

Nov. 11, 1958

C. E. EVANS

2,859,544

LADDER TYPE DITCHER

Filed Jan. 18, 1955

5 Sheets-Sheet 1

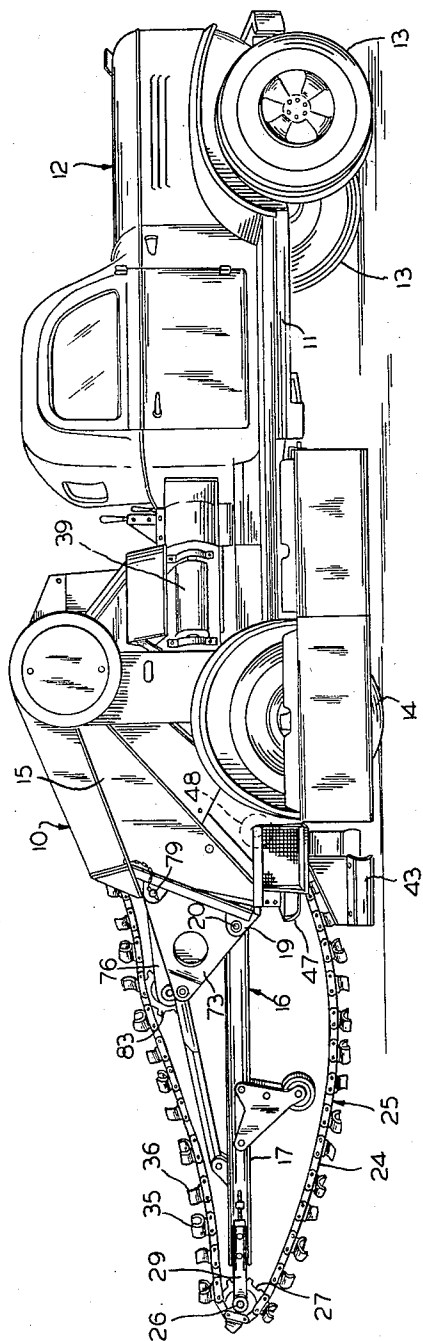


Fig. 1

INVENTOR.
CHARLES E. EVANS

BY

Hill, Sherman, Morris, Grant & Simpson
ATTORNEYS

Nov. 11, 1958

C. E. EVANS

2,859,544

LADDER TYPE DITCHER

Filed Jan. 18, 1955

5 Sheets-Sheet 2

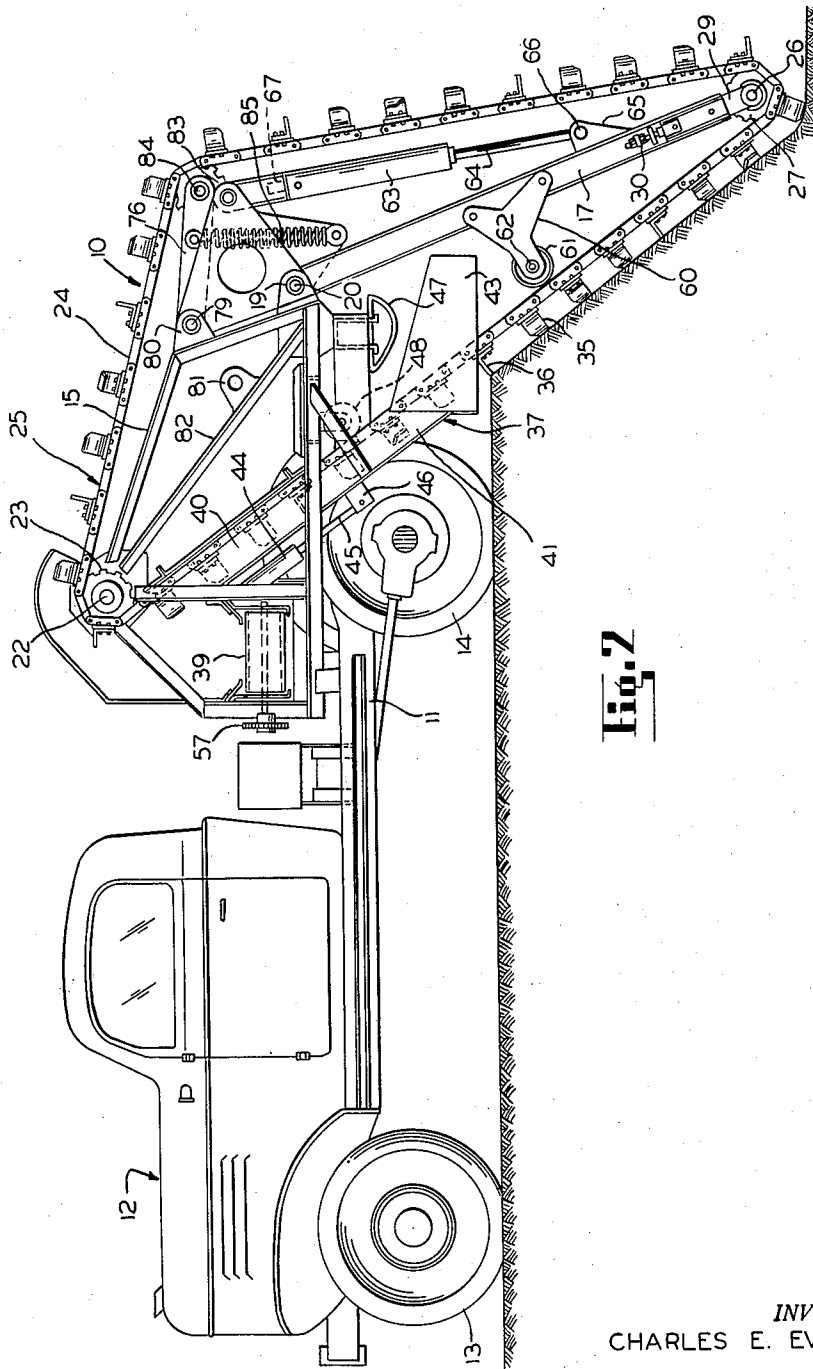


Fig. 2

INVENTOR.

