

May 12, 1936.

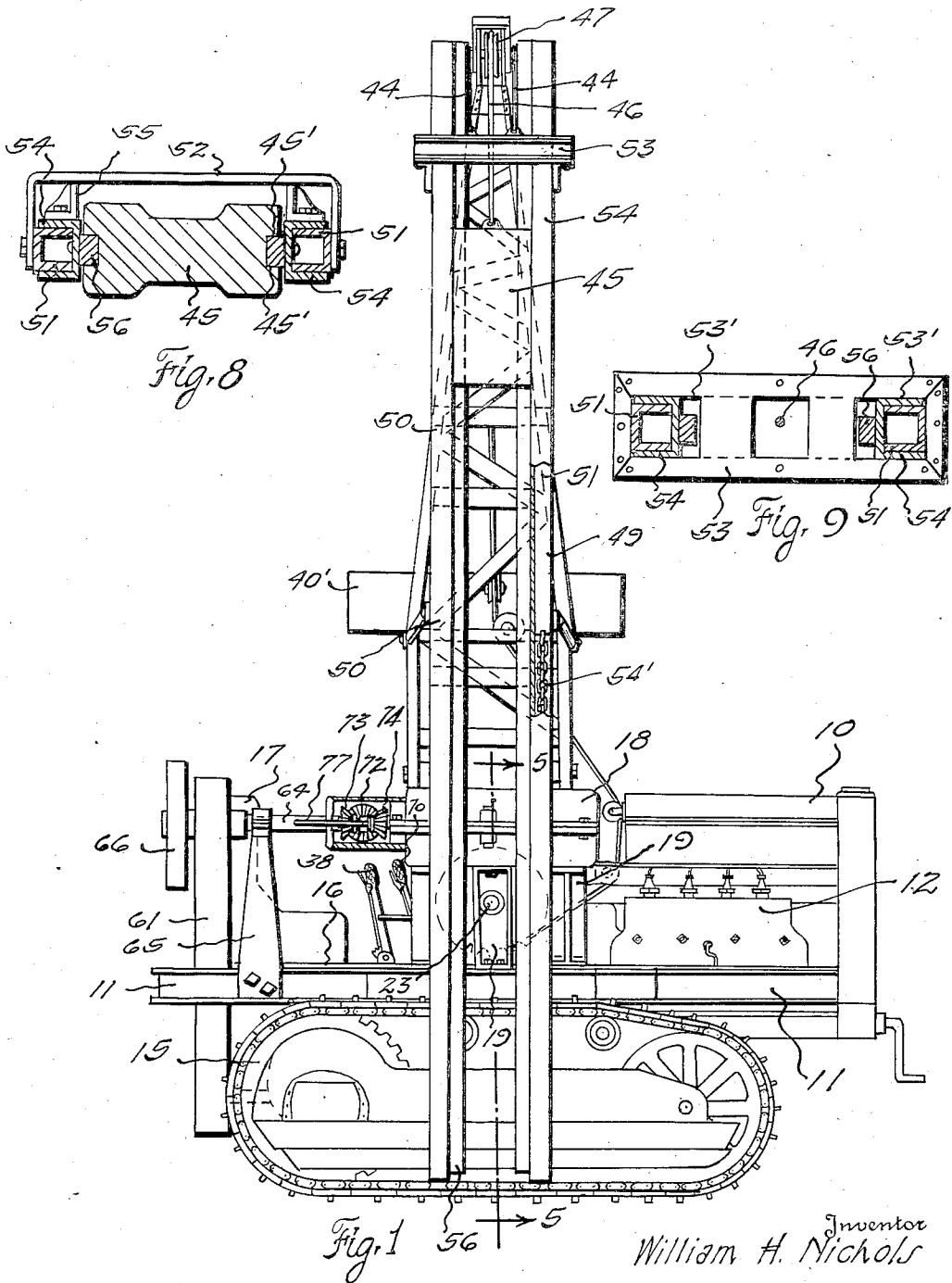
W. H. NICHOLS

2,040,668

PILE DRIVING ATTACHMENT

Filed Oct. 11, 1934

4 Sheets-Sheet 1



By

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May 12, 1936.

