P. E. HOLT.

AUTOTRACTOR CRANE.

APPLICATION FILED SEPT. 18, 1913.

1,159,841.

Patented Nov. 9, 1915.

3 SHEETS—SHEET 1.

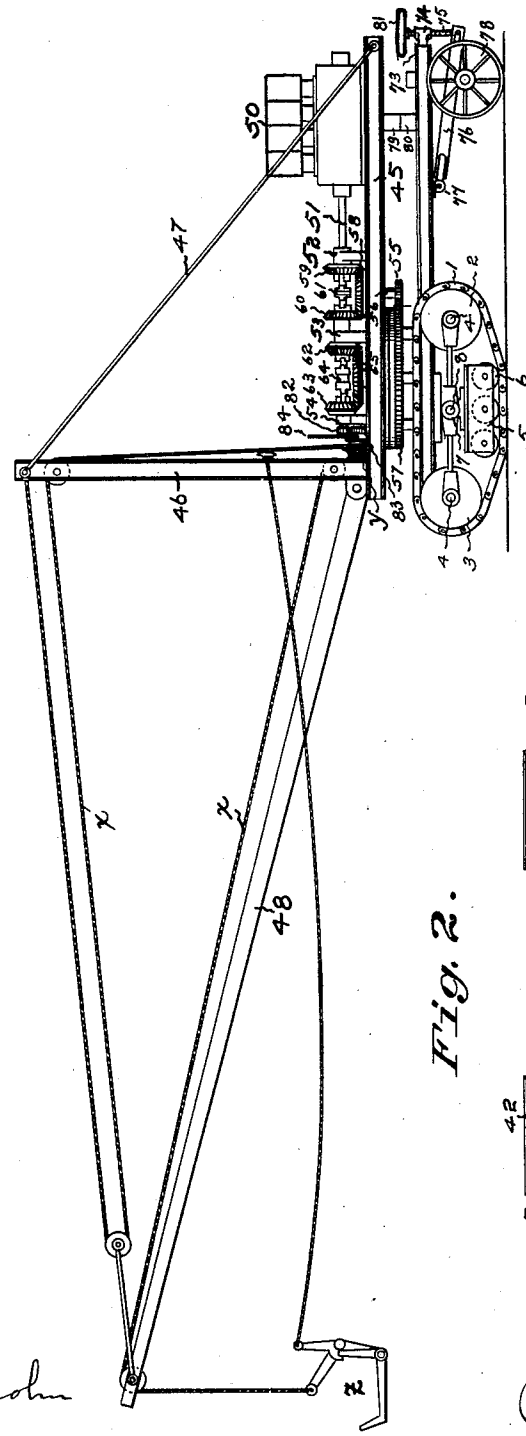


Fig. 1.

