Dec. 23, 1952 K. W. WALTERS 2,622,351

DIGGING MACHINE

Filed Nov. 9, 1949 5 Sheets-Sheet 1

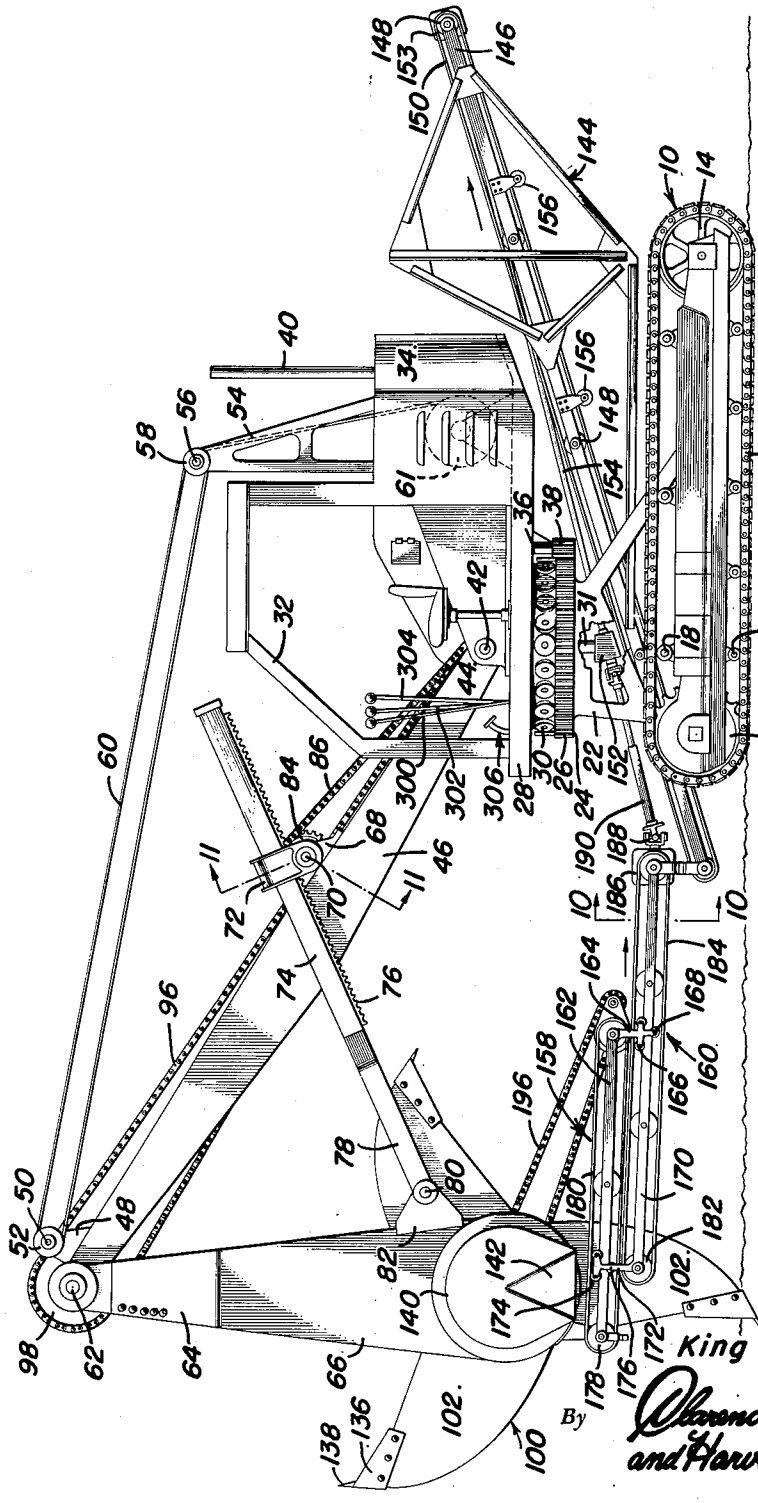


Fig. 1.

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DIGGING MACHINE

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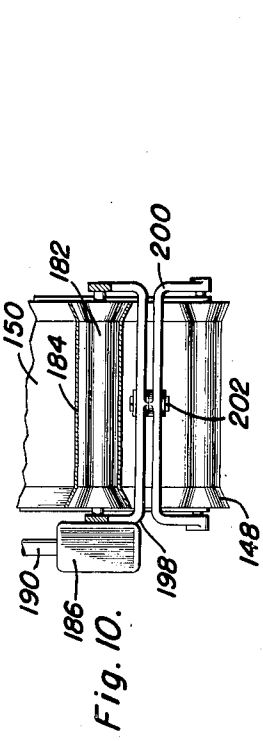


Fig. 10.

