May 7, 1957 J. E. HANCOCK 2,791,044

DIRT HANDLING APPARATUS

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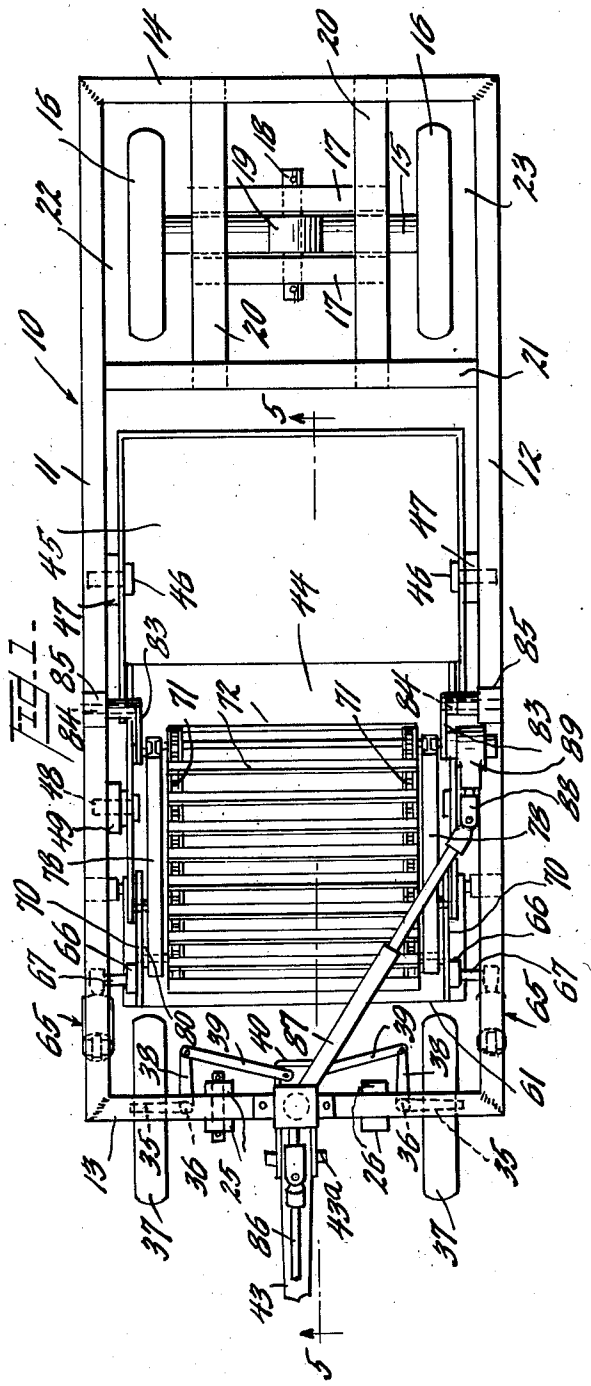


FIG. 1.

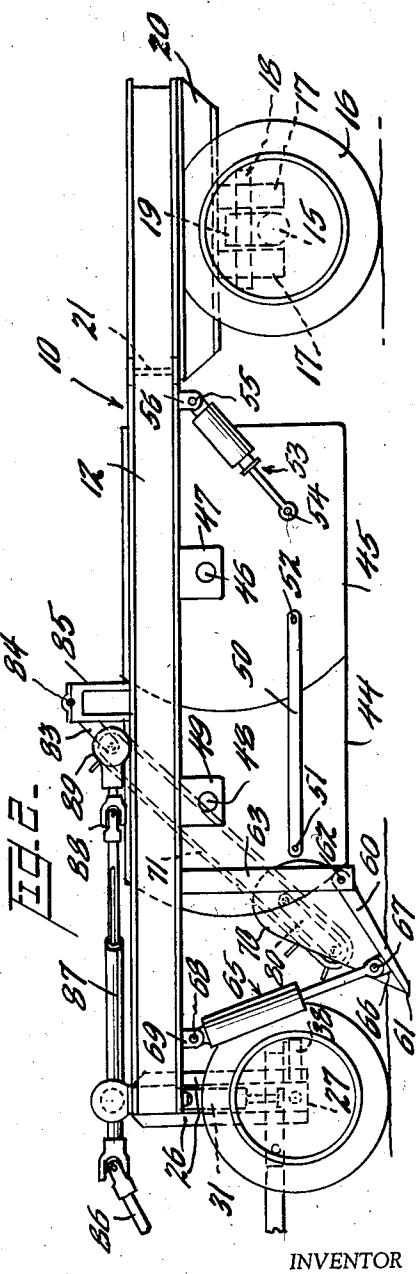


FIG. 2.