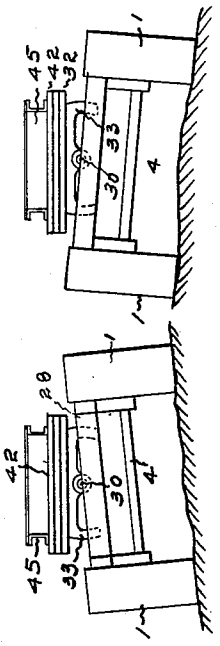


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

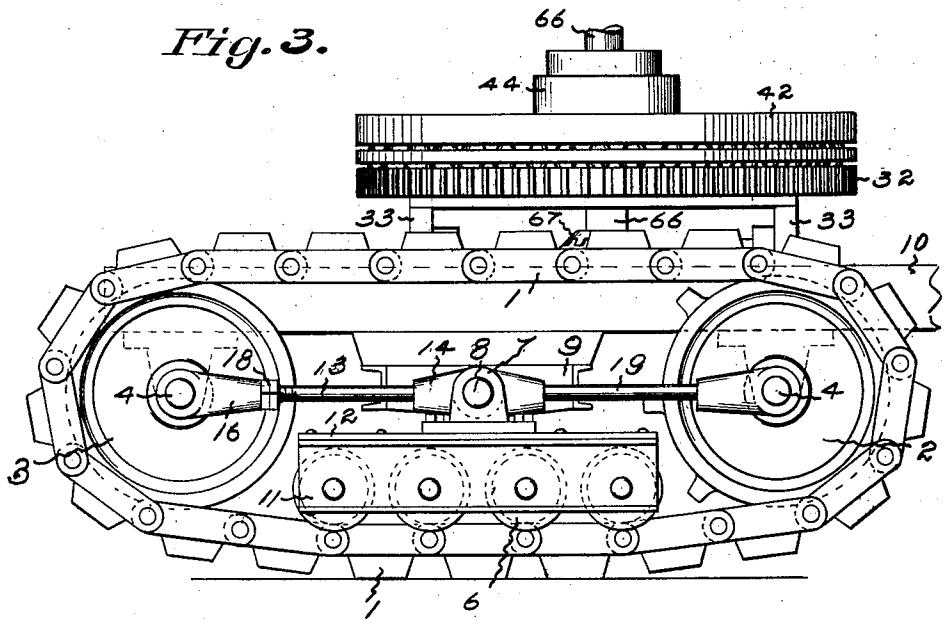
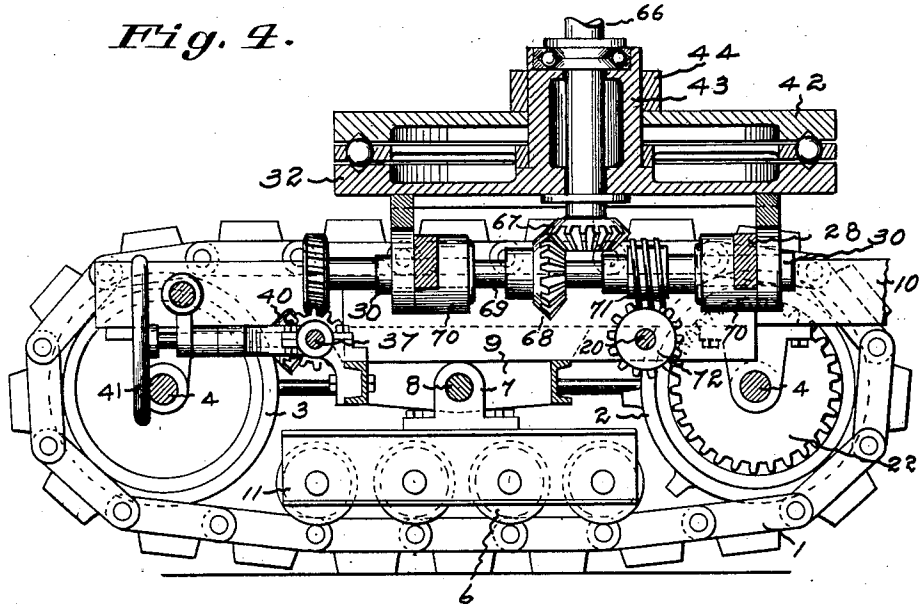


