This invention relates to tractor drawn apparatus for scraping, loading, transporting and spreading dirt.

A principal object of the invention is to generally improve the construction and operation of apparatus of this type to the end that dirt may be more expeditiously and efficiently scraped, loaded, transported to a place of use or disposal, and then dumped or spread as desired.

Another object of the invention is the provision of apparatus of the indicated type wherein novel means are provided for controlling the position of the cutting or scraping blade to assure uniform cutting thereby.

Still another object of the invention is the provision of apparatus of the indicated type having improved means for loading dirt which has been removed by the cutter or scraper.

A further object of the invention is the provision of apparatus of the indicated type wherein improved means are provided to facilitate unloading dirt.

These and other objects and advantages of the invention will become more apparent from the following detailed description, taken with the accompanying drawings, wherein:

Figure 1 is a top plan view of one form of apparatus in accordance with the invention;

Figure 2 is a side elevation of the apparatus shown in Figure 1;

Figure 3 is a front elevation of the apparatus;

Figure 4 is a rear elevation of the apparatus;

Figure 5 is a vertical cross-sectional view of a portion of the apparatus taken on the line 5—5 of Figure 1;

Figure 6 is a vertical cross-sectional view of a portion of the apparatus, similar to Figure 5, but showing the box sections in dumping position;

Figure 7 is a vertical cross-sectional view, similar to Figure 6, showing a modified form of apparatus;

Figure 8 is a detailed plan view of a portion of the apparatus showing the manner of securing the conveyor supporting chain; and

Figure 9 is a side elevational view of a portion of the apparatus showing a further modified structure.

Referring to the drawings, the numeral 10 generally designates the supporting frame of the apparatus comprising side frame members 11 and 12 and front and rear frame members 13 and 14. These frame members preferably comprise steel I-beams, beveled at their ends, and welded or otherwise secured together to form the rectangular frame 10.

At its rear, the frame 10 is tiltably supported by a pivoted axle 15 having wheels 16 rotatably mounted on the ends thereof. The axle 15 is pivotally mounted between rectangular box-type steel beams 17 by a pivot pin 18 which extends through suitable openings in the beams 17 and in a flange 19 secured to the upper edge of the axle 15. The beams 17 are spaced apart to provide a slot therebetween within which the axle 15 can rock on the pin 18 thereby acting to prevent any possible swinging movement of the axle 15 about a vertical axis.

The beams 17 are carried by longitudinally extending 1-beams 20, secured at their rear ends to the under side of the rear frame member 14, and at their forward ends to the under side of an intermediate transverse frame member 21. As will be apparent from Figure 1, the beams 20 are spaced from the side frame members 11 and 12 and the beam 21 from the rear frame member 14 to provide openings 22 and 23 into which the tops of the wheels 16 may project.

At its forward end, the frame 10 is provided with downwardly extending pairs of arms 25 and 26, secured at their upper ends, as by welding, to the front frame member 13. The pairs of arms 25 and 26 are mounted on opposite sides of the longitudinal center line of the apparatus and are connected at their lower ends with an axle structure now to be described.

In accordance with the invention, such axle structure comprises an axle 27 pivotally connected adjacent one end thereof (Figure 3), and by a pivot pin 28, to the lower ends of the arms 25. The axle 27 may be of any suitable construction, as, for example, a modified I-beam, as shown, a box beam or the like. Adjacent its opposite end, the axle 27 is secured, as by a hinged connection 27a, to the piston rod 29 of a hydraulic jack mechanism 30 operatively positioned between the downwardly extending arms 26. The cylinder 31 of the hydraulic jack mechanism 30 is secured to the lower edge of the frame 10 with respect to the frame member 13 as by welding or the like. It will be apparent that when the hydraulic jack mechanism 30 is operated to extend or retract the piston rod 29 that the right hand end of the axle 27, as viewed in Figure 3, will be lowered or raised. This will swing the axle 27 about the pivot pin 28 to raise or lower one side of the box 44 with respect to the other side, as will appear more clearly hereinafter.