CHARLES E. EVANS

BY

Will Sherman, Morris Ross & Simpson
ATTORNEYS

Nov. 11, 1958

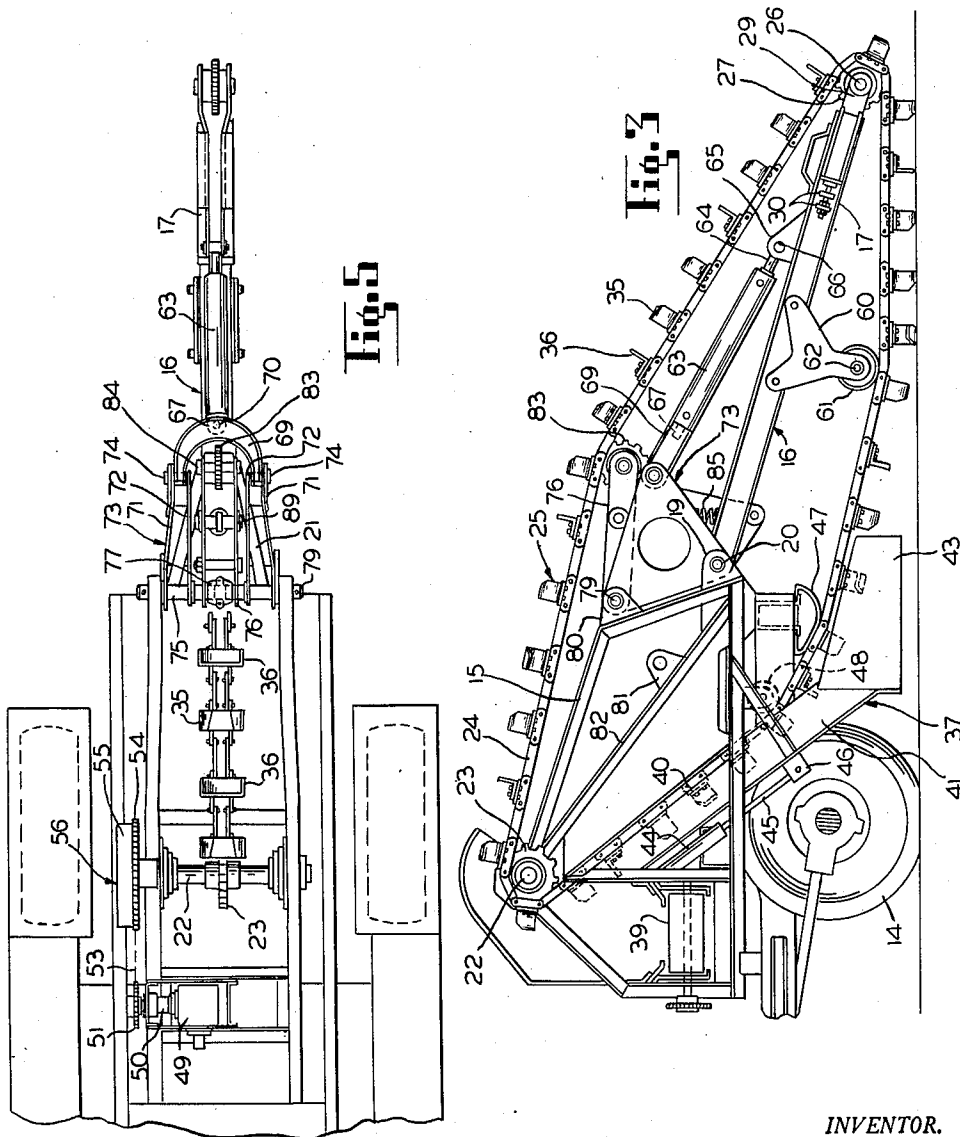
C. E. EVANS

2,859,544

LADDER TYPE DITCHER

Filed Jan. 18, 1955

5 Sheets-Sheet 3



INVENTOR.
CHARLES E. EVANS

BY

Hill, Sherman, Morris, Chase & Simpson
ATTORNEYS

Nov. 11, 1958

C. E. EVANS

2,859,544

LADDER TYPE DITCHER

Filed Jan. 18, 1955

5 Sheets-Sheet 4

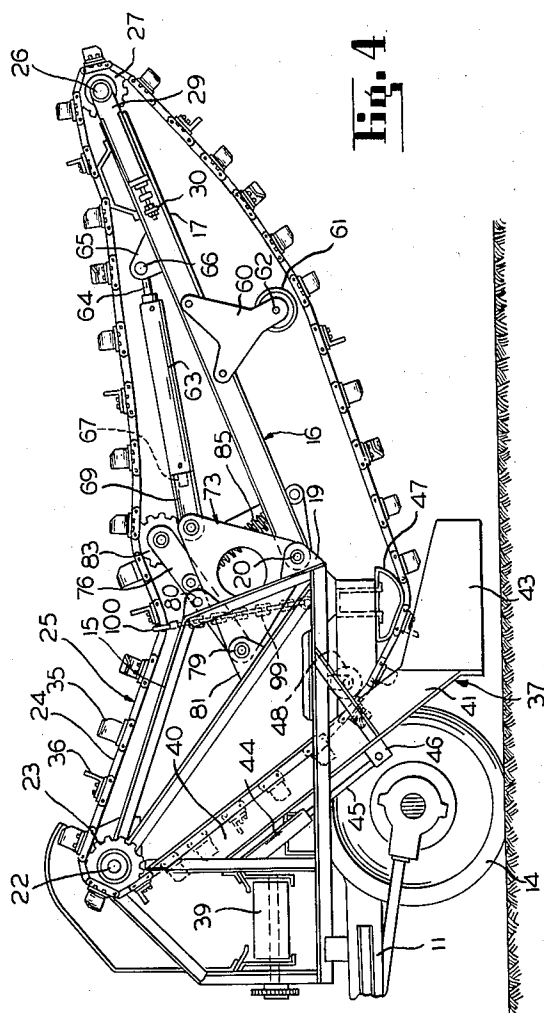


Fig. 4

INVENTOR.