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

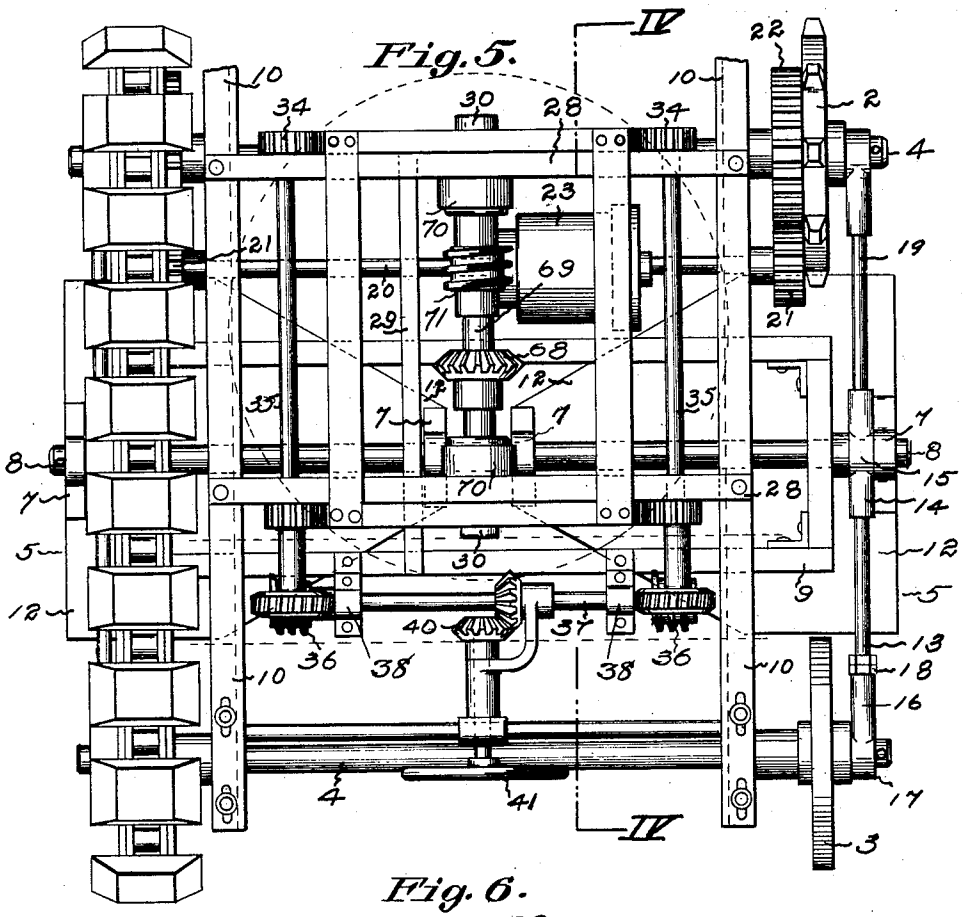


Fig. 6.

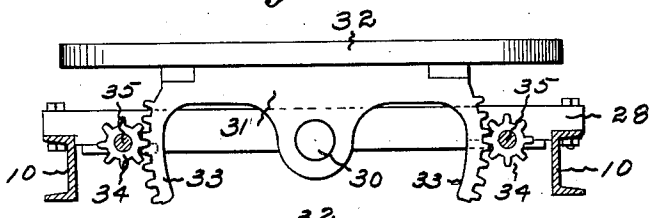
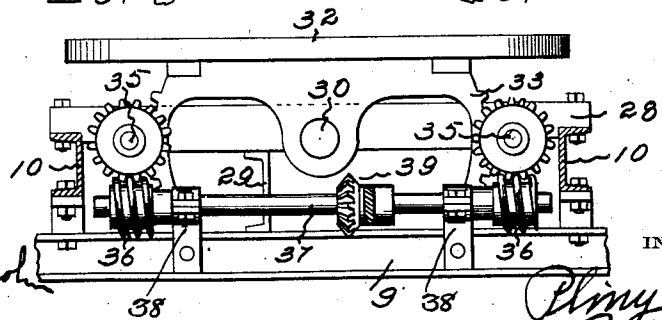


Fig. 7.



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UNITED STATES PATENT OFFICE.

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AUTOTRACTOR-CRANE.

1,159,841. Specification of Letters Patent. Patented Nov. 9, 1915.

Application filed September 18, 1913. Serial No. 790,574.

To all whom it may concern:

Be it known that I, PLINY E. HOLT, a citizen of the United States, and residing at Stockton, in the county of San Joaquin, State of California, have invented certain new and useful Improvements in Autotractor-Cranes; and I do hereby declare the following to be a full, clear, and exact description of the said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

This invention relates to improvements in auto-tractor cranes.

The principal objects of this invention are to provide a self propelling power crane adapted to operate on uneven ground; to so construct, arrange, combine and operate the parts that the turntable of the crane can be leveled independent of the plane of inclination of the tractor element; to produce a simple, compact, easily operated and maneuvered, self propelled power crane capable of traveling on hillsides, uneven or soft ground, provided with a lifting crane capable of raising, lowering and swinging a load in a horizontal plane about itself, independent of the plane of inclination or unevenness of the ground.

This invention is particularly advantageous in cane fields where the ground is uneven, unstable and the product hard to handle.

