Oct. 9, 1945. R. Q. ARMINGTON ET AL 2,386,187

CONVEYER LOADER WITH DIAGONAL BELT

Filed Sept. 29, 1941 4 Sheets-Sheet 1

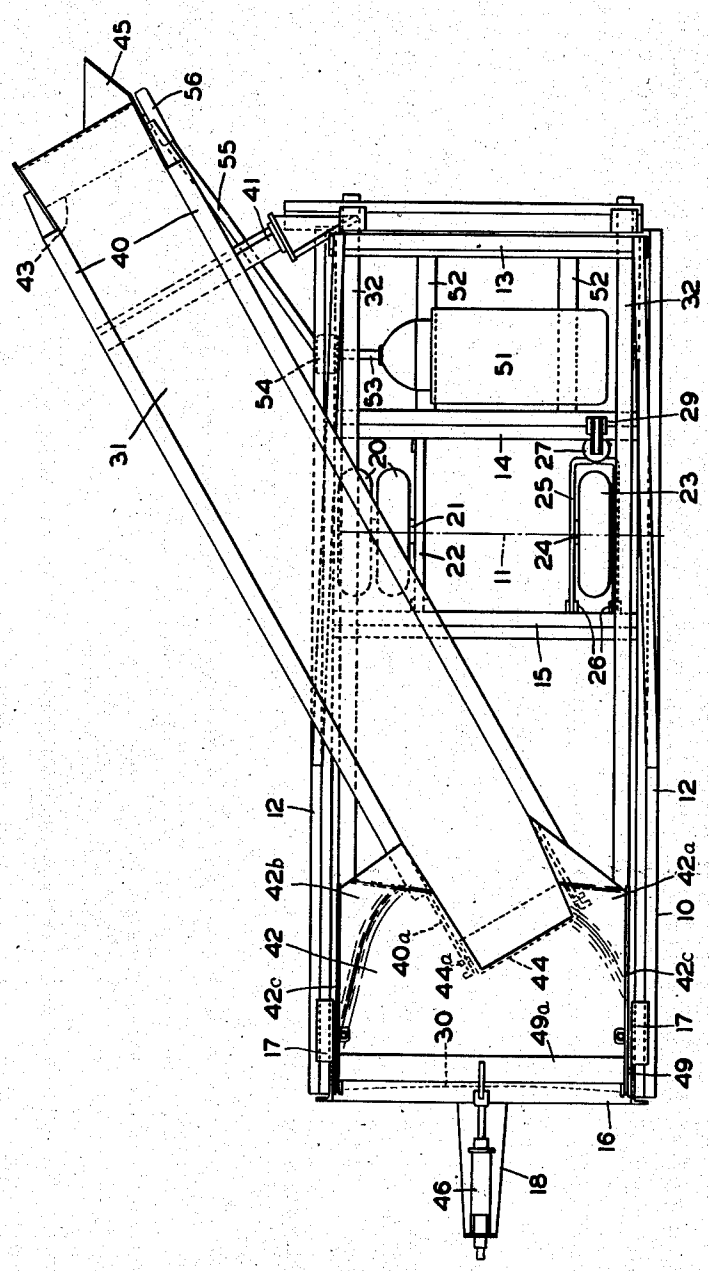


FIG. 1

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CONVEYER LOADER WITH DIAGONAL BELT