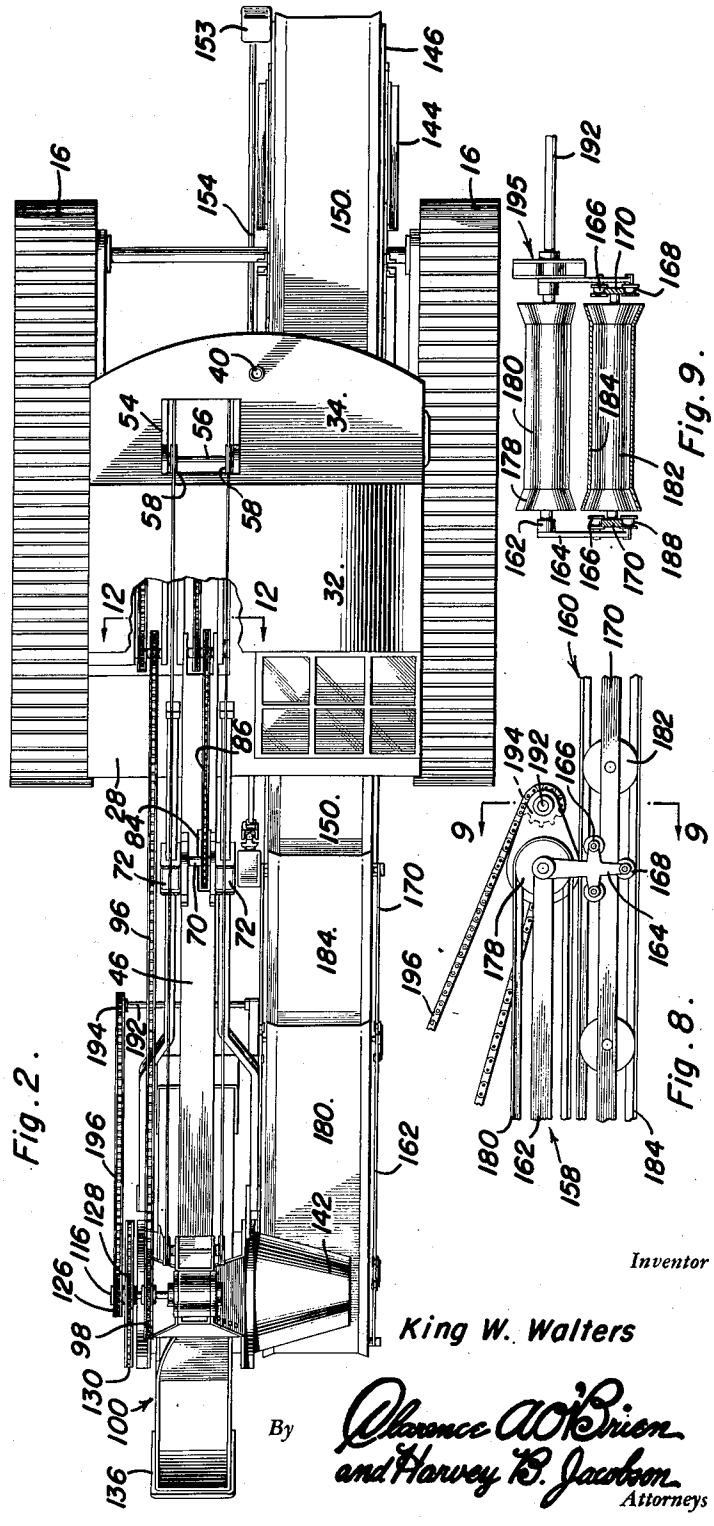


Fig. 2.

Fig. 9.

Fig. 8.

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DIGGING MACHINE

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Fig. 4.

