of a portion of the apparatus taken along the line **3—3** of FIG. 2;

FIG. 4 is a side view in elevation showing the apparatus in use in association with a piling and a piledriver in operative association therewith;

FIG. 5 is a side view in elevation of a modified form of apparatus;

FIG. 6 is an end view in elevation of such modified apparatus;

FIG. 7 is a vertical sectional view taken along the line **7—7** of FIG. 5;

FIG. 8 is a vertical sectional view taken along the line **8—8** of FIG. 6;

FIG. 9 is a side view in elevation of an adapter for use with a percussive tool to drive piling;

FIG. 10 is an end view in elevation of the adapter shown in FIG. 9; and

FIG. 11 is a cross-sectional view taken along the line **11—11** of FIG. 10.

Apparatus embodying the present invention is adapted for use with conventional pilings and drivers therefor; and referring to FIG. 4 in particular, the apparatus is shown in operative association with such a piling and with a piledriver therefor. For purposes of identification, the piling is denoted with the numeral **10** and the piledriver is designated with the numeral **11**. In the usual case, the piledriver **11** will be a standard heavy-duty piledriver as, for example, a model PB8A piledriver sold by Ingersoll-Rand Company. Such a piledriver is usually equipped with a fronthead **12** having cheek plates **13** that are adjustable so as to accept pillings **10** of from about two to three inches in thickness. The piledriver **11** shown is pneumatically actuated from a source (not shown) supplying air under pressure to the tool via a hose **14**.

The apparatus for supporting the piling **10** as it is being driven and for lighting and placing the piling prior thereto is designated in its entirety with the numeral **15**, and as shown best in FIG. 1 includes leg structure **16**. The leg structure **16** has a tripod configuration, and comprises front legs **17** and **18** respectively equipped at the lower ends thereof with adjustable feet or pads **19** and **20**. In the form shown, each of the feet **19** and **20** is vertically adjustable relative to its associated leg, as by means of having a threaded section engaged by a nut carried by the associated leg. Thus, in the case of the leg **17**, the adjustable nut carried thereby is denoted **21** and the threaded section of the foot is designated **22**; and as respects the leg **18**, the nut and threaded section are respectively designated **23** and **24**. The feet **19** and **20** are also pivotally supported relative to their associated legs so that they can firmly engage a support surface irrespective of any angular inclination thereof. Such accommodation of slope by the feet **19** and **20** is best shown in FIG. 4 in which the feet are firmly planted on a sloping surface **25** adapted to have the piling **10** driven thereinto.

The feet or pads **19** and **20** are equipped with spaced

apart rings or collars (**26** and **27** in the case of the foot **19**, and **28** and **29** in the case of the foot **20**) that are pivotally supported upon a post, **30** and **31** respectively, extending therethrough and carried by the respectively associated legs **17** and **18**. Thus, the feet **19** and **20** are supported for angular displacements about axes that are substantially normal to the longitudinal axes of the legs **17** and **18** and in the usual case are generally horizontally disposed. The legs **17** and **18** are interconnected at their upper ends via converging leg sections **32** and **33**, and are rigidified by a cross brace **34**.

The leg structure **16** further comprises an adjustable rear leg **35** that is elongated and may be reinforced therealong by oppositely oriented fins **36** and **37**. As shown best in FIG. 2, the leg **35** is tubular in the form illustrated and at its forward end is enclosed by an inverted, generally U-shaped channel **38** having at its forward end a bracket or channel section **39** welded thereto in transverse orientation. The converging leg sections **32** and **33** come together at the channel-shaped fastener **39** and are welded or otherwise fixedly secured thereto so as to rigidly relate the forward legs **17** and **18** to the rearwardly extending leg **35**. The structural interconnection of all of the legs is further strengthened by a plurality of rearwardly and inwardly extending struts or braces **40**.

Welded or otherwise rigidly secured to the leg structure **16** and, more particularly, to the inverted channel **38** thereof, is platform structure comprising a lower plate or platform **41** that is generally planar and an upper substantially planar platform **42** supported thereon. The platform **42** is displaceable through limited distances relative to the platform **41** so as to permit more accurate positioning of a piling **10** prior to its being driven into a surface **25** (FIG. 4). The relatively limited displacements required by the plate **42** to so align a piling may be obtained in any convenient manner as, for example, by the provision of a plurality of angularly disposed slots **43** and **44** adjacent each corner of the plates and which slots have nut-equipped bolts or comparable fasteners **45** extending therethrough. Thus, the plate **42** is displaceable in generally transverse and longitudinal directions relative to the plate **41** within the limits defined by each pair of the cooperative slots **43** and **44** and bolt **45** extending therethrough. The plates can be clamped in any position of adjustment by tightening the nut-equipped bolts **45**.