CHARLES E. EVANS

BY

Hill Sherman Merriam Brockington

ATTORNEYS

Nov. 11, 1958

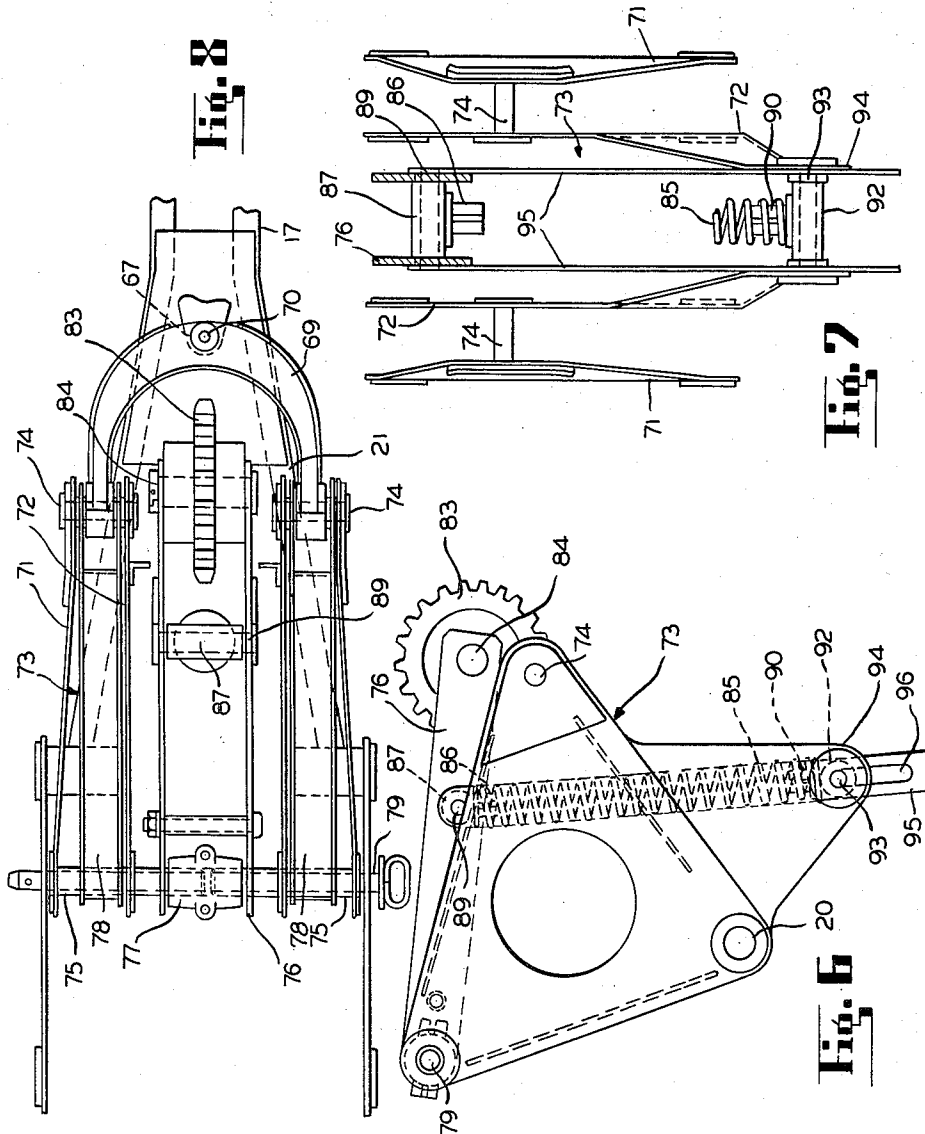
C. E. EVANS

2,859,544

LADDER TYPE DITCHER

Filed Jan. 18, 1955

5 Sheets-Sheet 5



INVENTOR.
CHARLES E. EVANS

BY

Will, Sherman, Morris, Good & Simpson
ATTORNEYS

1

2,859,544

LADDER TYPE DITCHER

Charles E. Evans, Naperville Township, Du Page County, Ill., assignor to Barber-Greene Company, Aurora, Ill., a corporation of Illinois

Application January 18, 1955, Serial No. 482,532

8 Claims. (Cl. 37—90)

This invention relates to improvements in ditchers and more particularly relates to an improved form of ditcher of the endless bucket line type for excavating ditches in earth and like material.

A principal object of my invention is to provide a new and improved form of ditcher having a simple and novel form of boom arrangement enabling the boom to be more readily manipulated than formerly.

Another object of my invention is to provide an endless bucket line type of ditcher having an improved form of boom arrangement pivoted to break intermediate its ends to increase the maneuverability thereof, and so arranged as to maintain the head shaft for driving the bucket line stationary and in the same general relation with respect to the bucket line regardless of the position of the movable part of the boom.

Still another object of my invention is to provide a boom construction particularly adapted for a ladder type ditcher having a stationary frame structure having the head shaft and the guide chute carried thereon and a movable beam structure pivoted thereto and shiftable by power into elevated traveling positions and lower digging positions, together with a simplified form of shifter structure selectively positionable to accommodate manipulation of the beam for digging and elevation of the beam for traveling from place to place.

Still another object of my invention is to provide a novel form of truck mounted ladder type ditcher having a boom pivoted to break intermediate its ends, with a hydraulic cylinder and piston for shifting the movable boom portion into an operative digging position from an upwardly extending traveling position, together with a pivoted shifter frame forming a support for one end of the cylinder and piston and shiftable into one position to accommodate the cylinder and piston to elevate the movable boom portion for traveling and into another position to accommodate the cylinder and piston to depress the movable boom portion for digging.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a perspective view of a ladder type truck mounted ditcher constructed in accordance with my invention looking toward one side thereof from the rear end thereof;

