

May 28, 1968

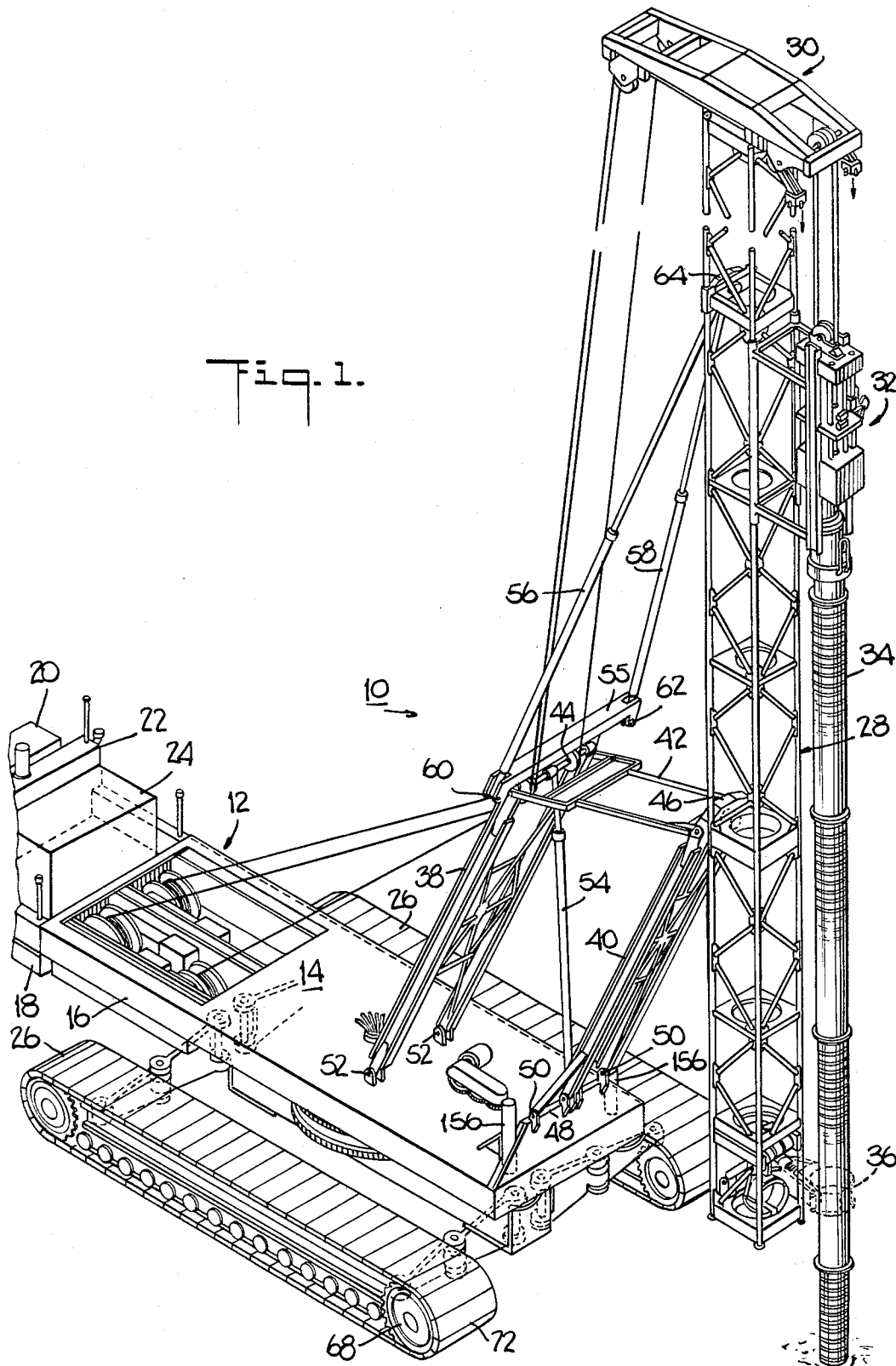
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Fig. 1.