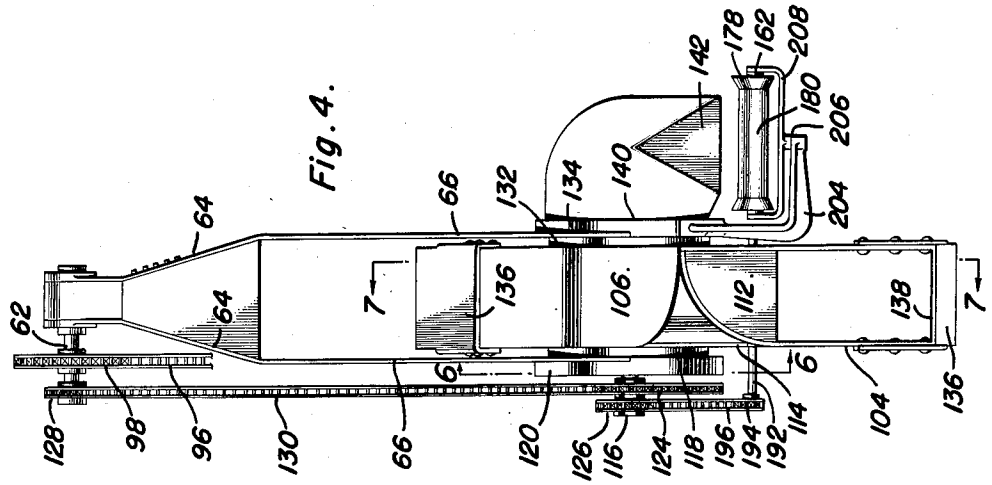
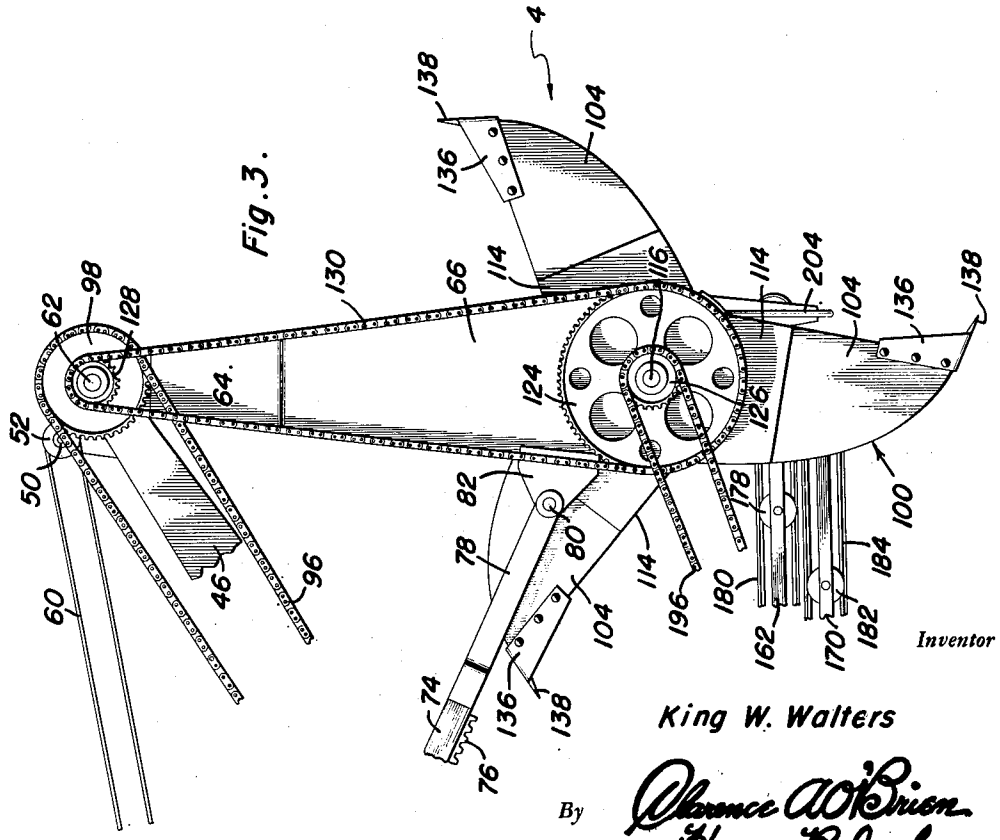


Fig. 3.



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DIGGING MACHINE

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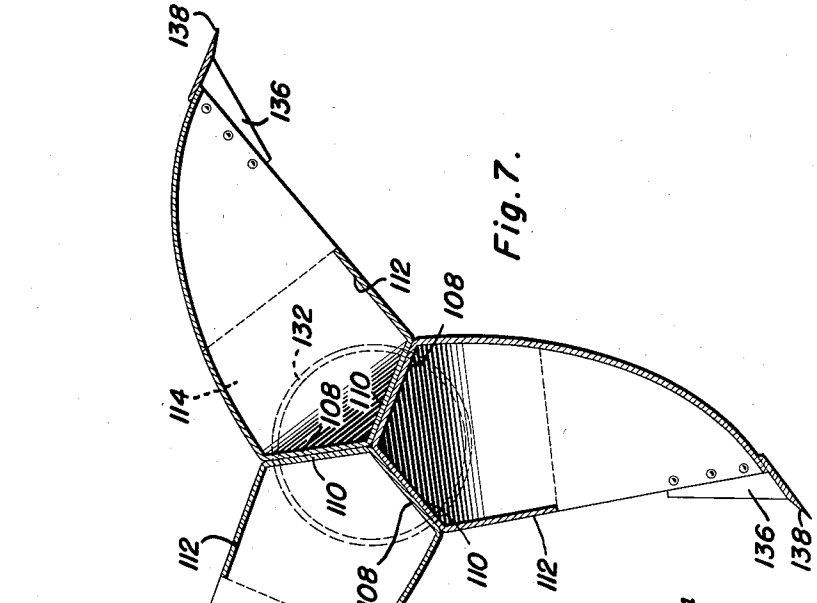


Fig. 7.