Figure 2 is an enlarged view in side elevation of the ditcher shown in Figure 1 showing the boom in a digging position;

Figure 3 is a fragmentary view in side elevation of the ditcher showing the movable boom portion elevated, with the bucket line resting on the ground and in a position to start a ditching operation;

Figure 4 is a fragmentary view in side elevation of the ditcher showing the ditcher boom in a fully elevated traveling position;

Figure 5 is a fragmentary plan view of the rear end portion of the ditcher;

2

Figure 6 is an enlarged detailed view showing the shifter frame carrying the elevating means for the ditcher in side elevation;

Figure 7 is an end view of the shifter frame shown in Figure 6 with certain parts broken away and certain other parts shown in vertical section; and

Figure 8 is a plan view of the shifter frame shown in Figures 6 and 7.

In the embodiment of my invention illustrated in the drawings I have shown a ladder type ditcher 10 mounted on the rear end portion of a frame 11 of a truck 12, herein shown as being a well known form of automotive truck mounted on the usual rubber tired front steering wheels 13 and rear drive wheels 14.

The portion of the truck frame 11 rearwardly of the cab for the truck forms a platform for a boom 16 which comprises generally a stationary head frame structure 15 mounted on the rear portion of the truck frame 11 and a vertically movable beam 17 pivoted to the rear end of said head frame structure. The beam 17 is pivoted on ears 19, projecting rearwardly from opposite sides of the head frame structure 15 and forming a support for pivot pins 20 extending through said ears and the furcations of a bifurcated rear end portion 21 of the beam 17.

The head frame structure 15 is shown as having a transverse head shaft 22 journaled at opposite sides of said head frame structure at the upper end thereof and having a head sprocket 23 keyed or otherwise secured thereto and meshing with an endless chain digger or chain 24 of an endless bucket line 25, for driving the same about the boom 16.