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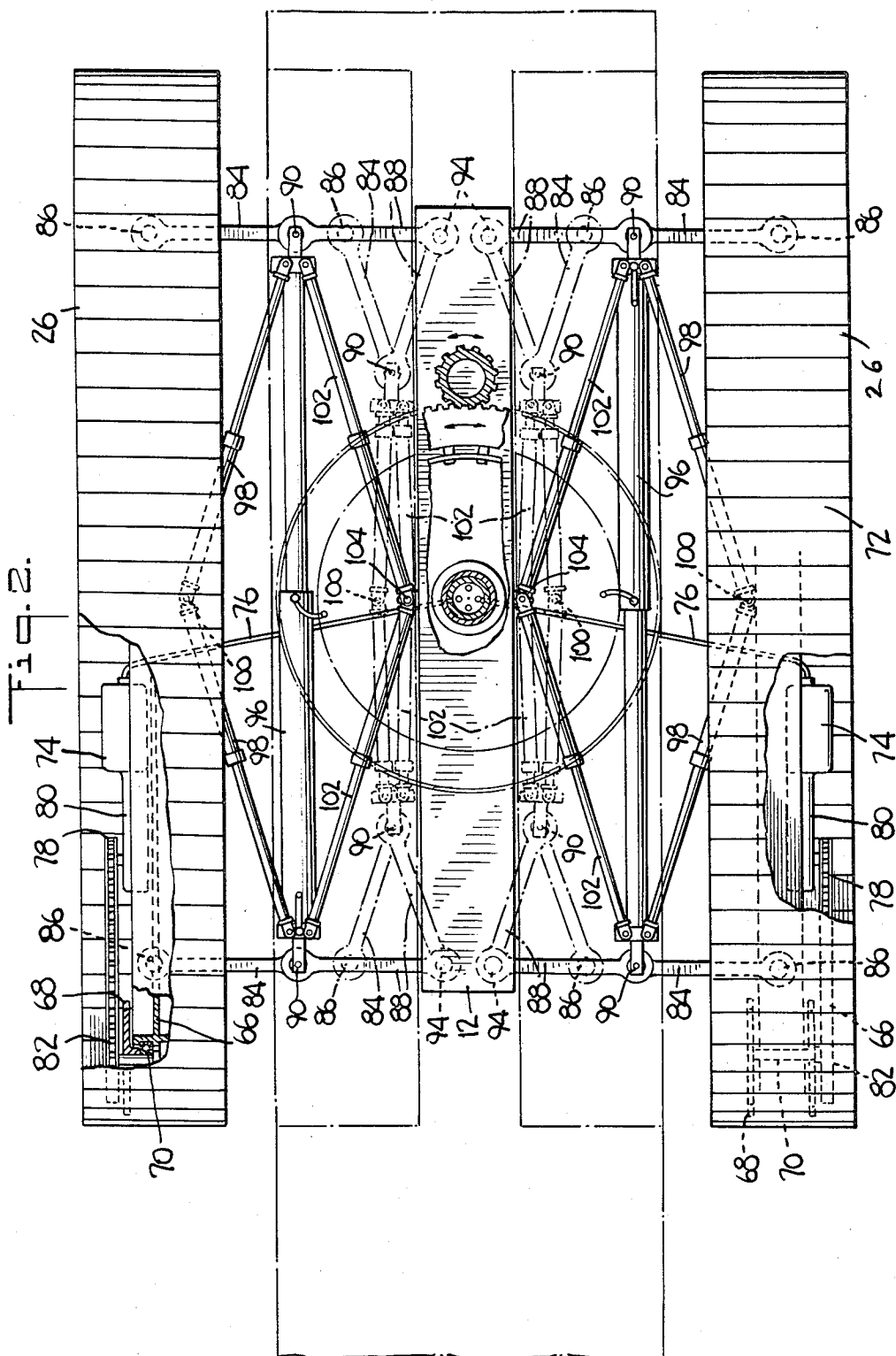
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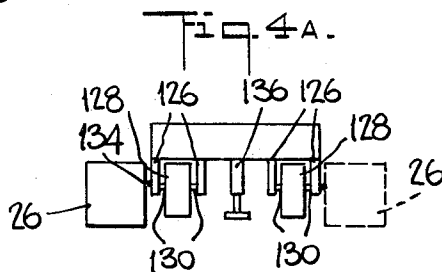