The invention posesses other advantageous features, that with the foregoing will be set forth at length in the following description, wherein I shall outline in full, that form of invention selected for illustration in the drawings accompanying and forming part of the present specification. The novelty of the invention will be included in the claims succeeding said description. From this, it will be apparent that I do not restrict myself to the showing made by said drawings and description, as I may adopt many variations within the scope of my invention expressed in said claims.

In the drawings: Figure 1 is a side elevation of a self propelled traveling crane constructed in accordance with this invention. Fig. 2 is a diagrammatic rear elevation of the tractor element and turntable of the crane, showing the latter leveled in two opposite directions to the inclination of the tractor. Fig. 3 is a side elevation in enlarged detail of the tractor propulsion element or truck, showing the turntable of the crane mounted above it. Fig. 4 is a similar view of the same in vertical cross section taken on the line IV—IV of Fig. 5. Fig. 5 is a plan view from above of the traction truck with the turntable removed, disclosing the traction driving mechanism, the turntable leveling mechanism; one traction belt also is removed to disclose the traction transmission mechanism. Fig. 6 is a front end elevation of the turntable and associated leveling mechanism in detail. Fig. 7 is a rear end elevation of the same.

While I show and prefer the application of the endless belt form of traction mechanism for many obvious reasons, I do not wish, however, to be understood as limiting this invention to any particular form of traction mechanism, as the leveling crane may be applied to portable trucks, or to wheel driven tractors without departing from the spirit of this invention.

Vehicle frame construction.—In detail the construction consists of the traction element preferably comprising the endless traction belts 1, 1 encircling the toothed driving sprockets 2, 2, and the idlers 3, 3. These several sprockets are free mounted upon axles 4, 4 respectively, which are mounted on the main frame. The major portion of the weight is supported upon the supporting trucks 5, 5 in which are suitably journaled the supporting rollers 6, that roll upon the top of the ground portion of the traction belts 1, 1. The supporting trucks are pivoted at 7, 7, on the shaft 8, extending across the traction truck and mounted in the sub frame 9, fixed to the side beams 10, 10 on both sides of the machine. The supporting trucks comprise the side beams 11 fixed to the top plates 12, 12. These top plates extend inward to near the center of the traction truck at which point they are pivoted upon the cross shaft 8. This inward extension of the top plates insures the proper horizontal alinement of the supporting trucks with respect to the plane of the traction belts, and the pivotal mounting allows a free oscillating vertical play or "teetering" of the trucks when the traction belts are passing over uneven road surfaces. The plates 12 can be of spring material to allow a limited accommodation of the trucks to the twisting of the traction belts. Elongation of the traction belts due to wear is taken up by the threaded push rods 13/13 engaging the sockets 14,

on the eye blocks 15, engaging the cross shaft 8 and threaded into the sleeves 16, on the eye blocks 17, engaging the ends of one of the axles 4; the threaded push rods 13 may be locked in adjusted position by the nuts 18 and the bolt and slot engagement of the axle mounting with the main frame beams. The push rods 19 are not adjustable, because the center of the other shaft 4 is fixed with respect to the differential pinion shaft 20 carrying the pinions 21, 21 enmeshed with the spur gears 22, 22 fixed upon the sprockets 2, 2 respectively. This pinion or jack shaft is provided with a conventional differential gear mechanism 23, to facilitate turning of the tractor.

Turntable and leveling mechanism.—The crane mechanism includes the cross beams 28, 28 fixed to the main frame, preferably over the traction trucks for the proper distribution of weight. To transmit the weight of the crane more directly to the supporting trucks the longitudinal support beam 29, is interposed between the hoist frame and the sub frame. The trunnion studs 30, 30 mounted in the beams 28, 28 support the weight of the hoist through the turntable base 32 having the end plates 31, 31 pivoted upon the studs 30, 30; the base 32 constituting a rockable carriage for the turntable 42 all as will be shortly described.

The lateral leveling of the turntable base or rockable carriage 32, is accomplished through the leveling mechanism comprising the gear segments 33, 33, preferably formed in the plates 31, 31, enmeshed with the pinions 34, 34, fixed upon the shafts 35, 35, journaled in the cross beams 28, 28. These shafts are rotated by worm gears enmeshed with the gear worms 36, 36, fixed upon the cross shaft 37, journaled in the brackets 38, 38, fixed upon the traction frame. The shaft 37 is rotated by the bevel pinion 39 fixed thereon and enmeshed with the similar pinion 40, fixed upon a suitably mounted shaft that may be mechanically actuated, or provided with the hand wheel 41 for manual operation of the leveling mechanism.