The beam 17 is shown as having a foot shaft 26 carried at its extreme forward end portion having an idler sprocket 27 carried thereon and meshing with the endless chain 24 and forming a foot sprocket therefor. The shaft 26 is carried at its ends in parallel spaced slides 29, slidably guided in beam 17 between the flanges thereof and suitably retained thereto. The slides 29 are movable along the beam 17 to take up tension on the chain 24 by a usual tension adjustment rod means commonly used to take up tension on conveyor and like chains and indicated generally by reference 30, and no part of my present invention so not herein shown or described further.

The endless bucket line 25 is herein shown as comprising the endless chain 24 having a plurality of spaced cutters 35 having arcuate upwardly and inwardly curved cutting blades with scrapers 36 interposed therebetween for cooperating with the cutters to scrape the excavated earth upwardly along the advance end wall of the ditch being excavated and along an extensible chute 37 onto a transfer conveyor 39. The transfer conveyor 39 extends across the rear end portion of the head frame 15 in material receiving relation with respect to the chute 37, and may be reversely operable to discharge material onto the ground to either side of the truck 10.

The extensible chute 37 is shown in Figure 2 as being inclined at the angle of the digging run of the bucket line 25 when in a digging position, to accommodate the cutters 35 and scrapers 36 to progress the excavated earth upwardly therealong for discharge onto the conveyor 39, and has an inclined stationary rear end portion 40 and an extensible lower end portion 41 telescopically mounted with respect to said rear end portion and having boots 43 extending forwardly from each side thereof and serving to retain the excavated earth to the chute 37.

The lower chute portion 41 is extensibly or retractably moved with respect to the upper chute portion 40 and is maintained in the desired loading position by means of a cylinder 44 secured to the bottom of the upper chute portion 40 and having a piston rod 45 ex-

tensible therefrom and connected between spaced ears 46 projecting from the bottom of the lower chute portion 41.

A shoe 47 is mounted at the rear end of the truck frame 11 and depends therefrom to engage the inside of the lower run of the bucket line when the beam 17 is in position to rest the bucket line on the ground and when the beam is in the elevated roading position shown in Figure 4. A roller 48 is spaced forwardly along the truck frame 11 to cooperate with the shoe 47 and take up on the chain when the bucket line is resting on the ground and when the boom is in its elevated position.

The drive to the head shaft 22 and head sprocket 23 is through a gear box 49 (Figure 5) having suitable reduction gearing (not shown) therein which may be driven from the transmission for driving the truck 10 in any well known manner and no part of my present invention, so not herein shown or described further. The gear box 49 has a drive shaft 50 extending outwardly therefrom and having a sprocket 51 on the outer end thereof meshing with and driving an endless chain 53. The endless chain 53 meshes with teeth 54 shown as being formed integrally with a drum 55 for a safety clutch 56 on the head shaft 22, for driving the same. The safety clutch 56 may be of any well known form of friction slip clutch, slipping upon predetermined loads and is no part of my present invention, so need not herein be shown or described further.

The movable beam 17 is shown in Figure 2 as having brackets 60 extending from opposite sides thereof intermediate the ends thereof, toward the digging run of the bucket line 25. The brackets 60 form a support for an idler roller 61 journaled therebetween on a transverse shaft 62, mounted at its ends in said brackets. The idler roller 61 serves to backup the bucket line 25 during the digging operation thereof, and to maintain a substantially straight bucket line from the foot sprocket 27 to the head sprocket 23 when the bucket line is in its extreme digging position.

A cylinder 63, having a piston (not shown) movable therein and a piston rod 64 extensible therefrom, is provided to crowd the movable beam 17 into its digging position and hold said movable beam in the digging position shown in Figure 2 and also to lift said movable beam for transportation. As herein shown, the piston rod 64 is connected at its free end between a pair of spaced ears 65 projecting from the opposite side of the movable beam 17 from the brackets 60 and forming a support for a pivot pin 66, pivotally connecting the piston rod 64 to said movable beam. The head end of the cylinder 63 is shown as having an ear 67 projecting therefrom and connected to the center of an arcuate yoke 69 on an upright pivot pin 70. The arcuate yoke is shown as being connected at its free ends between parallel spaced inner and outer side plates 71, 71 and 72, 72 of a shifter frame 73 on axially aligned pivot pins 74, 74. The shifter frame 73 is shown as being generally triangular in side elevation although it may be of various other forms, and as being mounted on the head frame structure 15 for movement about the axis of the transverse pins 20. As herein shown, the inner end portions of the side plates 71 and 72 of the shifter frame 73 are mounted on the pins 20 on opposite sides of the furcations 21 of the movable beam 17 and form a selectively movable support for the cylinder 63, connecting said cylinder to the head frame 15 in selected positions of adjustment, to effect a wide range of pivotal movement of the movable beam 17 by the operation of a single cylinder and piston.