The arms 26 preferably extend downwardly below the axle 27 to serve as a guide therefor during its pivoting movement. A pin 32 connects the ends of the arms 26 to hold them in spaced position end to act as a stop for the axle.

At its ends, the axle 27 carries auto-type spindles 35 pivotally secured thereto by pins 36. Wheels 37 are rotatably mounted on the spindles 35 in the usual manner. The spindles 35 are provided with steering arms 38 (Figure 1), which extend rearwardly therefrom and are pivotally connected at their ends to radius rods 39. The radius rods 39, in turn, are pivotally connected at their inner ends to a yoke member 40 which straddles the axle 27 at the center thereof as shown in Figure 5. The yoke member 40 is pivotally connected to ears 41, secured to and extending forwardly from the axle 27, by a pin 42. A tongue 43 is pivotally connected to the forward end of the yoke member 40, at 43a, and has means (not shown) on the forward end thereof for attachment to the hitch of a tractor or similar prime mover. It will be apparent that when the tongue 43 swings horizontally it will swing the member 40 about the pivot pin 42 to thereby turn the wheels 37 through the radius rod connections 39 and steering arms 38.

It will be noted that the frame 10 has a three point suspension or support, namely, one at the rear which is pivot. and two at the front, and that the front suspension is pivot at one side and vertically adjustable at the other side to permit tilting of the frame to different operative positions. The reasons for this will become more apparent hereinafter.

Dirt collecting boxes 44 and 45 are carried by the frame 10 and may be moved between the dirt carrying positions shown in Figure 5 and the dumping position shown in Figure 6. The rear box 45 has a bottom, a back and two sides, and is pivotally mounted, as at 46, on ears 47 secured to and depending downwardly from the side frame members 11 and 12. The box 44 has a bottom and two sides and is open at the front and...
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back. In the dirt loading and transporting position of the boxes the rear bottom edge of the box 44 abuts the forward bottom edge of the box 45 to provide a substantial continuous bottom. The sides of the box 45 are offset outwardly slightly from the sides of the box 44 and are arranged in overlapping relation therewith when the boxes are in dirt loading and dirt carrying positions, as clearly shown in Figures 1 and 5. The box 44 is pivotally mounted, as at 49, secured to and depending downwardly from the frame members 11 and 12.

The boxes 44 and 45 are linked together, for simultaneous swinging movement, by links 50, pivotally connected at their ends, as at 51 and 52, to the side walls of the boxes. Such swinging movement of the boxes is controlled by hydraulic cylinder and piston mechanisms 53 pivotally connected at their forward ends as at 54, to the side walls of the box 45, and pivotally connected at their rear ends, as at 55, to ears 56 welded or otherwise secured to the lower edges of the side frame members 11 and 12. When the pistons of the hydraulic cylinder and piston mechanisms 53 are extended or withdrawn it will be apparent that the buckets 44 and 45 will be simultaneously swung about their pivot connections 48 and 46.

The dirt scraping mechanism now to be described, is shown in Figures 2, 5 and 6. Such scraping mechanism comprises a scraper blade 69 having a forward cutting edge 61 and a rear shaft portion 62. The shaft portion 62 is pivotally mounted at its ends in suitable bearing openings formed in posts 63, secured to the side frame members 11 and 12 and depending downwardly therefrom, as best shown in Figure 2. In the dirt carrying position shown in Figure 5, the forward bottom edge of the box 44 closely abuts the rear surface of the shaft 62 to prevent the seepage of dirt therebetween.

The scraper blade 60 is raised, lowered and held in any desired adjusted position, by hydraulic cylinder and piston mechanisms 65. The blade 60 is provided adjacent each side thereof with upstanding ears 66 to which the lower ends of the hydraulic mechanisms 65 are pivotally connected as at 67. At their upper ends, the hydraulic mechanisms 65 are pivotally connected as at 68, to depending ears 69 secured to the under sides of the side frame members 11 and 12.

Adjacent each side thereof, the scraper blade 60 is provided with upstanding flanges 70. These flanges serve to confine the dirt on the blade 60 and guide it rearwardly at the rear end of the box 44. Such flanges also serve the additional function of pivotally supporting the conveying mechanism now to be described.