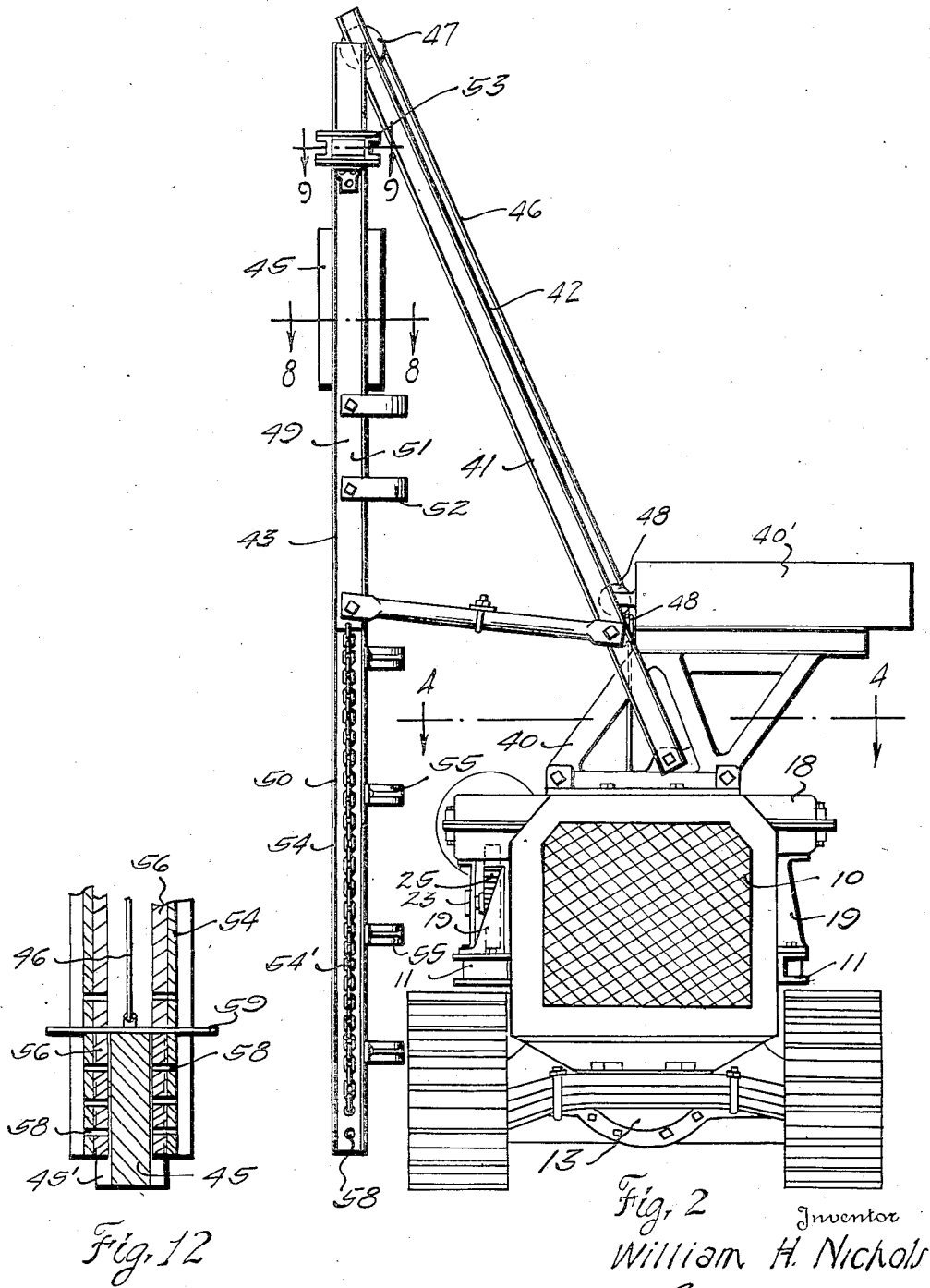
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# PILE DRIVING ATTACHMENT

Filed Oct. 11, 1934

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May 12, 1936.