By reference to Figs. 3 and 4 it will be seen that the rockable carriage 32 provides a suitable ball race or runway, for a concentric antifriction mounting for the turntable 42, both of which are centered by engaging the center column 43 of the carriage or turntable base around which they freely revolve, between the base and the collar 44 fixed upon the column.

Swinging support.—The swinging frame 45 comprising suitable side beams fixed upon the turntable and suitably cross braced, forms the bed or foundation for the prime mover 50 and associated transmission mechanisms, clutches, and cable drums, etc. This swinging frame is provided with the conventional mast 46, stay rods 47, and the boom 48 stepped in the swinging frame, such as make up the conventional portable crane. This hoisting structure is provided with the usual sheaves, reeved with cables x, attached to winding drums y, and grappling devices z, etc. Details of construction of the crane mechanism will vary with varying conditions to be met.

Leveling and driving connections.—The prime mover 50, preferably an internal combustion motor, being the heaviest member is mounted upon the end of the swing frame 45, opposite the crane, better to counterbalance the load lifted by the latter. The drive shaft extension 51, of the engine shaft is journaled in the bearings 52, 53 and 54. The frame 45 is swung by the pinion 55, fixed upon the vertical shaft 56, journaled in the swing frame, this pinion being enmeshed with the rack teeth 57, cut in the turntable base. The upper end of the shaft 56 is fixed in the bevel gear 58. Two loose pinions 59 and 60 are enmeshed with the gear 58, on opposite sides, to form a reversing mechanism for swinging the swing frame. The sliding clutch 61 is splined on the shaft 51, and is adapted to be slid into and out of engagement with the loose pinions 59 and 60, which being on opposite sides of the bevel gear 58, will rotate it in either direction, according to the pinion engaged by the clutch driven by the drive shaft 51.

A similar reverse gear drive for the traction mechanism is provided between the bearings 53 and 54, comprising the loose pinions 62 and 63 on the drive shaft 51, and the clutch 64 splined upon the same drive shaft, and adapted to be thrown into and out of engagement with either of said pinions. These pinions are enmeshed on opposite sides of the bevel gear 65, fixed upon the upper end of the vertical shaft 66, suitably journaled in the column 43 of the turntable base, preferably in vertical alinement with the axis of the studs 30, 30. The bevel gear 67 fixed upon the lower end of the shaft 66 is enmeshed with a similar gear 68, fixed upon the longitudinal shaft 69, journaled in the bearings 70, 70, mounted upon the cross beams 28, 28, respectively. The rotation of this shaft 69 is transmitted through the gear worm 71, fixed upon this shaft and enmeshed with the worm gear 72, fixed upon the differential shaft 20, geared to the driving sprockets of the traction belts, as previously described.

Steering mechanism.—The side beams 10 extend to the point designated at 73, where they are joined to the bracket 74. The spindle 75 is threaded in the bracket 74, and swiveled in the front end of the steering truck 76, which is pivoted to the main frame beams at 77. The steering wheel or wheels

78 are mounted upon an axle suitably attached to the steering truck, and steered by a steering gear not shown, as steering may be accomplished in any suitable manner. The sliding support blocks 79 and 80 are interposed between the swing frame and the tractor main frame, to support the free end of the former as it swings about its pivot.