Guide structure **46** adapted to have a piling **10** secured thereto is supported by the leg structure **16** via the platform structure comprising the plates **41** and **42**. The guide structure **46** is elongated and in the form shown constitutes an inverted, generally U-shaped channel equipped at spaced apart locations therealong with holders **47** and **48** adapted to secure a piling **10** thereto. The holders **47** and **48** may be identical, and in the embodiment illustrated constitute fasteners of U-shaped configuration extending about the guide structure **46** and equipped at the ends thereof with a strap, **49** and **50** respectively, which can be displaced toward the guide structure **46** by nuts threadedly engaging the ends of each fastener, thereby enabling the straps **49** and **50** to hold a piling **10** against the facing surface of the guide structure **46**. A plurality of spacers **51** may be used to isolate the fasteners **47** and **48** from such piling **10**.

Respecting the interconnection of the guide structure **46** with the leg structure **16**, the connector structure provided for this purpose includes (in addition to the platform-defining plates **41** and **42**) linkage **52** welded or otherwise fixedly secured at its lower end to the plate **42** and pivotally connected at its upper end to the guide structure **46** as by means of depending ears and a fastener extending therethrough, as shown generally at **53**. Rigidity of the linkage **52** relative to the plate **42** is augmented by a strut or brace **54** extending therebetween. Evidently, such interrelationship of the guide structure **46** with the plate **42** enables the guide structure to be pivoted about the axis defined through the fastener means **53** between generally horizontal and generally vertical positions, as indicated in FIG. 4. Such angular displacements of the guide structure **46** are effected by power mechanism generally denoted with the numeral **55**.

The power mechanism **55** for adjustably displacing the guide structure **46** relative to the leg structure **16** includes motor means in the form of piston-cylinder structure; the cylinder **56** of which is pivotally connected at one end thereof to the plate **42** by means of spaced apart ears **57** and a pivot pin **58**, and the piston **59** of which is pivotally connected at its outer end of the guide structure **46** by means of ears **60** attached thereto and a pivot pin **61** extending therethrough. The motor means is therefore operative between the guide structure and upper plate **42**, and it is connected in and forms a part of a hydraulic system by means of which the piston-cylinder structure or motor means is selectively energized in opposite directions so as to pivot the guide structure **46** between generally horizontal and vertical disposition.

The hydraulic system includes a pair of pumps **62** and **63** adapted to be manually energized, respectively, by crank arms **64** and **65** much in the manner of hydraulic jacks. The pumps **62** and **63** are mounted upon and are in flow-communication with a pump housing or block **66** equipped therewithin with a pair of valves (not shown) respectively associated with the pumps **62** and **63** and equipped with controls or levers **67** and **68** by means of which the valves are selectively opened and closed. A reservoir **69** containing a supply of hydraulic fluid is connected in flow-communication with the housing **66** through a conduit **70**. The housing **66** is also connected through a flow conduit **71** with the lower end of the cylinder **56**, and through a flow conduit **72** with the upper end of the cylinder **56**. With this arrangement, suitable manipulation of the valve levers **67** and **68** and appropriate actuation of the pump **62** or **63**, as the case may be, will energize the piston-cylinder structure so as to displace the guide structure **46** toward the vertical or horizontal position thereof.

In this reference, and assuming that the guide structure **46** is in the generally horizontal position showin in FIG. 1 and illustrated by broken lines in FIG. 4, if the valve **67** is displaced into the position thereof enabling fluid under pressure to be expressed through the conduit **71** to the lower end of the cylinder **56** upon actuation of the pump **62**, and if the valve **68** is displaced into a position in which fluid within the opposite end of the cylinder **56** can be returned to the pump housing **56** via the conduit **72**, as the pump **62** is actuated the piston **59** will be displaced outwardly from the cylinder **56** so as to pivot the guide structure **46** upwardly in a counter-clockwise direction (as viewed in FIGS. 1 and 4) and into the full-line position shown in the latter figure. Reversal of the valve settings **67** and **68** and actuation of the pump **63** will cause the guide structure **46** to be displaced in the opposite direction.

In use of the apparatus **15**, it will be placed along a surface at a location adjacent the position at which a piling is to be driven thereinto. The leg structure **16** is firmly planted along such surface, and a stable tripartite support for the apparatus is effected because of the pivotal connection of the feet **19** and **20** with the respectively associated legs **17** and **18** and adjustability of the feet **19** and **20** the elevation of which may be varied as necessary to effect such stable positioning of the apparatus. As shown in FIG. 4, the apparatus is especially able to accommodate surfaces **25** which are inclined or define a hillside or slope, and surfaces of such type have in the past caused great difficulty for contractors.