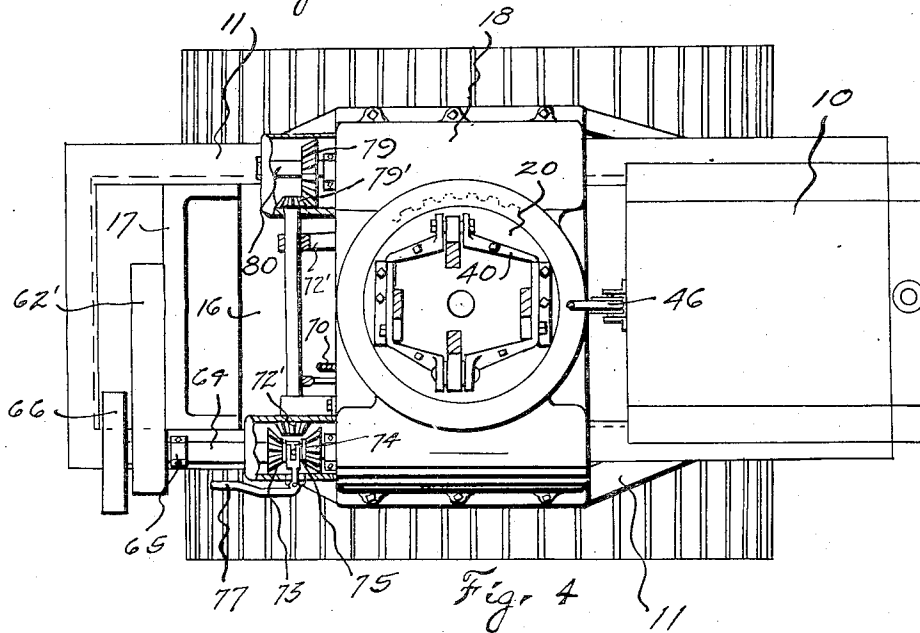
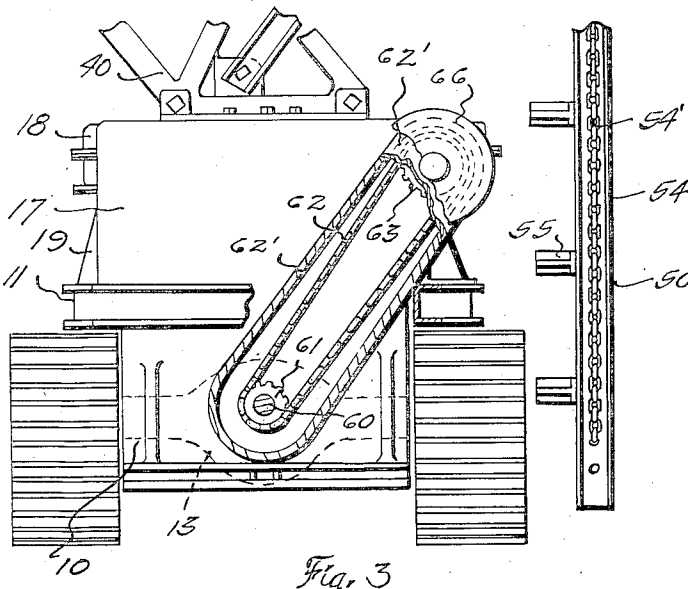
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# PILE DRIVING ATTACHMENT

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PILE DRIVING ATTACHMENT

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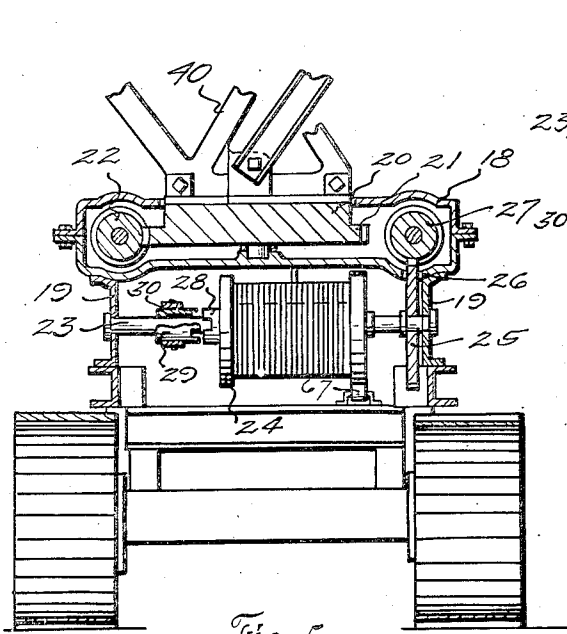