Operation.—This invention operates substantially as follows: Presuming the scene of operation to be a sugar cane field, which in the tropics, are largely hilly or uneven stretches of land, with low swampy areas intervening, or they may be deeply ridged or trenched, presenting a poor foundation for a tractor or portable crane. The endless belt, or "caterpillar" type of tractor is best adapted to these conditions. With the clutch 64 engaged, the power of the prime mover is transmitted to the traction mechanism, and the tractor proceeds to the desired location, probably along side of a temporary tramway in the field, on a hillside. It is manifestly impractical to operate a swing crane with the axis or mast at an inclination from the perpendicular; because, from the highest point of the plane of inclination, the load would swing laterally with great force, throwing undue strain on the mechanism, making the operation dangerous and generally unmanageable. With the tractor properly placed, under its own power, the turntable is leveled laterally, by turning the hand wheel 41, in the proper direction to rotate the pinions 34, engaging the racks 33, on the turntable base pivoted at 30. Usually lateral leveling only is sufficient, as the tractor can be placed to accomplish longitudinal leveling, approximately. The threaded spindle 75 operated by the hand wheel 81, interposed between the steering truck and the tractor main frame, provides a positive means for varying the height between the steering wheels and the front end of the tractor frame, to accomplish longitudinal leveling of the turntable, when necessary. This indirect leveling of the turntable longitudinally of the tractor is preferred, for the reason that direct leveling of the turntable in more than one plane, would unnecessarily complicate the transmission of power from the prime mover, through the turntable, to the traction mechanism beneath; although such universal leveling of the turntable is mechanically possible. With the turntable properly leveled, the clutch 61 is engaged to swing the turntable to bring the boom of the crane over the load to be handled. The load is supported in the grapple *z*, raised and lowered by the cable and winding drums, and placed by swinging the crane in an obvious manner. The cable drum *y* is driven through the pinion 82, fixed upon the end of the drive shaft 51 and enmeshed with the gear 83, free upon the drum shaft; the drum being driven preferably by a friction clutch interposed between the drum and the gear 83, and controlled by the hand lever 84 in the usual manner.

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

1. An auto-tractor having a main frame, means for leveling said frame longitudinally, a turntable mounted on said tractor main frame, and means for leveling said turntable, laterally to the longitudinal plane of the tractor main frame, and a crane mounted upon said turntable.

2. An auto-tractor having a main frame, a turn-table mounted upon said main frame on a horizontal pivot, a swing frame mounted upon said turntable on a vertical pivot; a crane and a prime mover mounted upon said swing frame, a shaft journaled in said vertical pivot, and geared to said prime mover and the traction mechanism of the tractor.

3. An auto-tractor having a main frame, means for raising and lowering one end of said frame, a turntable mounted upon said main frame on a horizontal pivot, a swing frame mounted upon said turntable on a vertical pivot; a crane, and a prime mover mounted upon said swing frame, a shaft journaled in said vertical pivot, and geared to said prime mover and the traction mechanism of the tractor.

4. An auto-tractor having a main frame, supported on a traction mechanism, a cross frame fixed to said main frame, horizontal pivots fixed on said cross frame, a tilting turntable base pivoted upon said pivots, and having rack segments thereon, pinions enmeshed with said rack segments and journaled in said main frame; a turntable mounted upon said base, a crane and a prime mover mounted upon said turntable, a vertical shaft journaled in the vertical axis of said turntable, and geared to said prime mover and the traction mechanism of said tractor.

5. An auto-tractor having a main frame, a traction truck fixed to said frame and having alined sprockets in opposite ends thereof, traction belts encircling said sprockets, supporting trucks pivoted on said traction truck and having supporting rollers journaled therein and bearing upon the upper side of the ground portion of said belts; a differential shaft journaled in said traction truck, and geared to one set of said sprockets, and having a worm gear fixed thereon enmeshed with a gear worm fixed upon a longitudinal shaft journaled on the tractor main frame; a turntable base pivoted on the main frame in line with the axis of said longitudinal shaft, and having a vertical pivot column; a vertical shaft journaled in said column, and having a bevel gear thereon enmeshed with a similar gear on said longi-

tudinal shaft; a turntable mounted upon said base about said pivot column; a prime mover mounted upon said turntable and geared to said vertical shaft; and a crane mounted upon said turntable.

6. A traveling hoist embodying an auto truck having a traction member, a rockable carriage on the truck, a turn-table on the carriage, hoisting mechanism on the turn-table, a prime mover carried by and movable with the turn-table, and connections between the prime mover, the hoisting mechanism, the traction member and the rockable carriage; whereby the prime mover controls the operations of the vehicle, turntable, and of the hoisting mechanism.

In testimony whereof, I have hereunto set my hand this 26th day of August, 1913.

PLINY E. HOLT.

Witnesses:
ELLA CHISHOLM,
O. H. ECCLESTON.