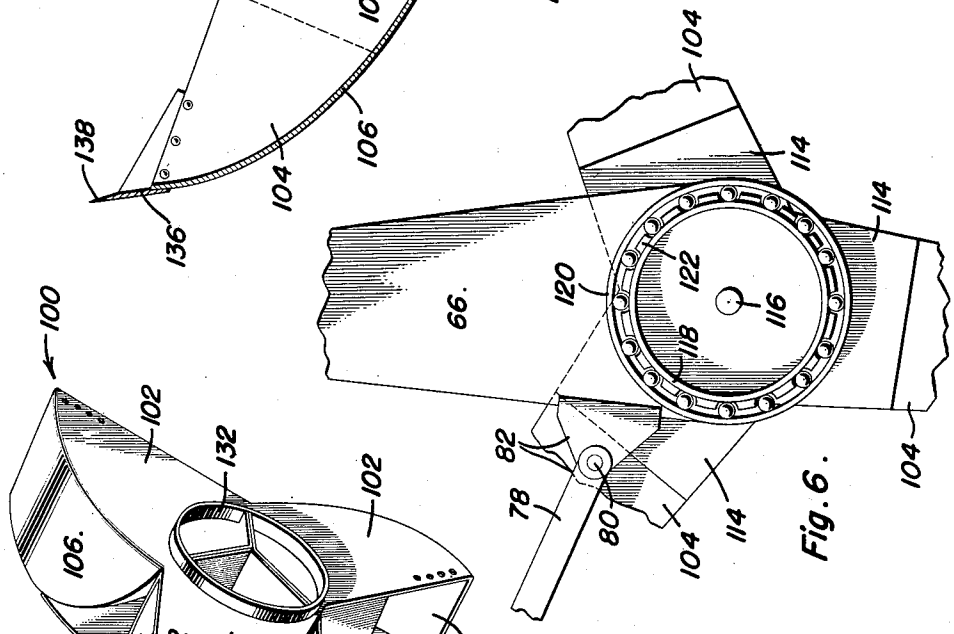


Fig. 6.

Fig. 5.

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DIGGING MACHINE

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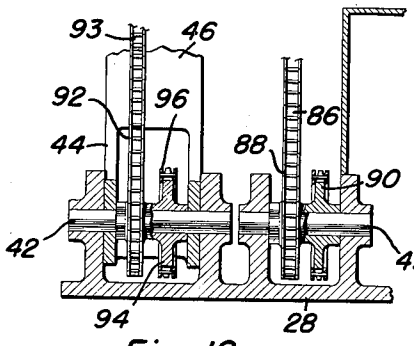
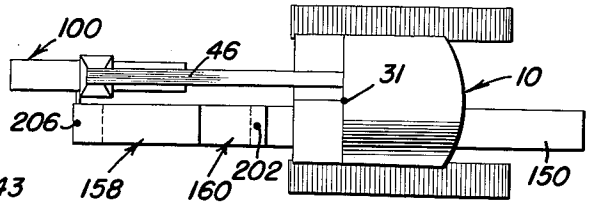


Fig. 12.

Fig. 13.



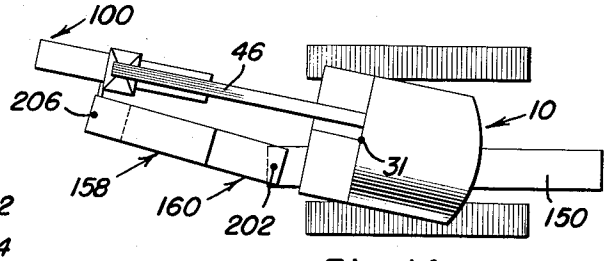


Fig. 14.

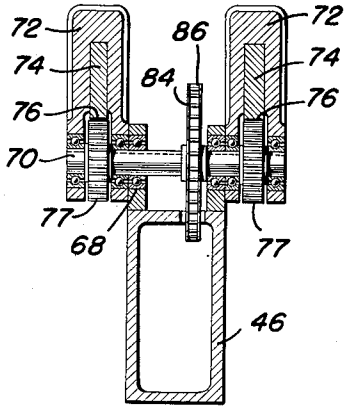


Fig. 11.

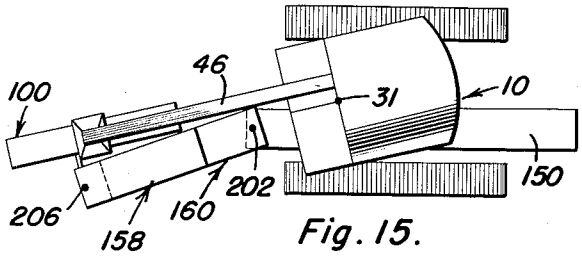


Fig. 15.

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Patented Dec. 23, 1952

2,622,351

UNITED STATES PATENT OFFICE

2,622,351

DIGGING MACHINE

King W. Walters, Paradise, Calif.

Application November 9, 1949, Serial No. 126,281

12 Claims. (Cl. 37—190)

1

This invention relates to new and useful improvements in digging machines and the primary object of the present invention is to provide a digging machine so constructed as to permit the same to work in small narrow cuts and ditches and around side hills where space is insufficient to accommodate shovels that must hoist and rotate for discharging material.

Another very important object of the present invention is to provide a digging machine including a rotary scoop or bucket that is composed of four pieces that are welded together and which is quickly and readily removable and replaceable without effecting appreciable cost.