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FIG. 3.

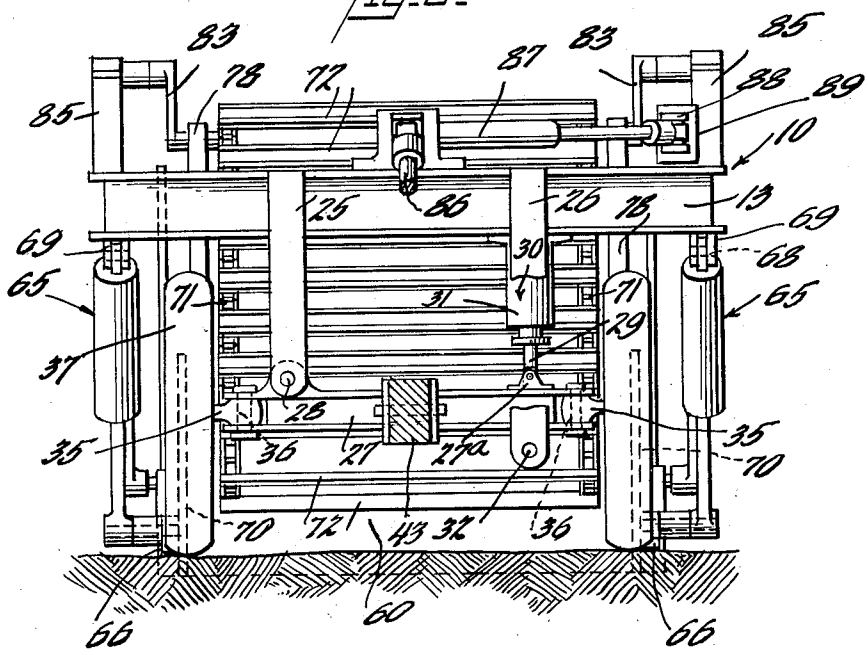
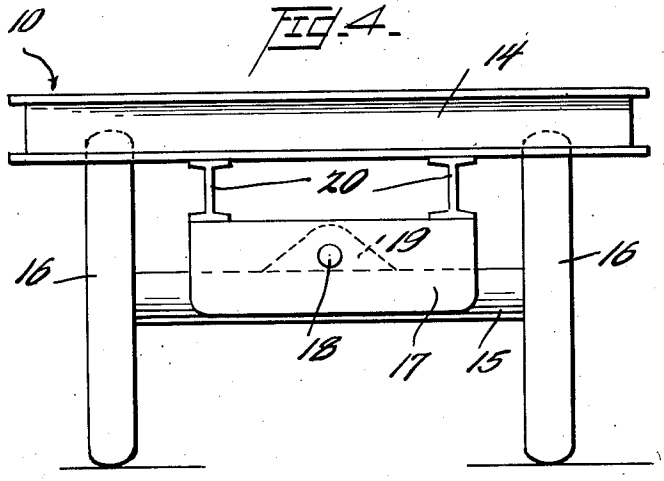


FIG. 4.