Fig. 5

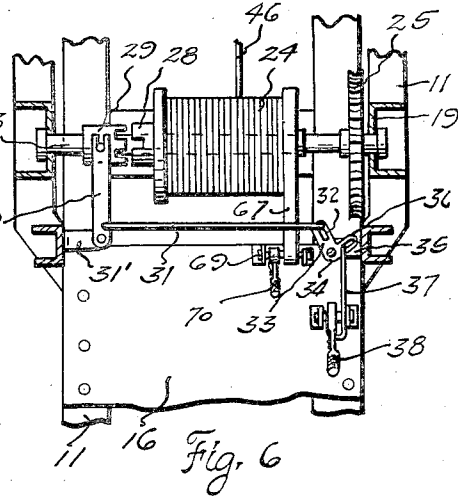


Fig. 6

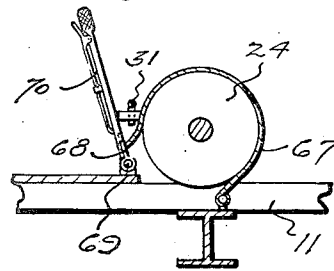


Fig. 7

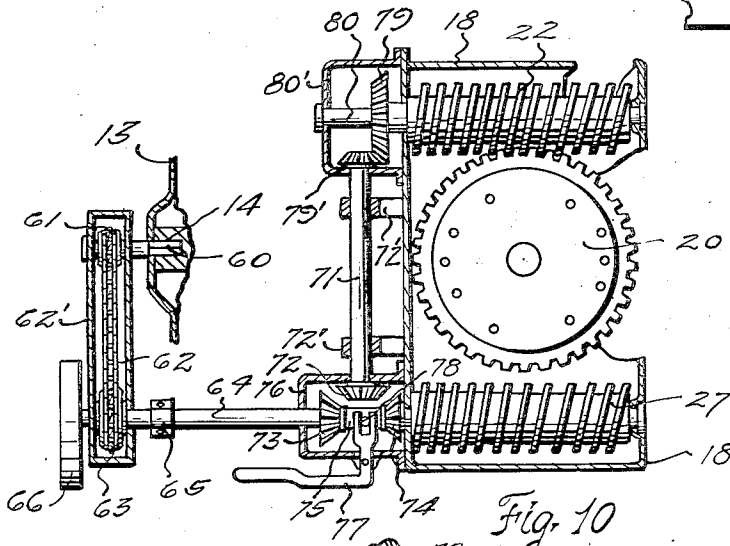


Fig. 10

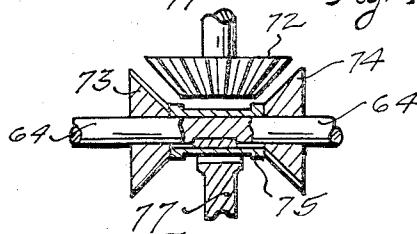


Fig. 11

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## UNITED STATES PATENT OFFICE

2,040,668

## PILE DRIVING ATTACHMENT

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Application October 11, 1934, Serial No. 747,905

12 Claims. (Cl. 61—74)

This invention relates to new and useful improvements in pile driving mechanisms.

One object of the invention is to provide an improved pile driving mechanism which may be readily attached to a standard type of self contained tractor having a power take-off and other controls and providing connections between the tractor power take-off and the pile driving mechanism for operating the same.

An important object of the invention is to provide improved means for operating a pile driver from the power take-off of any ordinary tractor.