Filed Sept. 29, 1941 4 Sheets-Sheet 2

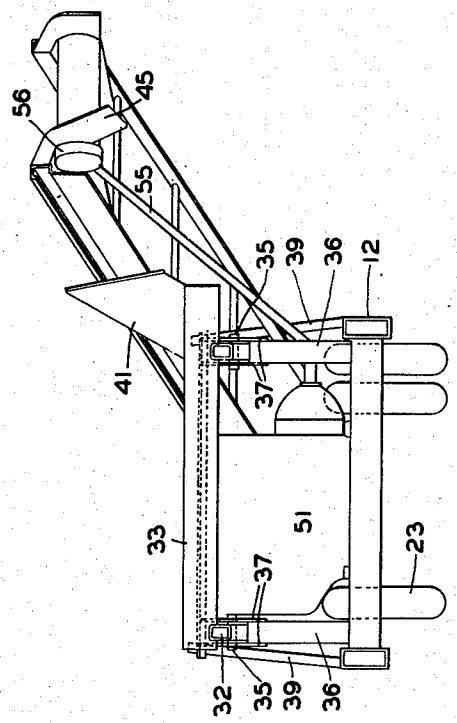


FIG.-3

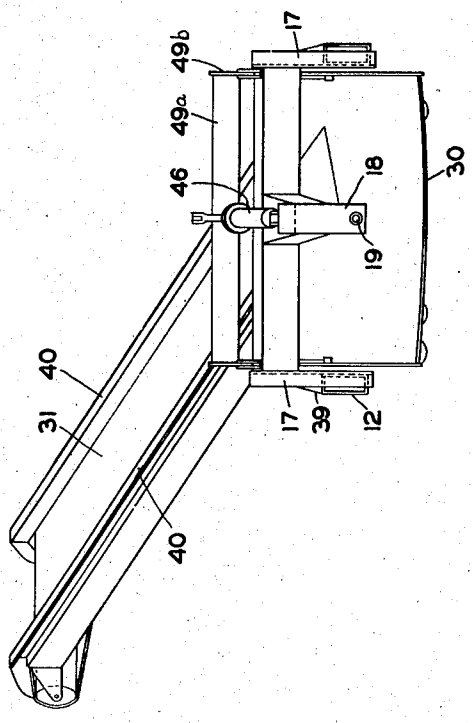


FIG.-2

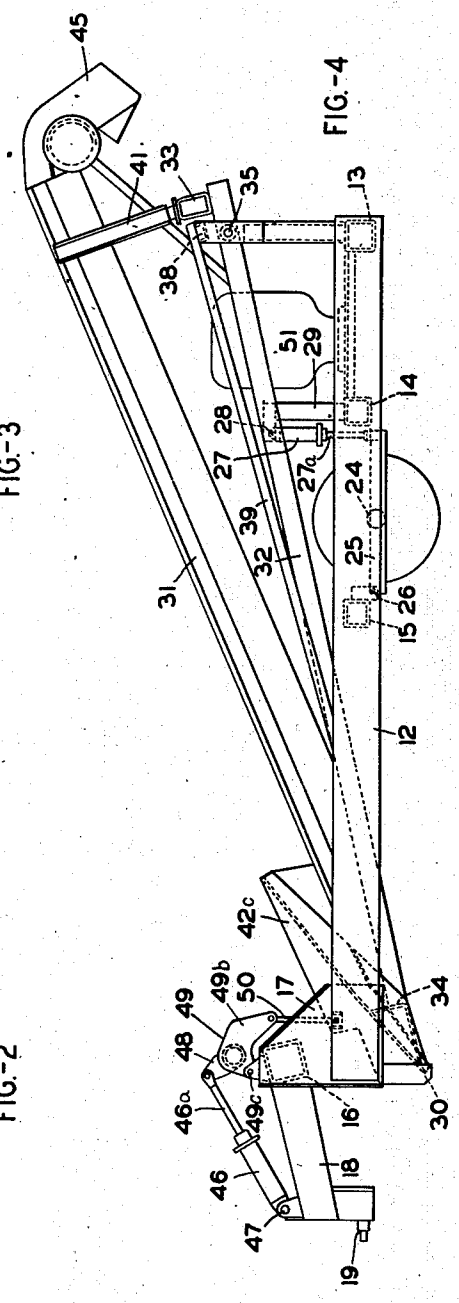


FIG.-4

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CONVEYER LOADER WITH DIAGONAL BELT

Filed Sept. 29, 1941 4 Sheets-Sheet 3

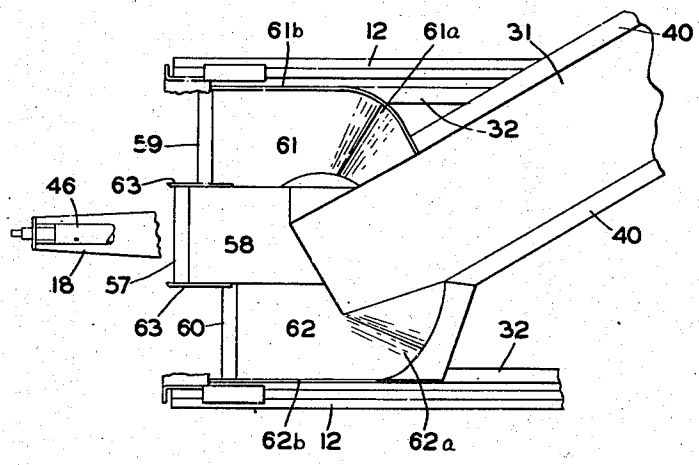


FIG.-5

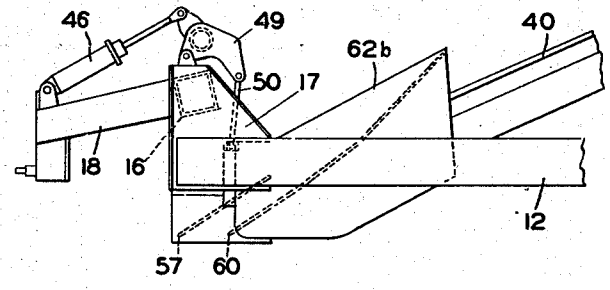


FIG.-6

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CONVEYER LOADER WITH DIAGONAL BELT