Usually, the guide structure **46** will be in a generally horizontally disposition, as shown in FIG. 1, and the holders **47** and **48** are released to enable a piling **10** to be disposed along the guide structure. The holders **47** and **48** are placed in position after a piling **10** has been located upon the guide structure whereupon they secure

such piling thereto. Next, the valve levers **67** and **68** are manipulated as necessary to permit pressure to be relieved from the outer end of the cylinder **56** as fluid under pressure is expressed into the lower end thereof by actuation of the pump **62**. As the pump is actuated, the guide structure **46** is swung upwardly to locate the piling **10** in a generally vertical orientation and at a position along the surface **25** at which it is to be driven thereinto by the repetitive impact delivered thereto from a piledriver **11**. Slight translational adjustments of the piling **10** to permit accurate positioning thereof can be effected by loosening the fasteners **45** and displacing the plate **42** relative to the plate **42** to the extent necessary.

After the apparatus **15** has been properly manipulated to orient the piling **10** in the position shown in FIG. 4, the piledriver **11** is actuated. As will be explained hereinafter, the pile driver is positioned on the top end of the pile by an adaptor which permits the pile to be longitudinally moved with respect to the driver. Thus, the piledriver will drive the pile into the ground. As the piledriver **11** approaches the guide structure **46**, it will be necessary to remove the guide structure from the piling so that the apparatus **15** does not interfere with penetration of the piling **10** into the ground and downward movement of the piledriver **11** therewith. At this time, however, the piling **10** will be sufficiently embedded in the ground to be self-supporting.

The relatively long rear leg **35** lends stability to the apparatus without requiring it to be excessively heavy; and on slopes that are excessively steep, the rear leg **35** can be weighted or otherwise affixed to the ground should this be necessary. In this reference, it might be noted that pilings can be quite heavy and, by way of example, one frequently used size thereof has a weight of the order of 500 pounds and may be driven by a conventional heavy-duty piledriver **11** which itself may exceed 175 pounds in weight.

The modified embodiment of the lifter and support apparatus illustrated in FIGS. 5 through 8 is generally similar, both structurally and functionally, to the embodiment heretofore described and departs therefrom mainly as respects the characteristics of the leg structure and as respects the inclusion of screw mechanism to effect translational displacements of the platform to accurately align a piling **10** with the particular position along a ground surface at which the piling is to be driven thereinto. The leg structure of such modified embodiment includes an inverted U-shaped channel **73** equipped adjacent the opposite ends thereof with nuts **74** threadedly engaged, respectively, by elongated legs **75** and **76** which are provided with threads along the lengths thereof and are pointed at their lower ends so as to penetrate a ground surface. Spaced upwardly a short distance above such pointed ends, the legs are respectively equipped with laterally extending flanges **77** and **78** which define relatively large-area abutments that limit penetration of the legs into such ground surface. At their upper ends, the legs are equipped with handles **79** and **80**, respectively, to facilitate adjustable rotation thereof.

Slidably mounted upon the channel **73** intermediate the legs **75** and **76** is an inverted U-shaped channel **81** bridged across the depending legs thereof with a closure plate **82**. Fixedly secured to the channel **81** and extending upwardly therefrom is a bracket **83**, and aligned therewith along the length of the channel **73** and fixedly mounted thereon is an upwardly extending bracket **84**. The brackets **83** and **84** are provided with openings therethrough receiving an elongated screw **85** equipped with a handle **86**. The screw threadedly engages the opening in the bracket **84** and is rotatable relative to the bracket **83** but is constrained by pins or otherwise against longitudinal displacements with respect thereto. Rotation of the screw **85** selectively in opposite directions causes the channel **81** to be displaced in corresponding directions along the channel **73**.

The leg structure further includes an elongated rearwardly extending leg **87** of generally T-shaped configuration (as shown best in FIG. 7), but with the web thereof diminishing in width toward the outer end of the leg. The leg is welded or otherwise rigidly secured to the channel **81** so as to move transversely therewith as it is displaced along the channel **73** by the first screw mechanism including the brackets **83** and **84** and screw **85** and so as to move vertically therewith as its elevation is varied by adjustment of the legs **75** and **76**. Slidably mounted upon the flange or head of the T-shaped leg **87** is a platform comprising a lower platform or channel member **88** cooperatively engaging the leg **87** and an upper platform **89** attached to the channel-platform **88** and equipped with a bracket **90** extending upwardly therefrom.