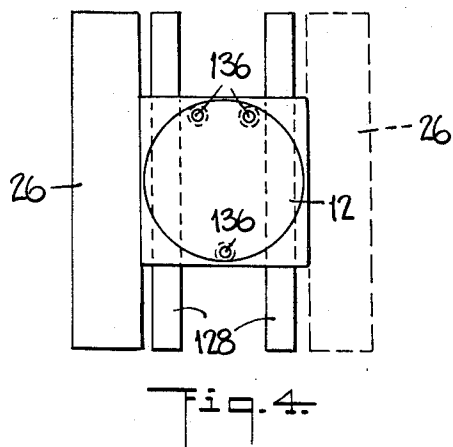
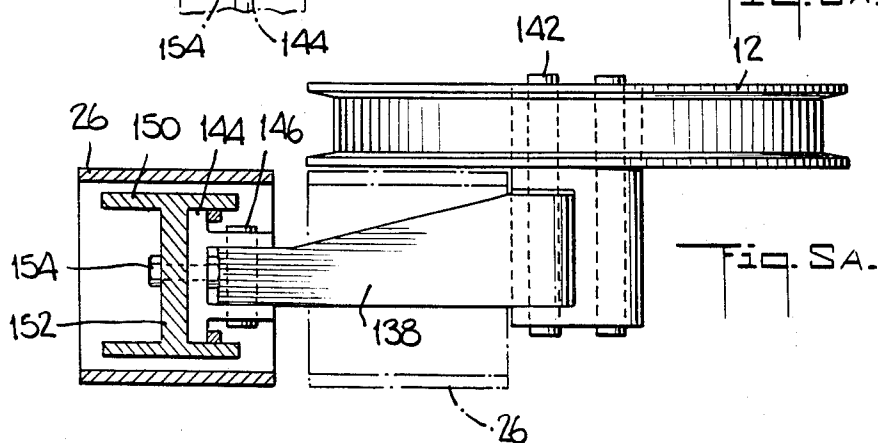
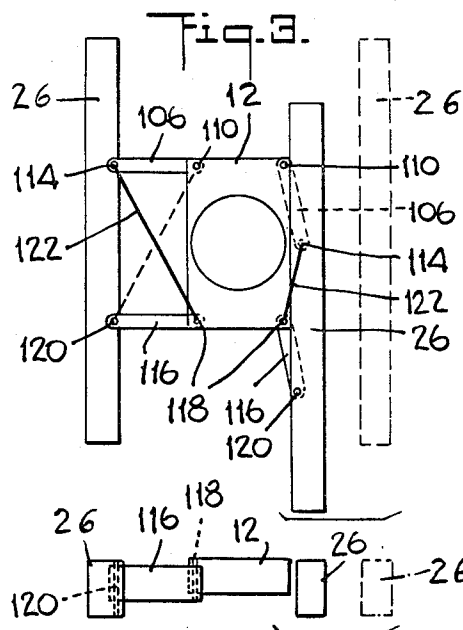
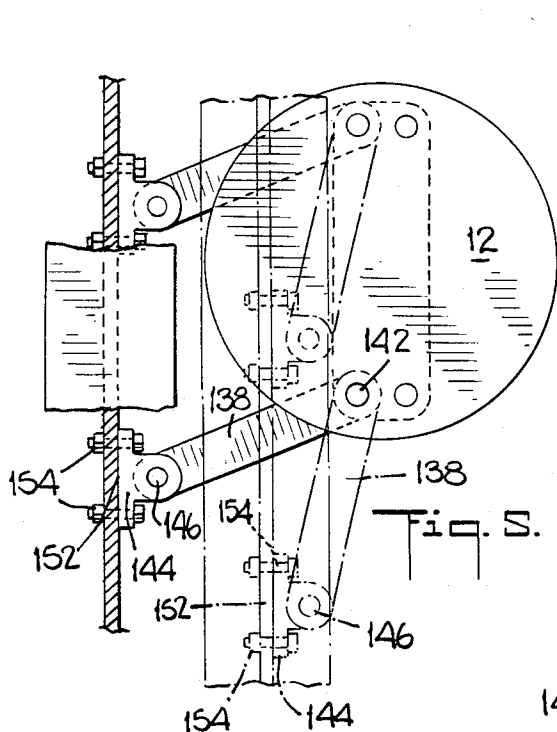