The upper rear end portions of the plates 71 and 72 are connected together by aligned sleeves or pipes 75, 75 which also form a pivotal support for spaced take-up arms 76, 76 pivotally mounted thereon inwardly of the inner plates 72, 72 of the shifter frame 73 and spaced apart by a coupling member 77, mounted on the inner ends of the pipes 75, 75 in position to abut the inner sides

of the arms 76 and coupling the inner ends of the pipes 75, 75 together.

A locking pin 79 may be selectively extended through spaced lugs 80 extending rearwardly of the head frame structure 15 above spaced lugs 19 and through the pipes 75 and coupling member 77, to hold the shifter frame 73 in position to connect the cylinder 63 to the head frame structure 15, to crowd the bucket line into the earth at the beginning of the digging operation and maintain the bucket line in the fully downwardly extended position shown in Figure 2. The pin 79 may also be inserted through spaced lugs 81 extending upwardly and rearwardly from a brace member 82 of the head frame structure 15 for holding the shifter frame 73 in position to connect the head end of the cylinder 63 to the head frame structure 15 in position to elevate the movable beam 17 to the extreme traveling position shown in Figure 4.

In Figure 8, I have shown spacer links 78, which may be provided between the plates 71 and 72 in cooperation with the pipes 75, to maintain the plates 71 and 72 in spaced relation with respect to each other and to stiffen the shifter frame structure.

A tension idler 83 is carried between the free ends of the take-up arms 76 on a transverse shaft 84, which is mounted at its ends on said arms. The tension idler 83 is meshed with the endless chain 24, and is biased to maintain tension on the endless chain 24 when in the digging position shown in Fig. 2 and when being crowded into a digging position by downward pivotal movement of the movable beam 17 by a compression spring 85.

The compression spring 85 is seated on a flanged stud 86 at its upper end having a sleeve 87 formed integrally therewith and extending transversely thereof. The sleeve 87 is shown as being pivotally mounted between the take-up arms 76 on a pivot pin 89. The opposite end of the compression spring 85 is seated on a flanged stud 90, the stud of which extends partially within said spring and has a sleeve 92 formed integrally therewith, through which extends a pivot pin 93 mounted at its ends in inwardly extending and depending ear portions 94 of the inner plates 72 of the shifter frame 73. A pair of spaced links 95 are pivotally mounted on the outer ends of the pivot pin 89 on the outer sides of the take-up arms 76 and extend downwardly along opposite sides of the spring 85. The links 95 have slots 96 extending along their lower end portions having slidable engagement with the pivot pin 93 inwardly of depending ear portions 94.

The spring 85 thus biases the take-up arms 76 and idler sprocket 83 in a take-up direction to maintain the required tension on the chain 24 during the digging operation of the bucket line.

A chain 99, is suitably secured at one end to the frame structure 15 of the boom 16 to the left of the pin 20, as shown in Figure 4. Said chain has a hook 100 on its opposite end which may be hooked over the upper run of the bucket line 25 to prevent sagging of the lower run of the bucket line during transportation of the ditcher.

In operation of the ditcher, the truck may be moved to a location close to the working place in the upwardly extending or roading position shown in Figure 4. The beam 17 may then be lowered by operation of the hydraulic cylinder 63 and piston rod 64 to allow the bucket line to rest on the ground. The pin 79 may then be removed from the spaced lugs 81. In order to do this, the cylinder 63 may be manipulated by the admission of hydraulic fluid under pressure thereto to ease the load on the pin 79. The chain 99 may then be unhooked from the bucket line, and hooked between the arms 76 out of the way.

When the pin 79 has been removed from the lugs or ears 81, hydraulic fluid under pressure may be admitted to the piston rod end of the cylinder 63 to pivot the

shifter frame 73 in a clockwise direction to the position shown in Figure 3. The rod or pin 79 may then be inserted through the lugs 80 and the pipes 75 of the shifter frame 73 to lock the shifter frame in the position shown in Figures 1, 2 and 3.

The beam 17 may then be raised to the position shown in Figure 1 by the admission of fluid under pressure to the piston rod end of the cylinder 63 and the truck may be operated to move the ditcher into the desired digging location.

The beam 17 may then be gradually lowered and as it is lowered to the position where the endless chain 24 is relatively taut as shown in Figure 3, the bucket line 25 may be started in operation. Fluid under pressure may then be admitted to the head end of the cylinder 63 to gradually crowd the beam 17 and bucket line 25 into the ground, pivoting said boom in a clockwise direction. At the same time the extensible lower chute 41 on the upper chute portion 40 and the boot 43 may be lowered into position close to the ground by operation of the hydraulic cylinder 44 and piston rod 45.

Lowering movement of the beam 17 may be continued until said beam reaches the position shown in Figure 2, at which position the digging and load carrying run of the bucket line 25 is in a substantially straight line between the foot sprocket 27 and head sprocket 23. The truck 12 may then be put into operation to progress the digger along the ground and continue the digging operation as desired.

When it is again desired to travel, fluid under pressure may be admitted to the piston rod end of the cylinder 63 elevating the beam 17 to the position shown in Figure 1. The truck 12 may then be operated to move the digger away from the ditch to a relatively flat spot on the ground at which time the beam 17 may be lowered by the admission of fluid under pressure to the head end of the cylinder 63. The pin 79 may then be removed from the ears 80.