Another object of the invention is to provide a pile driving mechanism arranged to be mounted on a tractor and having retractible leads which are constructed to be elevated so that they may be swung laterally over the engine hood of said tractor when not in use, or for any other purpose, whereby the leads will not project beyond the sides of the tractor.

Still another object of the invention is to provide an improved attachment arranged to be mounted on a tractor for driving railroad ties in wet, mud-heavy cuts and low mud-heavy fills along a railroad track so as to brace and reinforce the road bed and prevent sinking or settling thereof.

A further object of the invention is to provide an improved transmission arranged to be connected with the power take-off of a tractor and including means for driving the cable drum of a pile driver, and also including means driven by the first means for rotating the turntable of said pile driver in either direction; the first means being constructed to be engaged or disengaged from the second means, whereby the drum may be driven while the turntable remains stationary.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is a side elevation of a pile driving mechanism, constructed in accordance with the invention, mounted on an ordinary tractor;

Figure 2 is a front elevation of the same;

Figure 3 is a rear elevation, showing a portion of the gear case in section;

Figure 4 is a horizontal cross-sectional view, taken on the line 4—4 of Figure 2;

Figure 5 is a transverse, vertical, sectional view,

taken on line 5—5 of Figure 1, and having the leads eliminated;

Figure 6 is a partial, horizontal, cross-sectional view showing the cable drum and its operating clutch;

Figure 7 is a partial vertical, sectional view showing the brake for the cable drum;

Figure 8 is a horizontal, cross-sectional view of the leads, taken on the line 8—8 of Figure 2;

Figure 9 is a horizontal, cross-sectional view, taken on the line 9—9 of Figure 2;

Figure 10 is a plan view of the drive shafts and the drive worms connected therewith, together with the turntable of the pile driver;

Figure 11 is an enlarged detail of the slidable clutch which connects the two drive shafts, and

Figure 12 is a sectional detail of the hammer and lower ends of the leads.

In the drawings, the numeral 10 designates a tractor which is preferably of the crawler type but may be of any desired construction. The tractor shown includes the usual longitudinal frame bars 11, or chassis having the engine 12 mounted at their forward ends. The usual differential 13 having a power take-off connection 14 from the drive shaft is at the rear of the tractor between the rear drive wheels 15. A floor 16 is supported on the frame bars extending transversely of the machine at the rear thereof, and the usual operator's seat 17 is mounted thereon. For the sake of clearness in the drawings, the usual tractor controls are not shown. These parts are common to all tractors and, since they form no part of the invention, are subject to variation.

In carrying out the invention, a gear case or housing 18 (Figs. 4 and 5) extends transversely of the tractor and is mounted at the rear of the engine 12 and provides an attachment base of the pile driving mechanism. The housing is suspended above the frame bars 11 by angular supports 19 which extend vertically from said bars. The housing has a turntable 20 mounted to rotate therein and the outer end of the turntable is provided with a ring gear 21 which is in constant engagement with a worm 22 journaled in the side of the housing. The worm extends longitudinally within the housing and it is obvious that rotation of the worm will revolve the turntable.

Beneath the casing, a transverse shaft 23 has its ends journaled in the supports 19. This shaft has a drum 24 loosely mounted thereon at its central portion and a gear 25 keyed on one end thereof. The gear 25 has its upper end extend-

ing through an opening 26 in the underside of the housing (Fig. 5) and is in constant engagement with a worm 27 journaled in said housing on the side opposite to the worm 22. When the worm 27 is rotated, the gear 25 is also rotated which revolves the shaft 23. It is pointed out, however, that since the drum 24 is loosely mounted on the shaft, no motion is imparted when said shaft is revolved. For connecting the drum with the shaft, one end of said drum is provided with a clutch member 28. A complementary clutch member 29 is slidably keyed on the shaft 23 and when the members are engaged, rotation of the shaft will rotate said drum.