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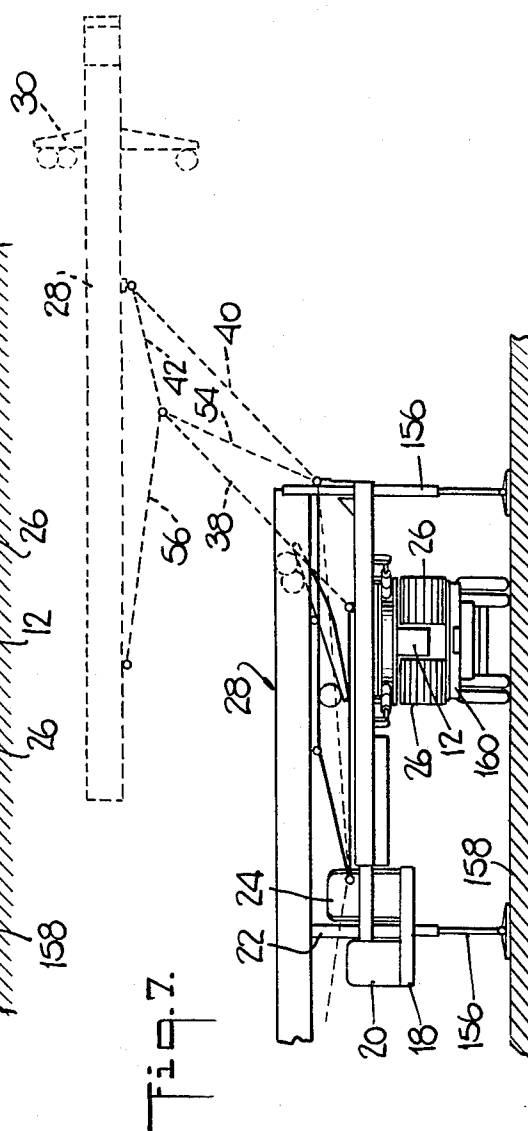
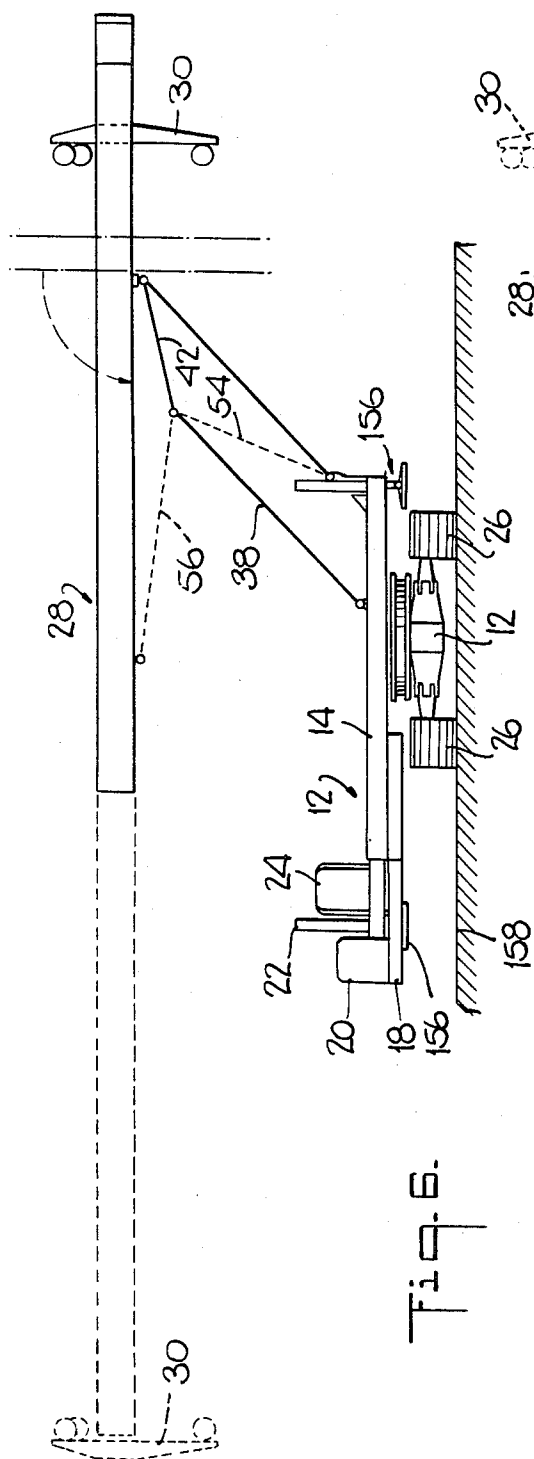
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PORTABLE DERRICKS