Yet another object of the present invention is to provide a digging machine including a bucket support having a bucket journaled thereon and a delivery chute for material dug by the bucket, together with a pair of slidably connected conveyors composed of two slidably connected frameworks, one of which is connected to the support so that one of the frameworks will be disposed beneath the chute at all times regardless of the position of the support.

Another object of the present invention is to provide a digging machine including a scoop and an elevator disposed beneath the machine for receiving material dug by the scoop to conduct the material to a discharge point at the rear of the machine or to trucks disposed adjacent the machine.

Another object of the present invention is to provide a shovel or truck loader including an operator's platform on which the control and operating means for all parts of the loader are located, whereby a single operator may conveniently control the operation of the loader.

A further object of the present invention is the provision of a digging machine so constructed as to reduce to a minimum the time required for digging material and for loading material into trucks.

A still further aim of the present invention is to provide a digging machine that is simple and practical in construction, strong and reliable in use, small and compact in structure, efficient and durable in operation, relatively inexpensive to produce, and otherwise well adapted for the purposes for which the same is intended.

Other objects and advantages reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming part hereof, wherein like numerals refer to like parts throughout, and in which:

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Figure 1 is a side elevational view of the present invention;

Figure 2 is a top plan view of Figure 1 and with parts of the cab broken away;

Figure 3 is an enlarged fragmentary side view of Figure 1 to show the means for rotating the bucket or scoop;

Figure 4 is a front elevational view taken substantially in the direction of arrow numbered 4 in Figure 3;

Figure 5 is a perspective view of the bucket used in the present invention with the digging elements removed therefrom;

Figure 6 is an enlarged vertical sectional view taken substantially on the plane of section line 6—6 of Figure 4;

Figure 7 is an enlarged vertical sectional view taken substantially on the plane of section line 7—7 of Figure 4;

Figure 8 is an enlarged detail view of Figure 1;

Figure 9 is a vertical sectional view taken substantially on the plane of section line 9—9 of Figure 8;

Figure 10 is an enlarged vertical sectional view taken substantially on the plane of section line 10—10 of Figure 1;

Figure 11 is an enlarged detail sectional view taken substantially on the plane of section line 11—11 of Figure 1;

Figure 12 is an enlarged vertical sectional view taken substantially on the plane of section line 12—12 of Figure 2;

Figure 13 is a schematic plan view showing the delivery conveyor spaced parallel to the boom;

Figure 14 is a schematic view showing the position of the delivery conveyor as the platform and the boom are swung in one direction; and

Figure 15 is a schematic view showing the position of the delivery conveyor as the platform and the boom are swung in a direction opposite from that shown in Figure 14.

Referring now to the drawings in detail, wherein for the purpose of illustration, there is disclosed a preferred embodiment of the present invention, the numeral 10 represents a tractor generally, including sprocket wheels 12 and 14, endless tracks or chains 16 that are trained about the sprocket wheels 12 and 14, upper and lower groups of track guiding and tensioning rollers 18 and 20, and a frame 22 supporting a circular base plate 24 having a circumferentially toothed edge 26.

A platform 28 is supported for rotation on the frame 22 and includes a plurality of circumferentially spaced rollers or anti-friction members

30 that track upon the base plate 24. A suitable pivot pin 31 connects the platform 28 centrally to the base plate 24. A cab or housing 32 is mounted on the platform 28 and is composed of a motor compartment or casing 34. The motor encased within the casing 34 is of any suitable type, such as diesel, gasoline or electric, and is operatively connected to a vertically disposed driven shaft 36 having a gear 38 fixed thereon for engaging the toothed edge 26 of the base plate 24 so that as the shaft 36 is rotated, the platform 28 will also rotate. It is preferred that the motor within the casing 34 be composed of a vertically disposed stack 40.

A pair of horizontally disposed coaxial shafts 42 and 43 are mounted for rotation in suitable bearings on the forward end portion of the platform 28 and the shaft 42 pivotally supports the inner bifurcated end 44 of a boom 46. A bracket 48 is mounted on the outer end of the boom 46 and rotatably supports a shaft 50 on the ends of which there is secured a pair of pulleys 52.

A frame member 54 rises from the platform 28 and supports a shaft 56 on which there is mounted a pair of pulleys 58. A pair of cables 60 are trained about the pulleys 52 and 60. One end of each of the cables is fixed to a part of the tractor or to the frame 54, whereas the other ends of the cables are secured to a suitable cable drum 61 operated by the power plant of the vehicle so that the boom 46 may be raised or lowered.

The outer end of the boom 46 supports a horizontal shaft or pivot 62 on which is received the upper offset and reduced ends 64 of a pair of bucket supports or side members 66.