The conveyor mechanism is preferably of the chain-drag type comprising spaced conveyor chains 71 to which are secured transverse conveyor flights 72. The chains 71 are trained over sprockets 73 and 74 mounted on axles or shafts 75 and 76 rotatably journaled at the upper and lower ends of a frame 77. The frame 77 may desirably be formed of side frame members 78 secured in spaced relation by any suitable type of cross frame members to provide a substantially rigid frame.

At its lower end, the chain drag conveyor is supported by swinging arms 80 pivotally connected at their rear ends, as at 81, to the upstanding flanges 70, and pivotally connected, at their forward ends, to the conveyor shaft 76. At its upper end, the conveyor is supported by swinging arms 83 pivotally connected at the upper rear ends, as at 84, to uprights 85 mounted on the side frame members 11 and 12, and at their lower forward ends to the conveyor shaft 75. This provides a floating type conveyor, the lower end of which is free to raise up over rocks or other obstructions encountered during operation of the apparatus. When the scraper blade 60 is raised or lowered, the lower end of the conveyor which normally rests thereon is likewise raised or lowered. Also during such raising and lowering of the scraper blade the pivot points 81 swing in an arc about the shaft 62 to swing the conveyor rearwardly. The swinging shaft 62 is of the telescopic type and is driven by the conveyor permit such movement as clearly shown in Figure 6.

The chain drag conveyor is driven from the tractor or other prime mover by power takeoff shafts 86 and 87 drivenly connected by any suitable type of universal joint. The shaft 87 is pivotally connected at its lower end to an upright 108, to a universal joint 88 with a gear device 89. The device 89 is mounted on the frame of the conveyor and drivenly connected with the upper conveyor shaft 75.

The hydraulic cylinder and piston mechanisms 30, 53 and 65, are actuated from hydraulic control mechanism on the tractor or other prime mover through suitable connecting tubes or pipes (not shown).

The apparatus of the invention is readily adaptable for use with any desired number of dirt collecting boxes. Three of such box sections are shown in the modified form of the invention illustrated in Figure 7 but more may be used if desired. As there shown, the boxes 91 and 92 are generally similar to the boxes 44 and 45 previously described. The box 93, like the box 91, has bottom and side walls, but is open at the front and back. The side walls of the boxes overlap as in the previous embodiment to prevent escape of dirt during the loading and transporting operations. The boxes 91, 92 and 93 are interconnected for simultaneous swinging movement by links 94 and 95 pivotally connected to the side walls of the boxes as at 96, 97 and 98. As before, the boxes are swung by a hydraulic cylinder and piston mechanism 99 pivotally connected between the side frame members 11 and 12 and the side walls of the box 92.

In the form of the invention shown in Figure 7 the lower end of the chain drag conveyor 100 is supported as before, namely, by swinging links 101. However, due to the greater combined lengths of the box sections in this form of the invention, and the corresponding greater length of the conveyor 100, it is preferred to support the upper end thereof by adjustable chains 102. These chains are secured to the upper conveyor shaft 103 of the conveyor and pass upwardly over a transverse supporting member 104, for example, a steel channel beam, angle iron or the like, secured to uprights 105 mounted on the side frame members 11 and 12, and having a horizontal flange 106. In a preferred arrangement, the flange 106 of the member 104 is provided with slots 107 for locking the chains 102 in any desired adjusted position. Such slots are slightly greater in width than the thickness of the chain links so that when one of same is positioned in each of the slots the next adjacent link toward the end of the chain will abut the edges of the slot to prevent the chains from pulling therethrough. It will be apparent that by suitable adjustment of the chains 102 the upper end of the conveyor may be raised or lowered as desired. For most purposes, it has been found desirable to arrange the conveyor at an angle of approximately 30° to the horizontal, although this may be varied as desired.