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Continuation-in-part of application Ser. No. 401,365, Oct. 5, 1964. This application Jan. 13, 1966, Ser. No. 520,476

8 Claims. (Cl. 52-116)

ABSTRACT OF THE DISCLOSURE

A movable derrick structure such as a pile driving rig having a leader and crawler tracks, all of which are secured with special linkages and actuating arrangements for permitting the device to be collapsed into a compact unit for transportation.

This application is a continuation-in-part of application Ser. No. 401,365 filed Oct. 5, 1964, now Patent No. 3,312,391.

This invention relates to derricks and more particularly to new and useful improvements in the construction and operation thereof. The concepts according to this invention are useful for various hoisting apparatus, particularly such apparatus employing a tackle rigged at the end of a beam, leader or boom. Such hoisting apparatus constructed in accordance with this invention may be used over a deep-well hole such as an oil well for supporting the tackle for boring or hoisting or lowering.

Apparatus according to the present invention may also be used advantageously with a pile driver and for purposes of explanation a pile driver constructed in accordance with the concept of this invention will be illustrated.

Although a variety of derricks are presently available and have been described in the literature, they have not been entirely satisfactory for many purposes. It is an aim of the present invention to provide new and improved derricks which incorporate structure of reduced dimensions and weight, which is compact and which may be readily transported from one job site to another. This is particularly important due to the large number and variation of highway restrictions and regulations. A feature of this invention resides in the provision of structure which is adapted to be folded for transportation purposes. A derrick constructed in accordance with this invention is easily converted from its operating condition to its transporting condition and thereby reduces time losses as well as decreasing the time involved between individual jobs. It is an aim of this invention to provide a new and improved derrick which is severable into components for transporting purposes. Also the pile driver is provided with a horizontal base which is extensible for operating purposes and retractable for transporting purposes. One of the features of this invention is the provision of a derrick having improved leader positioning means.

A feature of this invention resides in the provision of a derrick having improved structural support for a pivotable leader. Still another aim of this invention resides in the provision of a derrick which is reliable, economical, compact and efficient.

Briefly, the present invention contemplates the provision of a derrick comprising a horizontal base, a pivotable leader, a pair of crawlers for supporting the horizontal base, and a parallel motion mechanism pivotally interconnecting the base and the leader. Means are provided for moving the crawlers between a first position of spaced relationship one with respect to the other and a second position of increased spaced relationship one with respect to the other.

Further objects, features and advantages of the inven-

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tion hereof will appear from the detailed description given below, taken in connection with the accompanying drawings which form a part of this specification and illustrate by way of example, preferred embodiments of the invention.

In the drawings:

FIG. 1 is a fragmentary perspective view showing a pile driver constructed in accordance with the concepts of this invention;

FIG. 2 is an enlarged plan view of the pile driver with the turntable and portions of the bedsill removed therefrom in order to reveal the crawlers and their associated retracting and extending mechanism;

FIG. 3 is a schematic plan view of another arrangement of the crawlers and their associated retracting and extending mechanism;

FIG. 3a is a schematic front elevation of the crawlers of FIG. 3;

FIG. 4 is a schematic plan view of an alternate arrangement of the crawlers of the pile driver;

FIG. 4a is a schematic front elevation of the crawlers of FIG. 4;

FIG. 5 is an enlarged schematic plan view of still another arrangement of the crawlers and their associated retracting and extending mechanism;

FIG. 5a is a front elevation of the crawlers of FIG. 5;

FIG. 6 is a schematic side elevation of the pile driver partially folded for transit; and

FIG. 7 is a schematic side elevation of the pile driver of FIG. 6 with the hydraulic leveling jacks extended for purposes of supporting the unit while the crawlers are being retracted and a motor vehicle is driven thereunder.