In substantial alignment with the bracket **90** is a bracket **91** welded or otherwise rigidly secured to the leg **87**, and the bracket members **90** and **91** are provided with openings therethrough that receive an elongated threaded screw **92** equipped at one end thereof with a handle **93**. The screw **92** threadedly engages the bracket **81** and is rotatable relative to the bracket **90** but is constrained by pins or otherwise against displacements relative thereto. Evidently then, selective rotation of the second screw mechanism (including the brackets **90** and **91** and screw **92**) in opposite directions causes the platform structure comprising the lower platform **88** and upper platform **89** to move longitudinally along the leg **87** in associated directions. It should be noted that the upper platform **89** is substantially the same as the upper platform **42** in that it carries the holder-equipped guide means through linkage and carries the power mechanism by means of which the guide structure is displaced between the generally horizontal and generally vertical positions thereof. As respects the modified apparatus, all of such additional components arranged with the platform **89** may be the same as those shown in the embodiment of the invention illustrated in FIGS. 1 through 4 and heretofore described in detail, wherefore no further description thereof will be included.

An adapter **94** is illustrated in FIGS. 9 and 10 which may be used with the percussive tool **11** to drive piling **10**. The adapter **94** comprises a pair of L-shaped cheek plates **95** and **96** that are spaced apart a predetermined distance by pins having enlarged center portions defining spacers **97** and restricted end portions projecting through the cheek plates and flattened along the outer surfaces thereof like rivets. The cheek plates are provided with openings along their upper legs or outwardly projecting flanges to enable the same to be secured to the fronthead **12** of the percussive tool **11**, and the opening defined between the spacers **97** is adapted to pass a piling therethrough. Evidently then, such piling is confined within the opening of the adaptor and which opening has definitive dimensions established by the depending legs of the cheek plates **95** and **96** in one direction and by the spacers **97** in the opposite direction. The adaptor and pile driver rides freely on such piling received within the opening thereof.

While in the foregoing specification embodiments of the invention have been set forth in considerable detail for purposes of making a complete disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

We claim:

1. Apparatus of lightweight and portable construction for lifting piling and the like into a predetermined orientation and for then supporting the same as when such piling is driven by an impact-delivering driver therefor into a ground surface or the like, comprising a tripod leg structure adapted to be supported along such surface adjacent a location at which piling is to be driven thereinto and including a pair of transversely spaced and upwardly extending front legs and an elongated longitudi-

nally extending rear leg disposed so as to intersect the plane defined by said front legs, guide structure equipped with holder means for securing a piling thereto, connector structure interconnecting said leg and guide structures and supporting the latter for movement relative to the former so as to dispose any such piling secured to said guide structure at a predetermined orientation irrespective of the disposition of such leg-supporting surface, and power mechanism connected with said guide structure for adjustably displacing the same to effect such orientation of a piling.

2. The apparatus of claim **1** in which said front legs are vertically adjustable relative to each other so as to accommodate irregularities along any such surface.

3. The apparatus of claim **2** in which said adjustable legs are equipped with feet pivotally related thereto so as to enable said apparatus to be disposed readily along inclined surfaces.

4. The apparatus of claim **1** in which said guide structure is elongated so as to support any such piling along an extended length thereof.

5. The apparatus of claim **4** in which said holder means comprises a plurality of spaced apart fasteners for securing such piling to said guide structure.

6. The apparatus of claim **1** in which said connector structure includes a platform secured to said leg structure, and further includes linkage pivotally securing said guide structure to said platform, the aforesaid rear leg being disposed so as to extend generally along the plane of said platform.

7. The apparatus of claim **6** and further comprising adjustment means connecting said platform with said leg structure to enable said platform to be adjustably displaced translationally relative to said leg structure.

8. The apparatus of claim **7** in which said adjustment means includes a first screw mechanism for displacing said platform transversely and a second screw mechanism for displacing said platform longitudinally.

9. The apparatus of claim **1** in which said power mechanism includes motor means operative between said guide and leg structures.

10. The apparatus of claim **9** in which said motor means comprises piston-cylinder structure pivotally connected with said leg and guide structures, and a hydraulic pump system including said piston-cylinder structure for energizing the same to effect adjustable displacements of said guide structure relative to said leg structure.

11. The apparatus of claim **1** in which said front legs are vertically adjustable relative to each other so as to accommodate irregularities along any such surface, in which said connector structure includes a platform carried by said leg structure and linkage pivotally securing said guide structure to said platform, and in which said power mechanism includes motor means operative between said guide and leg structures, the aforesaid rear leg being disposed so as to extend generally along the plane of said platform.

12. The apparatus of claim **11** in which said guide structure is elongated so as to support any such piling along an extended length thereof.

13. The apparatus of claim **12** in which said motor means comprises piston-cylinder structure pivotally connected with said leg and guide structures, and a hydraulic pump system including said piston-cylinder structure for energizing the same to effect adjustable displacement of said guide structure relative to said leg structure.

14. The apparatus of claim **13** and further comprising adjustment means connecting said platform with said leg structure to enable said platform to be adjustably displaced translationally relative to said leg structure, said adjustment means including a plate secured to said leg structure and a plurality of releasable fasteners selectively constraining said platform in any position of adjustment thereof to said plate.

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U.S. Cl. X.R.

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