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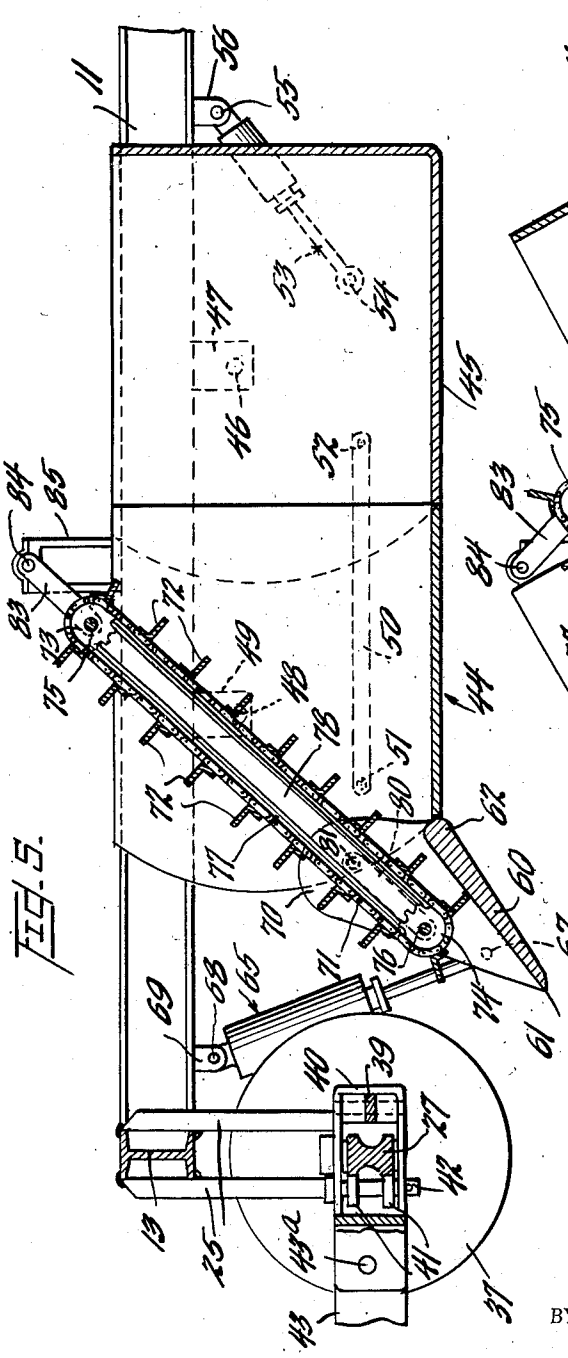


FIG. 5.

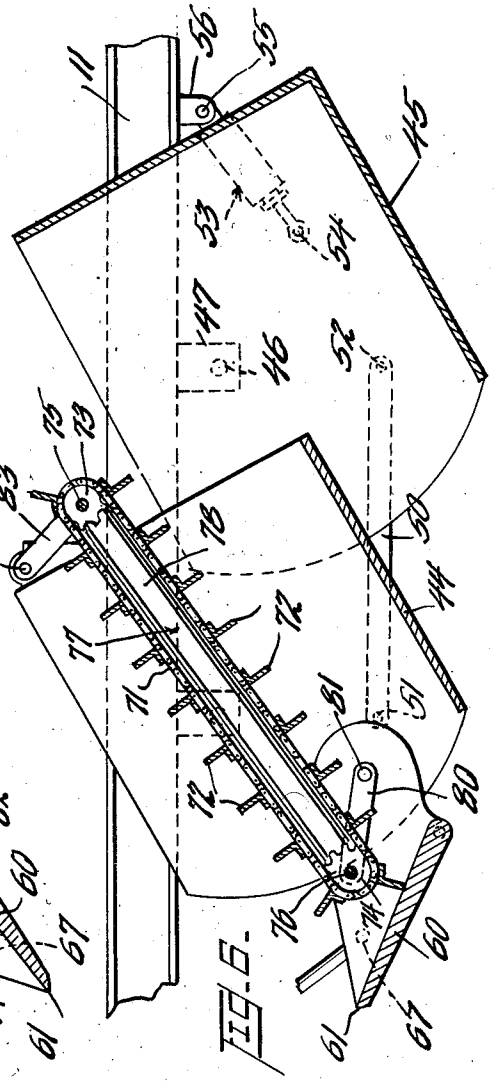


FIG. 6.