For sliding the clutch member 29 into and out of engagement with the member 28, a forked arm 30 is engaging a pin 30' on the member 29. This arm has its other end pivoted to a bracket 30 secured to the inside of one of the supports 19. A transversely extending rod 31 (Fig. 6) has one end pivotally connected to the arm and has its other end engaging a slot 32 in one arm 33 of a bell crank 34. The crank is pivoted to a bracket 35 extending inwardly from one of the supports 19 on the opposite side of the tractor. The other arm 36 of said crank is connected by a link 37 to a hand lever 38 mounted to swing on the floor 16 of said tractor. It is obvious that by swinging the lever 38 the clutch member 29 will engage or disengage the clutch member 28 to impart rotation from the shaft 23 to the drum 24.

The turntable 20 has a supporting base 40 bolted, or otherwise secured thereto. A boom 41, constructed of angular members 42 in the usual way, is mounted on the base and extends upwardly therefrom, being preferably disposed at a slight inclination, as shown in Figure 2. Vertical leads 43 are suspended from the upper end of the boom by a pair of cables 44. A hammer 45 is slidable between the leads and is supported by a cable 46 which passes upwardly over a pulley 47 journaled in the upper end of the boom. The cable passes downwardly contiguous to the boom and over idler pulleys 48 and has its end secured to the drum 24 on the shaft 23. It is obvious that rotation of the drum will wind or unwind the cable thereon to raise and lower the hammer.

The leads 43 are constructed in two units, a stationary unit 49 which is suspended from the cable and a slidable unit 50. The unit 49 comprises a pair of channel bars 51 which are secured together by braces 52. A crosshead 53 is provided at the upper end of the bars 51 and it is this crosshead to which the cables 44 fasten to suspend the leads. The unit 50 comprises a pair of channel bars 54 connected by braces 55 and these bars have a sliding fit in the bars 51 (Fig. 8) and have their upper ends extending through openings 53' in the crosshead. The lower ends of the bars 51 are secured to the lower end of the bars 54 by chains 54' which extend vertically along the latter bars and may be secured thereto in different positions. It is pointed out that the channel bars 51 and 54 have their base portions in opposed relation, whereby the base of the bars 51 form the outer side of each lead while the base of the bars 54 form the inner side of each lead. The bars 54 have vertically extending guide tracks 56 on their inner sides and these tracks are engaged by grooves 45' in the sides of the hammer 45, whereby said hammer is guided between the leads.

During normal operation of the pile driver the leads have their lower ends positioned a few inches from the ground as shown in Fig. 2, the

chains 54' serving to hold them in such position. The rotation of the drum 24 will wind the cable thereon which will raise the hammer. The pile or tie to be driven is set between the leads, and release of the clutching members between the drum 24 and the shaft 23, will permit the hammer to fall, unwinding the cable from said drum. A suitable counterweight 40' may be mounted on the base 40 to counterbalance the weight of the hammer up on its descent. It will be seen that when operating, the leads and boom are at one side of the machine and when moving the tractor from place to place, or for clearing the railroad track to permit passage of a train when the device is being used to drive ties along a railroad, it is desirable to swing the leads so that they will be in longitudinal alignment with the tractor, whereby the leads are out of the way and the width of the tractor is not increased.

For this purpose a plurality of openings 58 are provided near the lower end of the channel bars 54. The hammer 45 is dropped to the ground and a transverse bar 59 is inserted in the openings (Fig. 11) above said hammer. The drum 24 is then operated to raise the hammer and it is obvious that the hammer engaging the bar will slide the channel bars 54 upwardly within the bars 51 and crosshead 53. When the lower ends of the bars 54 are raised sufficiently to clear the hood of the engine 12, the chains 54' are readjusted and the turntable 20 may be operated to swing the boom 41 and leads 43 above said hood, whereby they are completely out of the way above the tractor.

An important feature of the invention is the transmission of power from the power take-off 14 of the tractor differential, to the worms 22 and 27 to operate the turntable 20 and drum 24. This mechanism is clearly shown in Figure 10 and includes a stub shaft 60 which is inserted into the power take-off socket. This shaft carries a gear 61 on its outer end and the gear has a driving connection through a chain 62 with another gear 63, which is mounted at the upper end and at one side of the machine, on a longitudinally extending drive shaft 64. This drive shaft has one end supported in a bracket 65 extending upwardly from one of the frame bars 11, while its other end passes through the gear casing 18 and has driving connection with the worm 27 which drives the drum shaft 23. A counterbalance 66 may be mounted at the extreme rear end of the drive shaft 64. The gears 61 and 63 as well as the chain 62 are enclosed in a gear case 62' which is fastened to the rear of the operator's seat 17 of the tractor.