In the modified form of the invention shown in Figure 9, it is proposed to support the upper end of the conveyor 100 with hydraulic cylinder and piston mechanisms 110, pivotally connected at their lower forward end to the upper conveyor shaft 103, and at their upper rear end to uprights 112, secured to the side frame members 11 and 12. The hydraulic cylinder and piston mechanisms 110 are connected to a control and actuating mechanism on the tractor or other prime mover, by suitable pipes or tubing (not shown), thereby permitting actuation by the operator of the tractor.

Operation

In the operation of the apparatus, the tongue 43 is secured to the hitch of a tractor and the shaft 86 connected to the power take-off of the tractor in a well known
manner. The pipes or tubing (not shown) leading from the hydraulic cylinder and piston mechanisms are then connected to the hydraulic control and actuating mechanism on the tractor and the device is ready to be put into operation.

During the dirt scraping and loading operation the parts of the apparatus are disposed as shown in Figures 2, 5 and 7. As the apparatus moves forwardly over the ground the scraper 60 scrapes or digs the dirt to the particular depth for which the scraper blade is set by the hydraulic cylinder and piston mechanism 65. The dislodged dirt collects on the scraper 60 where it is engaged by the flights 72 of the conveyor and moved upwardly and rearwardly for discharge into the boxes 44 and 45. The dirt initially will be deposited for the most part, in the box 44. However, as the box 44 fills up, due to the action of the conveyor, the dirt will also be carried into the box 45 until both are substantially full.

When the boxes are filled, the scraper 60 is raised to the forwardly and upwardly inclined dirt transporting position of the apparatus as shown in Figure 6. This is accomplished by actuation of the hydraulic cylinder and piston mechanisms 65 through the operation of controls on the tractor by the operator thereof. As the scraper 60 moves to its dirt carrying position, the lower end of the conveyor is swung upwardly and rearwardly by virtue of its pivotal connection, as at 81, to the flanges 70. Simultaneously therewith, the upper end of the conveyor swings rearwardly on the arms 53 to the position shown in Figure 6.

With the parts thus positioned, the load of dirt is then transported to any desired point for dumping. In order to dump the dirt, the boxes 44 and 45 are swung rearwardly to the positions shown in Figure 6 by actuation of the hydraulic cylinder and piston mechanisms 53. In such positions it will be noted that the forward bottom edge of the box 44 is spaced rearwardly from the rear surface of the shaft 62 and that the forward bottom edge of the box 45 is spaced rearwardly and downwardly from the rear bottom edge of the box 44. This provides relatively large discharge openings through which the dirt quickly passes from the downwardly inclined bottoms of the boxes 44 and 45 and from the downwardly inclined scraper 60.

When the dirt has been dumped, as aforesaid, the boxes are returned to the positions shown in Figure 5 following which the scraper 60 may be lowered to initiate another dirt scraping and loading operation. In prior apparatus of this general type, there is frequently a tendency for one end of the scraper blade to make a deeper cut than the other. This results in undue strain on the apparatus, and in addition, makes it impossible to provide a level scraped surface. In accordance with the present invention, this condition is very easily overcome by suitable adjustment of the hydraulic jack mechanism 58. This raises or lowers one side of the frame 10 with respect to the other and since the scraper blade is carried by posts secured to the frame one side of the blade is correspondingly raised or lowered with respect to the other side, to thereby correct the stated condition. Such mode of operation of the present apparatus is made possible by the single point pivoted connection of the rear axle, together with the pivoted connection of the front axle at one side thereof and the adjustable connection at the other side.

In the operation of the apparatus it frequently happens that large rocks are dislodged by the scraper blade and move upwardly thereon into the path of the conveyor blades. The giddily mounted conveyor with rocks would result in destructive strains thereon and in most cases would cause breakage or serious damage. However, with the pivoted arm connections of the present invention, the lower end of the conveyor is permitted to swing forwardly and upwardly over the rocks without strain on or damage to the parts.

The operation of the modified forms of the invention shown in Figures 7, 8 and 9, is similar to that previously described. Such forms of the invention, however, have the added advantages that the upper end of the conveyor may be raised and lowered, in addition to its swinging movement, to better adapt it to various operating conditions.