In the embodiment of the invention illustrated in FIG. 1, it is seen that the pile driver 10 comprises a horizontal base designated generally at 12 including a turntable 14, an integral drum platform 16, a power unit platform 18 and a fuel tank 22. The power unit platform 18 carries an engine 20 and a power pack 24. The horizontal base 12 is carried by a pair of crawlers 26 and in turn supports a boom or leader designated generally at 28, the leader being of the box type.

The leader 28 supports a head frame 30 which in turn carries a hammer unit 32 adapted for driving a pile 34. In addition, the leader 28 carries a bottom pile guide 36 for purposes of aligning and positioning the pile 34.

As best seen in FIG. 1, the leader 28 is positioned and supported by a back frame 38, a front frame 40 and a top frame 42. Still referring to FIG. 1, the back frame 38 is pivotally connected to the top frame 42 along a first pivot line as by means of a cross pin 44. The top frame 42 is pivotally connected to the front frame 40 along a second pivot line as by means of cross member 46. The leader 28 is also pivotally connected to the top frame 42 and the front frame 40 by the same cross member 46. The front frame 40 is pivotally connected to the turntable 14 along a third pivot line as by means of cross pin 48 which is supported on the turntable 14 by means of tie plates 50. The back frame 38 is pivotally connected to the turntable along a fourth pivot line as by means of tie plates 52. Still referring to FIG. 1, a hydraulic spotting cylinder 54 is anchored at one end to the cross pin 48 on the turntable 14 and anchored at the other end to cross pin 44 between the back frame 38 and the top frame 42. Thus, the frames 38, 40 and 42 collectively form substantially a parallel motion mechanism or parallelogram linkage with the table 14 for supporting the leader 28. By extending or contracting the hydraulic cylinder 54, the leader 28 may be positioned at any radius within the range of the machine.

A cross member 55 (FIG. 1) is pivotally attached to the cross pin 44. A pair of hydraulic batter cylinders 56 and 58 are pivotally anchored at one end to the

cross member 55 as at 60 and 62 respectively, and are pivotally anchored at the other end to cross member 64, cross member 64 being carried by the leader 28. In FIG. 1, it is clearly seen that the lower portions of the batter cylinders 56 and 58 are spaced one from the other, while the upper portions thereof are pivotally connected one to the other.

In operation adjustment of the batter cylinders 56 and 58 controls the plumb of the leader 28. By means of adjusting the spotting cylinder 54, the leader 28 may be positioned at any radius within the range of the machine without the necessity of altering the batter cylinders. This is a marked advance over apparatus of the prior art which apparatus destroyed the plumb of the leader when spotting out and swinging it down.

As mentioned hereinbefore the pile driver is provided with a pair of crawlers 26. In order for the unit to be made as compact as possible for purposes of transporting it from one job site to another, the crawlers 26 are adapted to be moved inwardly during transit and moved outwardly when operating the device. Referring to FIG. 2, the crawlers 26 are shown by the solid lines when they are in their outer position and by the dotted lines when they are in their inner or retracted position. The crawlers 26 comprise frame members 66 which support sprocket-like gears 68 by means of axles 70, which gears drive the continuous roller belt or treads 72. Each crawler is individually driven by a hydraulic motor 74, fed by means of a hydraulic cable 76, through mechanical means including an endless chain 78, a gear reducer 80, and a gear 82 mounted on axle 70.

As best seen in FIG. 2, the outboard bedsill links 84 are shown pivotally attached to the frame as at 86 and pivotally attached to inboard bedsill links 88 as at 90. The inboard bedsill links 88 are also pivotally connected to the base 12 as at 94. Fluid or hydraulic cylinders 96 disposed substantially parallel to the crawlers 26 interconnect pivot points 90, respectively. Two pairs of tension links 98 are provided for each crawler. One end of each link is pivotally connected at point 90 and the other end thereof is pivotally connected to the crawler as at 100. There are provided two additional pairs of tension links 102. One end of each link is pivotally connected at point 90 and the other end thereof is pivotally connected to the base 12 as at 104. In operation, after the crawlers have been lifted out of contact with the ground, selective actuation of the cylinders 96 controls the movement of the crawlers 26. When the cylinders 96 are extended by means of fluid or hydraulic pressure, the links assume the positions shown by the solid lines in FIG. 2 wherein the crawlers are in their outer or extended positions. When the cylinders 96 are retracted by means of hydraulic pressure, the links assume the position as shown by the dotted lines in FIG. 2 wherein the crawlers are in their inboard or retracted position such as is desirable for transit.