It is obvious that power is transmitted from the differential 13, through the gear 61 and chain 62 to the drive shaft 64 which drives the worm 27. As has been explained, the worm drives the drum shaft 23 and when the clutching members 28 and 29 are engaged, the drum is revolved to wind the cable thereon to raise the hammer 45. When the clutching members are disengaged, the shaft 23 continues to rotate but the drum, being loose on the shaft, the weight of the hammer 45 will cause it to fall, thereby unwinding the cable therefrom. For checking the descent of the hammer, a brake band 67 surrounds one end of the drum (Figs. 6 and 7). This band has one end fastened to the frame of the tractor and its other end secured to a crank arm 68 which is mounted on a rock shaft 69. A hand lever 70 is fastened on the shaft, whereby said shaft may be rocked to swing the arm 75

68 and tighten the band on said drum to check the rotation thereof.

From the above, it will be seen that the drive shaft 64 is constantly rotating to drive the worm 27. For driving the worm 22 to revolve the turntable 20 and swing the boom 41, a transverse shaft 71 is mounted at right angles to the drive shaft 64 and is supported in brackets 72' extending rearwardly from the housing 18. This shaft is provided with a pinion 72 on end and this pinion is arranged to be engaged by bevel gears 73 and 74. The gears 73 and 74 are connected to each other by a collar 75 which is slidably keyed on the shaft 64. The collar spaces the gears sufficiently far apart that when in a neutral position, neither the gear 73 nor the gear 74 engages the pinion 72, whereby no motion is transmitted to the transverse shaft 71 from the drive shaft 64. A casing 76 encases the gears and pinion and a bell crank 77 is pivoted to the casing. The crank has its inner forked end extending through the side of the casing and engaging a pin 78 on the collar. By grasping the other arm of the crank, the operator may slide the collar to engage either the gear 73 or 74 with the pinion 72. This will rotate the shaft 71 in one or the other direction, and thus a reversal of the rotation of the shaft 71 is accomplished.

The opposite end of the shaft carries a pinion 79' which is in constant mesh with a bevel gear 79 fastened on a forwardly extending shaft 80. The shaft 80 has a driving connection with the worm 22, which engages the gear ring 21 on the turntable. It will be seen that the turntable is operated by means of the transverse shaft 71. The gear 79 and pinion 79' may be encased in a gear case 80'.

From the foregoing, it is obvious that no auxiliary power is necessary to efficiently operate the pile driving mechanism. The transmission of motion from the usual power take-off to the drum and turntable is accomplished with a minimum number of parts. The drive shaft 64 is constantly rotating, being connected to the drum through the clutching members 28 and 29. The sliding collar 75 which is fastened to the bevel gears 73 and 74 provides not only for a neutral position, at which time the shaft 71 controlling the turntable, is idle, but also permits the drive shaft 64 to rotate the shaft 71 in opposite directions, whereby the turntable may be revolved in opposite directions.

The retractible leads permit the pile driving mechanism to be swung over the tractor so as to be completely out of the way. This is particularly advantageous when the device is used to drive railroad ties adjacent the railroad track to brace the road bed to prevent sinking or settling thereof. When so used, it is necessary to remove the leads from the path of trains passing along the track, and if this could not be done quickly without moving the entire tractor, much time and energy would be wasted. Further, when the leads are swung over the hood of the engine, the tractor may be moved over the ordinary road without taking up any more room than the usual tractor.

What I claim and desire to secure by Letters Patent is:

1. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, leads mounted on the tractor and arranged to be swung laterally, a hammer slidable vertically in the leads,

means for transmitting motion from the power take-off of said tractor to operate the hammer, and means for transmitting motion from the power take-off to swing the leads.

2. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable, leads carried by the turntable, a hammer slidable vertically in the leads, means for transmitting motion from the power take-off of the tractor to raise and lower the hammer, and means for transmitting motion from the power take-off to said turntable to rotate the same to swing the leads laterally.

3. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, leads adapted to be suspended from the frame of the tractor and arranged to be swung laterally, a hammer slidable vertically in the leads, means for transmitting motion from the power take-off of said tractor to operate the hammer, and means for transmitting motion from the power take-off to swing the leads.

4. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable adapted to be secured on the frame of said tractor, leads carried by the turntable, a hammer slidable vertically in the leads, means for transmitting motion from the power take-off of said tractor to raise and lower the hammer, and means for transmitting motion from the power take-off to the turntable for rotating the same to swing the leads laterally of said tractor.

5. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, leads adapted to be suspended from the frame of the tractor and arranged to be swung laterally, a hammer slidable vertically in the leads, means for transmitting motion from the power take-off of said tractor to operate the hammer, means for controlling the transmission of power from the take-off to the hammer, and means for transmitting motion from the power take-off to swing the leads.

6. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, leads adapted to be suspended from the frame of the tractor and arranged to be swung laterally, a hammer slidable vertically in the leads, means for transmitting motion from the power take-off of said tractor to operate the hammer, means for controlling the transmission of power from the take-off to the hammer, and means for controlling the transmission of power from the take-off.

7. The combination with a self contained tractor

tor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable adapted to be secured to the frame of said tractor, retractible leads carried by the turntable, a hammer slidable vertically in the leads, a cable connected with the hammer, a rotatable drum arranged to be secured to the tractor frame and having one end of the cable secured thereto, means for transmitting motion from the power take-off of the tractor to the drum to revolve the same whereby the cable is wound thereon to raise the hammer, and means for transmitting motion from the power take-off to the turntable to rotate the turntable and swing the leads.

8. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable adapted to be secured to the frame of said tractor, retractible leads carried by the turntable, a hammer slidable vertically in the leads, a cable connected with the hammer, a rotatable drum arranged to be secured to the tractor frame and having one end of the cable secured thereto, means for transmitting motion from the power take-off of the tractor to the drum to revolve the same whereby the cable is wound thereon to raise the hammer, means for controlling the transmission of power from the take-off to the drum, and means for transmitting motion from the power take-off to the turntable to rotate the turntable and swing the leads.

9. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable adapted to be secured to the frame of said tractor, retractible leads carried by the turntable, a hammer slidable vertically in the leads, a cable connected with the hammer, a rotatable drum arranged to be secured to the tractor frame and having one end of the cable secured thereto, means for transmitting motion from the power take-off of the tractor to the drum to revolve the same whereby the cable is wound

thereon to raise the hammer, and means arranged to be connected with the drum driving means for rotating the turntable to swing the leads.

10. The combination with a self contained tractor having a traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable adapted to be secured to the frame of said tractor, retractible leads carried by the turntable, a hammer slidable vertically in the leads, a cable connected with the hammer, a rotatable drum arranged to be secured to the tractor frame and having one end of the cable secured thereto, means for transmitting motion from the power take-off of the tractor to the drum to revolve the same whereby the cable is wound thereon to raise the hammer, and means for disconnecting the last named means from the drum driving means, whereby said drum may be operated while the turntable is stationary.

11. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a pile driving mechanism for attachment thereto including, a turntable carrying pile driver leads between which a pile driver hammer slides, a base supporting said turntable, means for mounting said base on the tractor chassis, driving mechanism for operating the turntable and pile driver mechanism, control means therefor, and means for transmitting power from the tractor power plant through the tractor power take-off for operating the same.

12. The combination with a self contained tractor having traction means including a differential at one end of the tractor, a power take-off connected to the differential and driven thereby and the usual tractor controls, of a superstructure for attachment thereto comprising, a boom mounted on the tractor and arranged to be swung laterally, a cable suspended from the upper end of the boom and movable vertically with relation thereto, means for transmitting motion from the power take-off to raise and lower the cable, and means for transmitting motion from the power take-off to swing the boom.

WILLIAM H. NICHOLS.