A bearing 68 is mounted on the boom 46, intermediate the ends of the boom 46, and rotatably supports a shaft 70. A pair of yokes 72 are journaled on the shaft 70 and slidably receive a pair of dipper members or arms 74 having toothed lower edges 76. Gears 77 are fixed on the shaft 70 and engage the toothed lower edges 76. The offset end portions 78 of the arms 74 are pivoted, as at 80, to ears 82 projecting laterally from the side members 66. The shaft 70 also supports a central sprocket 84 about which there is trained a sprocket chain 86 (see Figure 11).

The shaft 43 supports a sprocket 88 about which the chain 86 is trained. The shaft 43 also carries a sprocket 90 that is connected to a shaft driven by the power plant of the tractor so that as the shafts 43 and 70 rotate, the arms 74 will move within the yokes 72 for adjusting the side members 66 relative to the boom 46. The shaft 42 supports a pair of sprockets 92 and 94, the latter being connected to a shaft driven by the power plant of the tractor by a sprocket chain 93 and the former sprocket (92) receives a sprocket chain 96 that is trained over a gear 98 fixed on the shaft 62.

A bucket or scoop 100 is journaled for rotation on the side members 66 and includes a plurality of circumferentially spaced radially disposed digging members. Each of the digging members is composed of a flat side wall 102, an inwardly curved side wall 104 and an inwardly curved connecting wall 106 joining the side walls 102 and 104. The connecting wall of each digging member is provided with a substantially V-shaped extension having leg portions 108 and 110. The leg portions 110 are elongated and include projections 112 that are bent toward the outer end portions of the digging member and fixed between the side walls 102 and 104.

The side walls 104 of all of the digging members are connected and reinforced by a gusset plate 114. This gusset plate is spaced parallel to the side wall 102 and supports a laterally projecting horizontal shaft 116 and a ring 118 concentric with the shaft 116. The ring 118 enters an outer ring member 120 fixed to one of the side members 66 (see Figure 6) and a ball bearing assembly 122 is mounted between the ring 118 and the ring member 120.

The shaft 116 supports gears 124 and 126 as shown best in Figures 3 and 4 of the drawings. The gear 124 is connected to a gear 128 fixed on the shaft 62 by a sprocket chain 130 so that the scoop 100 will be rotated upon rotation of the shafts 62 and 42.

The side walls 102 of the digging members are formed with a discharge opening from the edges of which there extends a ring 132 that enters a ring member 134 mounted on one of the side members 66. A ball bearing assembly (similar to 122) is received between the ring 132 and ring member 134 and will tend to permit unrestricted rotation of the scoop 100 relative to the side members.

Fixed to the outer ends of the side walls, 102 and 104, also the outer ends of the connecting walls 106, are channel-shaped digging elements 136, the webs of which are provided with sharpened edges 138. The channel-shaped digging elements are quickly and readily removed from the digging members for repair, or replacement.

A hopper 140 is journaled within the ring member 134 and is movable with the side members 66. The hopper 140 includes a downwardly curved discharge chute or spout 142. The hopper 140 is so arranged as to receive material within the digging members as the latter rotate.

The tractor frame supports a conveyor framework 144 including a pair of elongated spaced parallel side rails 146 between which there is journaled a plurality of spaced parallel rollers 148. An endless elevator conveyor 150 is trained about the rollers 146. The side rails 146 are vertically inclined and their central portions are disposed beneath the platform 28.

The pivot pin 31 is also a driven shaft operatively connected to the power plant of the tractor and supports a universal connection 152 that is connected to a drive shaft 154. The drive shaft 154 is connected to the uppermost of the rollers 148, by a gear box 153, so that as the pin 31 is rotated, the conveyor 150 will move in a clockwise direction as shown in Figure 1. Tensioning rollers 156 are mounted on the side rails 146 and prevent the lower flight of the elevator conveyor from sagging.

Means is provided for delivering material discharged from the hopper spout 142 to the lower end of the elevator conveyor. This means consists of a delivery conveyor composed of upper and lower slidably connected frameworks 158 and 160. The upper framework 158 includes a pair of side rails 162 at the rear ends of which there is mounted depending brackets or arms 164 that support upper and lower rollers 166 and 168. The lower framework 160 is also constructed to include a pair of side rails 170 to the forward end of which there is mounted upstanding brackets or arms 172 that support upper and lower rollers 174 and 176. The upper rollers 166 ride upon the upper edges of the side rails 170 and the lower rollers 168 ride against the lower edges of the side rails 170. Furthermore, the upper rollers 174 ride upon the upper edges of the side rails

162 and the lower rollers 176 ride against the lower edges of the side rails 162.

Upper rollers 178 are journaled on the side rails 162 and receive an endless conveyor or belt 180, and lower rollers 182 are journaled on the lower rails 170 and receive an endless conveyor or belt 184. Both of the belts 180 and 184 rotate in a clockwise direction as shown in Figure 1 so that material discharged from the hopper spout 142 will pass onto the conveyor 180, then from the conveyor 180 onto the conveyor 184.

The rearmost of the lower rollers 182 is connected, through a gear box 186, to a universal joint 188 which, in turn, is connected to a driven telescoped shaft 190 that is operatively applied to the universal joint 152.