It will thus be seen that the present invention provides a highly effective apparatus of the indicated type for handling dirt. While preferred forms of the invention have been disclosed herein, the invention is not to be construed as limited to the specific details illustrated and described, except as included in the following claims.

1. Apparatus for handling dirt comprising a frame having front and rear ends, a scraper mounted on the frame adjacent the front end and transversely thereof, mobile supporting means pivotally mounted the rear end of said frame for free tilting movement transversely thereof, and mobile supporting means mounting the front end of said frame, said latter means including an axle member pivotally connected to the frame adjacent one side thereof and adjustable connected to the frame adjacent the opposite side thereof, whereby the transverse inclination of the frame and scraper carried thereby may be varied by actuation of said adjustable connection.

2. Apparatus for handling dirt comprising a frame having front and rear ends, a scraper mounted on the frame adjacent the front end and transversely thereof, a rear axle pivotally connected to said frame for free tilting movement transversely thereof and having wheels rotatably journaled thereon, and a front axle having wheels rotatably journaled thereon, said front axle being pivotally connected to said frame adjacent one end thereof and adjustable connected to said frame adjacent its opposite end, whereby the transverse inclination of said frame and of the scraper carried thereby may be varied by pivotal adjustment of said front axle.

3. Apparatus of the type set forth in claim 2 wherein the wheels on said front axle are carried by auto-type spindles pivotally connected to the front axle.

4. Apparatus of the type set forth in claim 2 wherein said adjustable connection comprises a hydraulically operated mechanism.

5. Apparatus of the type set forth in claim 2 wherein said front axle is pivotally connected between the lower ends of a pair of arms secured to and depending downwardly from said frame.

6. Apparatus of the type set forth in claim 2 wherein said adjustable connection is disposed between spaced arms secured to and depending downwardly from said frame, said arms extending downwardly on opposite sides of said axle to guide the same during vertical adjusting movement thereof.

7. Apparatus of the type set forth in claim 3 wherein a draft tongue is pivotally connected with said axle, and means are provided operable by said tongue for controlling the positions of the wheels on said front axles.

8. Apparatus for handling dirt comprising a mobile frame, a dirt collecting open front box mounted on said frame, a dirt removing scraper pivotally mounted on said frame in advance of said dirt collecting box, discharging thereinto, flanges secured to and extending upwardly from said scraper adjacent the ends thereof, an inclined endless scraper-type conveyor mounted on said frame for moving dirt from said scraper into said dirt collecting box and arms pivotally connected at their ends to said flanges and to said conveyor.

9. Apparatus for handling dirt comprising a mobile frame, an open-front dirt collecting box mounted on said frame, a dirt removing scraper pivotally mounted on said frame in advance of said dirt collecting box, an endless conveyor structure for moving dirt from said scraper into said dirt collecting box, said conveyor structure extending upwardly and rearwardly with respect to said frame,
means pivotally connecting the lower portion of said conveyor to said scraper, separate means connecting the upper portion of said conveyor to said frame, both said connecting means cooperating for swinging movement of the conveyor in a vertical plane, and said scraper being swingable about its mounting to close the open front of the box.

10. Apparatus of the type set forth in claim 9 in which the pivotal means connecting the upper portion of said conveyor structure to said frame comprise arms pivotally connected at their ends to said conveyor structure and to said frame.

11. Apparatus of the type set forth in claim 9 in which the pivotal means connecting the upper portion of said conveyor structure to said frame comprise chains and means for adjusting the length of said chains.

12. Apparatus of the type set forth in claim 9 in which the pivotal means connecting the upper portion of said conveyor structure to said frame comprise hydraulic cylinder and piston mechanisms.

13. Apparatus for handling dirt comprising a mobile frame, dirt collecting means mounted on said frame, a dirt removing scraper pivotally mounted on said frame adjacent said dirt collecting means, an endless conveyor structure for moving dirt from said scraper into said dirt collecting means, said conveyor structure extending upwardly and rearwardly with respect to said frame, and means supporting said conveyor structure for swinging movement in a vertical plane comprising pairs of arms pivotally connecting the lower end of the conveyor structure to the scraper and the upper end thereof to the frame.

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