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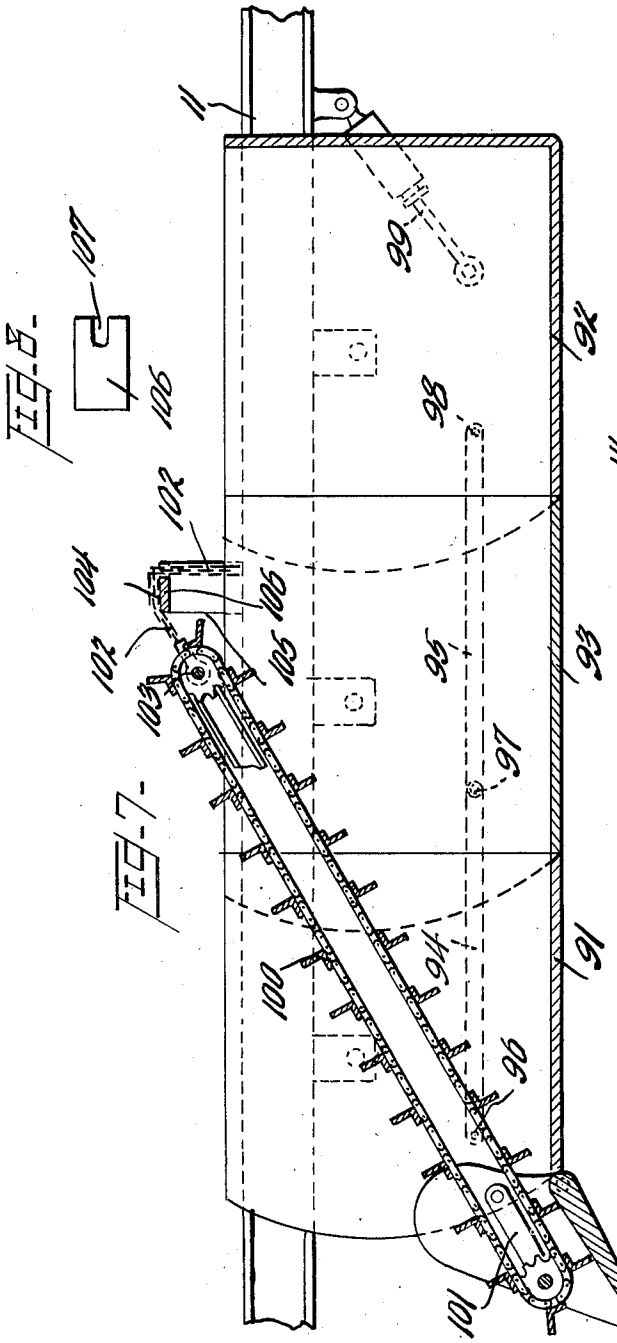
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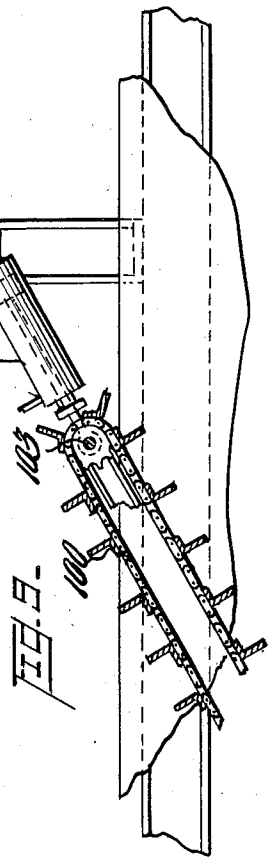
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DIRT HANDLING APPARATUS

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DIRT HANDLING APPARATUS

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Application January 27, 1953, Serial No. 333,575

13 Claims. (Cl. 37—126)

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

I-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), as 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 **27*a***, 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 front 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 frame **10** 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 and 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**, as at **43*a***, 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 pivotal and two at the front, and that the front suspension is pivotal 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

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 substantially 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 **48**, on ears **49**, secured to and depending downwardly from the frame members **11** and **12**.

The boxes **44** andn **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 best shown in Figures 2, 5 and 6. Such scraping mechanism comprises a scraper blade **60** 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 edge 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 into the open end of the box **44**. Such flanges also serve the additional function of pivotally supporting the conveyor 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 their 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 arms **83** which support the upper end of 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** drivingly connected by any suitable type of universal joint. The shaft **87** is of the telescopic type and is drivingly connected by a universal joint **88** with a gear device **89**. The device **89** is mounted on the frame of the conveyor and drivingly 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 ends to the upper conveyor shaft **103**, and at their upper rear ends, 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 83 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 strains 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 30. 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. In the case of a rigidly mounted conveyor such 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.

I claim:

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 mounting 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 adjustably 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 adjustably 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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