Referring next to FIGS. 3 and 3a, there is shown an alternate arrangement of the crawlers and their associated retracting and extending mechanism. Rear swinging arm supports 106 are pivotally connected to the base 12 as by means of pins 110 at one end thereof and to the crawlers 112 as by means of pins 114 at the other end thereof. Front swinging arm supports 116 are pivotally connected to the base 12 as by means of pins 118 at one end thereof and to the crawlers 26 as by means of pins 120 at the other end thereof. Telescoping members 122, such as hydraulic cylinders for example, interconnect pins 114 at the outside ends of rear swinging arm supports 106 with pins 118 at the inside ends of front swinging arm supports 116, respectively.

The crawlers 26 are extensible as shown by the broken line on the right hand side of FIG. 3, when the pile driver is in operation, and the crawlers are retractable, as shown by the solid lines in FIG. 3, when the pile driver is being shipped or transported from one location to

another such as between job sites, for example. It is noted that the telescoping members 122 are extended when the crawlers are extended and they are retracted when the crawlers are retracted.

Referring next to FIGS. 4 and 4a, there is shown another alternate arrangement of the crawlers and their associated retracting and extending mechanism. A horizontal base 12 is provided with downwardly depending lugs 126 (FIG. 4a). A pair of removable crawlers 26 are removably connected to lugs 126 as at 134 (FIG. 4a). The crawlers 26 as shown by the solid lines in FIGS. 4 and 4a are attached to the horizontal base member 12 when the pile driver is in operation, and the same crawlers 26 are removed when the pile driver is being shipped or transported from one location to another such as between job sites, for example. That is, the crawlers 26 in their first position are disconnected from said horizontal base and in their second position are operatively connected to said horizontal base. In order to remove or apply the crawlers 26, hydraulic jacks 136 are provided which when extended lift the base 12 and the crawlers up off the ground, but during the remainder of the time the jacks 136 are telescopically retracted to allow the crawlers to engage the ground surface. A second pair of spaced crawlers 128 are permanently attached to the lugs 126 as at 130. These crawlers are disposed inwardly of the first pair of crawlers 26 when the first pair are positioned in their second position.

Referring next to FIGS. 5 and 5a, there is shown still another alternate arrangement of the crawlers and their associated retracting and extending mechanism. In this arrangement only one crawler and its swinging arm supports are shown. However, it will be appreciated that a second oppositely disposed crawler is structurally similar and operates in a similar manner. Swinging arm supports 138 are pivotally attached to the horizontal base 12 as by means of pins 142. The other end of the swinging arm support 138 is pivotally attached to the slide 144 as by means of pin 146. The crawler 26 is provided with an I-shaped frame 150 having a sliding surface 152 (FIG. 5a) which engages the slide member 144. Bolts 154 removably secure the slide member 144 to the frame 150 after the tracks have been positioned as desired.

The crawlers 26 are moved to their extended positions as shown by the solid lines in FIGS. 5 and 5a during normal operation of the pile driver. When it is desired to retract the crawlers 26 to their innermost position as shown by the broken lines in FIGS. 5 and 5a for purposes of shipping the pile driver from one location to another, the bolts 154 are removed and the slide member 144 is allowed to slide along the sliding surface 152 until the slide member 144 reaches its position as shown by the dotted line in FIG. 5 wherein the bolts 154 are again employed to hold the slide member in its new position. The crawlers are then in their retracted position and are ready for transit.

As best seen in FIGS. 6 and 7, the pile driver may be folded to present a compact unit for purposes of shipping or transporting from one location to another such as between job sites, for example. The leader 28 is compacted by means of retracting the spotting cylinder 54 until the leader 28 is at its maximum radius, and thence retracting the batter cylinders 56 and 58 until the leader 28 is in a horizontal position as shown in FIG. 6. Thereafter, the upper portion of the leader 28 is folded from its position as shown in the dotted lines in FIG. 6 to its position shown in the solid line in FIG. 6. Then, the hydraulic jacks 156 are extended until they engage the ground 158 as shown in FIG. 7. The crawlers 26 are retracted from their extended position as shown in FIG. 6 to their retracted position as shown in FIG. 7, and the leader 28 is folded from its position as shown by the dotted lines in FIG. 7 to the position as shown by the solid lines in FIG. 7. Finally a truck 160 is driven under the crawlers 26 and the jacks 156 are retracted so that

the truck carries the weight of the pile driver. After the unit is tied down (not shown), it is ready to be driven away.