The rearmost of the upper rollers 178 is connected through the medium of a drive 195 to a shaft 192 supporting a sprocket 194. A sprocket chain 196 is trained about the sprocket 194 and the sprocket 126 so that as the shafts 42, 62 and 116 rotate, the shaft 192 will also rotate to drive the rearmost of the upper rollers 178 and to thereby cause the belt 180 to move toward the rear end of the lower conveyor framework 160.

The framework 160 is supported on and swivelled to the forward end portion of the elevator framework as shown best in Figures 1 and 10 of the drawings. This swivel connection consists of back-to-back upper and lower U-shaped members 198 and 200. The leg portions of the lower member 200 support the forwardmost roller 140 of the elevator conveyor and the leg portions of the upper member 198 support the rearmost of the rollers 182 of the framework 160. The web portions of the upper and lower members 198 and 200 are pivoted together as at 202.

The framework 160 can swing about the pivot 202 and since the supporting shaft for the rearmost of the rollers 82 is journaled on the leg portions of the member 198, the framework 160 can also swing vertically about the member 198.

The forward end portion of the framework 158 is swivelled to one of the side members 66 as shown best in Figure 4. The mounting whereby the framework 158 is secured to or supported on the said one of the side members consists of a substantially L-shaped bracket 204, the horizontal leg portion of which is pivoted, as at 206, to the web portion of a U-shaped member 208. The leg portions of the U-shaped member 208 journally support a shaft on which the forwardmost of the rollers 178 is journaled and on which the forward ends of the side rails 162 are journaled.

The manner in which the frameworks 158 and 160 are connected together, and to the side member 66 and to the member 198 will permit the frameworks to move with the side members 66 with a portion of the framework 158 always beneath the hopper spout 142. This operation is illustrated best by the schematic showings in Figures 13, 14 and 15.

Mounted on the platform and operatively connected to the power plant, in a manner usual for shovels or truck loaders, is a series of hand levers 300, 302, and 304 and foot pedals 306. The lever 300 controls the raising and lowering of the boom 46; the lever 302 controls the movement of the dipper stick or arms 74, 78; the lever 304 controls the drive mechanism for the bucket 100; and the pedals 306 control the rotation of the platform 28 about the base 22.

Having described the invention, what is claimed as new is:

1. In a truck loader including a rotatable platform, a boom pivoted on the platform, a bucket support mounted on the boom, an elevator conveyor, and a bucket on said support, means for receiving material dug by said bucket comprising upper and lower slidably connected conveyor frameworks, means swivelling the upper framework to the support adjacent the bucket, and means swivelling the lower conveyor to the elevator conveyor.

2. In a truck loader including a rotatable platform, a vertically swingable boom pivoted on the platform, a vertically swingable support pivoted to the boom, adjusting means between the support and the boom, and a bucket journaled on said support, an elevator conveyor supported on said loader, and means for delivering material dug by said bucket to the elevator conveyor, said means including upper and lower conveyor frameworks, means slidably securing the upper framework to the lower framework, means swivelling the lower framework to the elevator conveyor, and further means swivelling the upper framework to the support.

3. In a truck loader including a swingable bucket support, a bucket journaled for rotation on the support, and a hopper for receiving material dug by said bucket, an elevator conveyor having a lower end portion, and means for receiving material discharged from the hopper and conducting the material to the elevator conveyor, said means including an upper conveyor and a lower conveyor, means slidably securing said upper and lower conveyors together, means swivelling the upper conveyor to the support and retaining a portion of the upper conveyor beneath the hopper, and means swivelling the lower conveyor to the lower end portion of the elevator conveyor.

4. A digging machine comprising a tractor including a frame, a platform mounted for rotation on the frame, a boom pivoted at one end to the platform for vertical swinging movement, a frame member supported on the platform, a pulley on said frame member, another pulley on the outer end of said boom, a cable attached at one end to said frame member and trained about said pulleys, a power operated cable drum on the frame and connected to the other end of said cable for selectively raising and lowering the boom, a bucket support pivoted to the outer end of said boom and depending from the boom, an adjustable connection between said support and said boom, means on said platform and connected to said adjustable connection for actuating the latter to selectively move the support toward and away from said boom, a bucket rotatably supported by said support, a power driven shaft on said platform, means operatively connecting said power driven shaft to said bucket for rotating the bucket, a dispenser carried by said support for receiving material from said bucket, and conveyor means for material leaving the dispenser including a carrier underlying said dispenser.

5. The combination of claim 4 wherein said adjustable connection includes a pair of arms pivoted to said support, a transverse shaft rotatably supported on said boom and disposed transversely of said boom, a pair of yokes rotatably mounted on said transverse shaft and slidably receiving said arms, said arms having lower

toothed edges, and gears on said transverse shaft meshing with said toothed edges.