Fluid under pressure may again be admitted to the head end of the cylinder 63, pivoting the shifter frame 73 in a counterclockwise direction into position to register the pipes 75 with the holes through the ears 81. The pin 79 may then be placed through the holes in said ears and the pipes 75, to hold the shifter frame 73 in the roading position shown in Figure 4 and to hold the cylinder 63 in position to elevate the pivoted beam 17 to the elevated position shown in Figure 4 by the admission of fluid under pressure to the piston rod end of the cylinder 63. The chain 99 may then be hooked over the bucket line to prevent sagging of the lower end thereof.

It may be seen from the foregoing that I have provided a truck mounted, ladder type ditcher of a more compact arrangement than former ditchers by breaking the boom in the center and pivoting the free end portion thereof, to accommodate the boom to be positioned in the downwardly extended digging position shown in Figure 2, and in the extreme upwardly extending roading position shown in Figure 4.

It may further be seen that the compactness and the maneuverability of the beam 17 is attained in an extremely simple manner and the beam is moved to its various positions by a single stroke double acting cylinder and piston through the use of a shifter frame connecting the cylinder and piston to the stationary boom structure and shiftable by the cylinder and piston into position to hold the cylinder and piston to crowd the bucket line into the earth for digging and maintain the bucket line in a digging position and elevate the bucket line from its digging position, and is also shiftable into a second position to accommodate the same cylinder and piston to pivot the beam 17 in the extreme upwardly extended roading position shown in Figure 4.

It will be understood that various modifications and variations of the present invention may be effected with-

out departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In a self propelled ladder type ditcher, a truck having a frame, a boom supported on said frame and comprising a stationary head frame structure on said truck frame and beam pivoted to the rear end of stationary head frame structure for movement about a transverse axis, a head shaft on said stationary head frame structure having a drive sprocket thereon, a foot shaft on the free end of said beam having an idler sprocket thereon, an endless bucket line trained about said idler sprocket and driven from said drive sprocket and moving about said boom for the length thereof, cylinder and piston means connected between said beam and said head frame structure for crowding said beam for digging and lifting said beam into an elevated position, and a means connecting said cylinder and piston means with said stationary head frame structure comprising a shifter frame pivoted to said stationary head structure for movement about the axis of pivotal movement of said beam and having said cylinder and piston means connected thereto at a point spaced outwardly from the pivotal axis of said beam, said cylinder and piston means being operative to move said shifter frame into a plurality of selected operating positions, and locking means for selectively locking said shifter frame in its selective operative positions.

2. In a self propelled ladder type ditcher, a truck having a frame, a boom supported on said frame and comprising a stationary head frame structure on said truck frame and a beam pivoted to the rear end of said stationary head frame structure for movement about a transverse axis, a head shaft on said stationary head frame structure having a drive sprocket thereon, a foot shaft on the free end of said beam having an idler sprocket thereon, an endless bucket line trained about said idler sprocket and driven from said drive sprocket and moving about said boom for the length thereof, cylinder and piston means connected between said beam and said head frame structure for crowding said beam for digging and lifting said beam into an elevated position, and a means connecting said cylinder and piston means with said stationary head frame structure comprising a shifter frame pivoted to said stationary head structure for movement about the axis of pivotal movement of said beam and having said cylinder and piston means connected thereto at a point spaced outwardly from the pivotal axis of said beam, said cylinder and piston means being operative to move said shifter frame into a plurality of selected operating positions, and locking means for selectively locking said shifter frame in its selective operative positions, a take-up arm pivoted on said shifter frame and having an idler sprocket on the end thereof meshing with said bucket line, and spring means interposed between said shifter frame and take-up arm for biasing said take-up arm and idler sprocket in a take up direction.

3. In an endless bucket type of ditcher of the class described, a base frame, a boom mounted on said base frame and including a stationary head frame structure and a pivoted beam pivoted to and projecting from said head frame structure and forming a continuation thereof, a head shaft on said stationary head frame structure, a foot shaft at the free end of said beam, a drive sprocket on said head shaft, an idler sprocket on said foot shaft, an endless bucket line trained about said sprockets and driven from said drive sprocket, cylinder and piston means having connection with said pivoted beam adjacent said foot shaft for vertically moving said beam about the pivotal axis thereof, and selectively positional mounting means for said cylinder and piston means, mounting said cylinder and piston means on said stationary head frame and angularly adjustable into position to maintain said cylinder and piston means in effective position to

7

crowd said beam and bucket for digging an angularly positionable into position to support said cylinder and piston means in an elevated position to pivot said beam into an elevated position for roading.