Although particular embodiments of the invention are herein disclosed for purposes of explanation, various modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains, reference should accordingly be had to the appended claims in determining the scope of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. A derrick comprising a horizontal base, a pivotable leader, a motion control mechanism interconnecting said base and said leader, a pair of crawlers for supporting said base, and means for moving said crawlers between a first position of spaced relationship one with respect to the other and a second position of spaced relationship one with respect to the other comprising a pair of arms having the inner ends thereof pivotally connected to said base and having the outer ends thereof pivotally connected to slide members respectively, said crawlers having slide surfaces for receiving said slide members in sliding engagement, means for fixedly securing said slide members to said crawlers in first positions, respectively, when said crawlers are in their first positions and means for fixedly securing said slide members to said crawlers in a second position when said crawlers are in their second positions.

2. A derrick comprising a horizontal base, a pivotal leader, a motion control mechanism interconnecting said base and said leader, a pair of crawlers for supporting said base, means for moving said crawlers between a first position of spaced relationship one with respect to the other and a second position of increased spaced relationship one with respect to the other, said crawlers in their said first position being disconnected from said horizontal base, said crawlers in their said second position being operatively connected to said horizontal base and said derrick further comprising a second pair of spaced crawlers which are permanently attached to said base and are disposed inwardly of the first pair of crawlers when the first pair of crawlers are positioned in their second position.

3. A method of compacting a derrick for shipping purposes when said derrick includes a base, a leader, a parallel motion mechanism pivotally interconnecting said leader and said base, a pair of crawlers, said method comprising swinging said leader to a horizontal position, folding said leader over upon itself, jacking up said base including said crawlers, moving said crawlers from a first position of spaced relationship one with respect to the other to a second position of decreased spaced relationship one with respect to the other, compacting said leader to a position adjacent said base, lowering said base including said leader and crawlers onto a truck, whereby the derrick is ready for transit.

4. A method of compacting a derrick for shipping purposes according to claim 3 wherein said derrick further comprises a parallelogram linkage for connecting each of

said crawlers to said base and fluid cylinder means interconnected two opposite points of said parallelogram linkage, said step of moving said crawlers from a first position to a second position includes retracting said fluid cylinder means.

5. A method of compacting a derrick for shipping purposes according to claim 3 wherein said derrick further comprises a pair of rear swinging arm supports and a pair of front swinging arm supports, the inner ends of said supports being pivotally connected to said base and the outer ends of said supports being pivotally connected to said crawlers respectively, and telescoping members interconnecting the outer pivotal connection of said rear swinging arm supports and the inner pivotal connection of said front swinging arm supports respectively, said step of moving said crawlers from a first position to a second position includes retracting said telescoping members.

6. A method of compacting a derrick for shipping purposes according to claim 3 wherein said derrick further comprises arms having their inner ends pivotally connected to said base and having the outer ends pivotally connected to slide members respectively, said crawlers having slide surfaces for receiving said slide members in sliding engagement, means for fixedly securing said slide members in first and second positions to said crawlers respectively, said step of moving said crawlers from a first position to a second position includes releasing said slide members from said crawlers, sliding said slide members along said slide surfaces, and securing said slide members to said crawlers in their second positions, respectively.

7. A method of compacting a derrick for shipping purposes according to claim 3 wherein said derrick has a second pair of crawlers disposed inwardly of the first pair of crawlers, and wherein said step of moving the first pair of crawlers from a first position to a second position comprises detaching said crawlers from said base.

8. A derrick comprising a horizontal base, a leader, mounting means comprising pivotal links for movably mounting said leader on said base, a pair of crawlers for supporting said base, a parallelogram linkage connecting each crawler to said base, said linkage including a pair of arms pivotally connected at each end respectively to said crawler and to said base at displaced, fixed, pivot points therealong, and expansible actuating means operative between diagonally opposed corners of each said parallelogram linkage.

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