6. A digging machine comprising a tractor including a frame, a platform mounted for rotation on the frame, a boom pivoted at one end to the platform for vertical swinging movement, a frame member supported on the platform, a pulley on said frame member, another pulley on the outer end of said boom, a cable attached at one end to said frame member and trained about said pulleys, a power operated cable drum on the frame and connected to the other end of said boom for selectively raising and lowering the boom, a bucket support pivoted to the outer end of said boom and depending from the boom, an adjustable connection between said support and said boom, means on said platform and connected to said adjustable connection for actuating the latter to selectively move the support toward and away from said boom, a bucket rotatably supported by said support, a power driven shaft on said platform, means operatively connecting said power driven shaft to said bucket for rotating the bucket, a hopper projecting laterally from one side of said support, said bucket including an opening in communication with said hopper and means for directing material in the bucket through said opening and into the hopper, and conveyor means for material leaving the hopper and including a carrier underlying the hopper.

7. In a digging machine including a frame, a platform mounted on the frame for rotation, a vertically swingable boom mounted on the platform, and means on the platform and operatively connected to the boom for selectively raising and lowering the boom; a bucket support comprising a pair of elongated vertically disposed side members having upper reduced ends, means pivotally securing the upper ends of said side members to the boom, a bucket supported for rotation between the lower ends of said side members and having a discharge opening, one of said side members having an opening concentric with the discharge opening in said bucket, a ring projecting from the bucket about the opening in the bucket and through the opening in said one of said side members, a hopper having a portion rotatably mounted in said ring, means supported on the platform and operatively connected to said bucket for rotating the bucket, and means extending from the hopper to the frame for conveying material leaving the hopper to a discharge point.

8. In a digging machine including a frame, a platform mounted on the frame for rotation, a vertically swingable boom mounted on the platform, and means on the platform and operatively connected to the boom for selectively raising and lowering the boom; a bucket support comprising a pair of elongated vertically disposed side members having upper reduced ends, means pivotally securing the upper ends of said side members to the boom, a bucket supported for rotation between the lower ends of said side members and having a discharge opening, one of said side members having an opening concentric with the discharge opening in said bucket, a ring projecting from the bucket about the opening in the bucket and through the opening in said one of said side members, a hopper having a portion rotatably mounted in said ring, said means pivotally securing the upper ends of said side members to said boom comprising a horizontal shaft, means mounted on the platform and connected to said shaft for rotating the shaft, a drive connection between said shaft and said bucket, and means between the bucket support and the frame for conveying material from the hopper to a discharge point.

9. The combination of claim 7 and a rack bar pivoted to said bucket support and extending transversely across the boom, means mounted on the boom and engaging the rack bar to slide the rack bar and adjust the bucket support relative to the boom, and means on the platform and operatively connected to said rack bar engaging and sliding means for actuating the latter.

10. A digging machine comprising a frame, a horizontally rotatable platform mounted on the frame, a rigid boom pivoted at one end to the platform for vertical swinging movement, a bucket support pivoted to and depending from said boom and supported solely by said boom, a power driven bucket rotatably mounted on the support, means adjustably connecting the support to the boom, means mounted on the platform and connected to the boom for selectively raising and lowering the boom, a power driven conveyor extending between the boom and the frame, a hopper on the support overlying the conveyor and adapted to receive material from the bucket, and an elevator conveyor supported on the machine and having an end disposed below one end of the power driven conveyor, said power driven conveyor including upper and lower conveyor frames slidably connected together, means swiveling the upper conveyor frame to the support, and additional means swiveling the lower conveyor frame to the elevator conveyor to permit the upper conveyor frame to always underlie the hopper throughout raising and lowering of the boom and adjustment of the support relative to the boom.

11. In a digging machine including an elevator conveyor, a vertically swingable boom, a bucket support, a horizontal power driven shaft securing said bucket support to the boom and constituting a pivot for the support, a bucket rotatably supported by said support and operatively connected to the shaft for rotation of the bucket with the shaft, a hopper on said support for receiving material from the bucket, an upper conveyor frame swiveled to the support and underlying the hopper, said upper conveyor frame including an endless carrier operatively connected to the bucket for rotation therewith, and a lower conveyor frame slidably secured to said upper conveyor frame and having a swivel at one end attached to the elevator conveyor.

12. An earth digger comprising a frame, a platform rotatably mounted on said frame, a vertically swingable rigid boom attached to the platform, means mounted on the platform and operatively connected to the outer end of the boom for selectively raising and lowering the boom, a bucket support pivoted to and hanging from the outer end of said boom, a bucket rotatably supported by the lower end of said support, a hopper carried by the support and positioned at one side of the bucket for receiving material from the bucket, a power driven elevator mounted on the frame, upper and lower slidably connected conveyor members, means swiveling the upper conveyor member to the support beneath the hopper, means swiveling the lower conveyor member to the frame, said lower conveyor member including an inner end portion overlying the lower end of the elevator, an endless belt carried by each

conveyor member, means operatively connecting the elevator to the belt of the lower conveyor member, means mounted on the platform and connected to the bucket for rotating the bucket, a drive connection between the bucket and the belt of the upper conveyor member, and an adjustable connection between said support and said boom.

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