4. In an endless bucket type of ditcher of the class described, a base frame, a boom mounted on said base frame and including a stationary head frame and a beam pivoted to and projecting from said head frame and forming a continuation thereof, a head shaft on said head frame, a foot shaft at the free end of said beam, a drive sprocket on said head shaft, an idler sprocket on said foot shaft, and endless bucket line trained about said shafts and driven from said drive sprocket, cylinder and piston means having connection with said beam for elevating and lowering said beam about its axis of connection to said head frame, selectively positionable support means for said cylinder and piston means adjustably mounted on said head frame comprising a shifter frame movably mounted on said head frame and having said cylinder and piston means pivotally connected thereto, means for selectively locking said shifter frame in a plurality of selected operative positions, said shifter frame having a take-up arm pivoted thereto having an idler sprocket thereon engaging said bucket line, and means on said shifter frame for biasing said take-up arm and sprocket to take up slack on said bucket line.

5. A boom structure particularly adapted for an endless bucket ladder type ditcher comprising a base frame, a head frame mounted on said base frame, a beam transversely pivoted to said head frame and forming a continuation thereof and extending beyond said base frame, a shifter frame transversely pivoted on said head frame and selectively positionable into a plurality of selected fixed operative positions, a hydraulic cylinder and piston pivotally connected between said shifter frame and said beam and operable to pivot said beam into elevated roading and lowered digging positions and to shift said shifter frame into its selected operative positions, and means operable to lock said shifter frame in a selected operative position.

6. A boom structure particularly adapted for ladder type endless bucket ditchers comprising a base frame, a head frame mounted on said base frame, a beam transversely pivoted to said head frame and extending beyond the end thereof, a head shaft and sprocket on said head frame, a foot shaft and sprocket on the free end of said beam, and endless bucket line trained about said sprockets and driven from said head shaft, a shifter frame pivoted on said head frame for movement about an axis coaxial with the pivotal axis of said beam and shiftable into a plurality of stationary operative positions, cylinder and piston means connected between said shifter frame and said beam for moving said shifter frame into a plurality of operative positions, and for vertically moving said beam upon the locking of said shifter frame in a selective operative position, means selectively operable to lock said shifter frame in one operative position to position said cylinder and piston means to crowd said movable bucket line in a digging direction and in a second operative position to position said cylinder and piston means to elevate said beam into an elevated roading position.

7. In a self propelled ladder type ditcher, a truck having a frame, a boom supported on said frame and extending beyond the rear end thereof and comprising a stationary head frame structure mounted on said frame adjacent the rear end thereof and a beam transversely

8

pivoted to said head frame structure at the rear end thereof, a head shaft on said head frame structure having a drive sprocket thereon, a foot shaft on the free end of said beam having an idler sprocket thereon, an endless bucket line trained about said sprockets and driven from said drive sprocket, cylinder and piston means connected between said head frame structure and said beam for pivoting said beam into its several operative positions, means connecting said cylinder and piston means to said head frame structure to effect lowering movement of said beam into a generally upright ditch digging position and to effect upward movement of said beam into an upwardly extending roading position, comprising a shifter frame shiftable into a plurality of selective operative positions and having said cylinder and piston means pivotally connected thereto, means selectively operable to lock said shifter frame to said head frame structure to connect said cylinder and piston means to said head frame structure in position to hold said beam in said first mentioned selective generally upright digging position and to elevate said beam out of the ditch being excavated, and to lock said shifter frame to said head frame structure in position to connect said cylinder and piston means to said head frame structure to hold said cylinder and piston means to elevate said beam into said second mentioned selective upwardly extending roading position.

8. A boom structure particularly adapted for ladder type endless bucket ditchers comprising a base frame, a head frame mounted on said base frame, a beam pivoted to said head frame for vertical movement about a transverse axis and extending beyond the end thereof, a head shaft and sprocket on said head frame, a foot shaft and sprocket on the free end of said beam, an endless bucket line trained about said sprockets and driven from said sprocket on said head shaft, a shifter frame pivoted on said head frame for movement about an axis coaxial with the axis of pivotal movement of said beam, cylinder and piston means connected between said shifter frame and said beam, said cylinder and piston means being operable to move said shifter frame into a plurality of selected operative positions and to pivot said beam upon the locking of said shifter frame in one of its selected operative positions, said shifter frame being selectively positionable in one of said plurality of selected operative positions to position said cylinder and piston means to operate said beam in a digging direction and being selectively positionable in a second of said plurality of selected operative positions to position said cylinder and piston means to lift said beam into an elevated roading position, means locking said shifter frame in its several selected operative positions, take-up arms pivotally mounted on said shifter frame and having a take-up idler thereon engaging said bucket line, and spring means on said shifter frame biasing said take-up arms in a take-up direction.

References Cited in the file of this patent

UNITED STATES PATENTS

1,080,250	Blick	Dec. 2, 1913
1,210,412	Budlong	Jan. 2, 1917
2,249,640	Smith	July 15, 1941
2,588,918	Graham	Mar. 11, 1952
2,620,575	Pace	Dec. 9, 1952

FOREIGN PATENTS

64,479	France	Sept. 15, 1864
412,008	Great Britain	June 21, 1934