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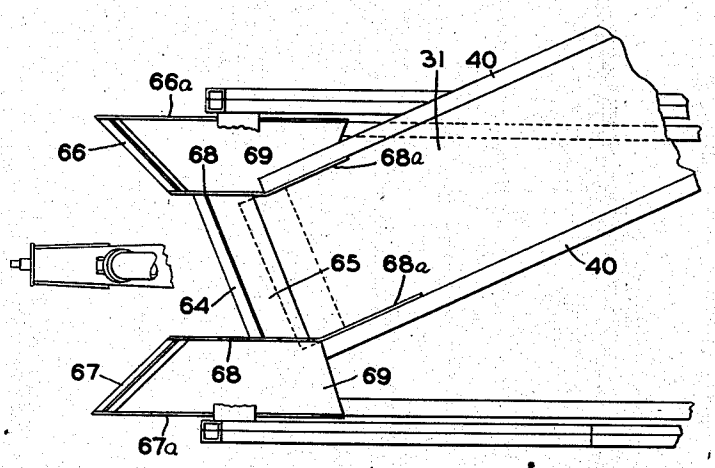


FIG.-7

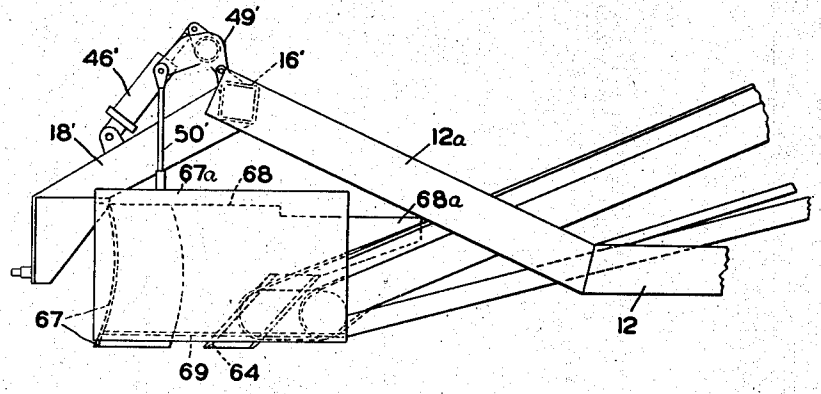


FIG.-8

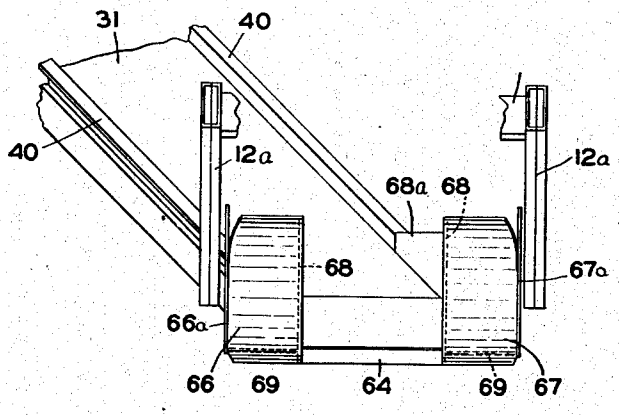


FIG.-9

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UNITED STATES PATENT OFFICE

2,386,187

CONVEYER LOADER WITH DIAGONAL BELT

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Application September 29, 1941, Serial No. 412,762

10 Claims. (Cl. 37—110)

This invention relates to improvements in conveyer loaders, i. e., apparatus adapted while traveling to excavate earth beneath it and to convey the earth to a loading point outside the vehicle.

An object of the present invention is to provide apparatus adapted to excavate a large amount of earth per foot of vehicle travel and to converge the excavated material from a wide area to a comparatively narrow conveyer for lifting the material upward and to one side for loading into another vehicle for transportation.

Among the objects of the present invention is the provision of a conveyer of great capacity arranged in as small a space as possible, together with novel means for loosening dirt or similar material and directing it to the conveyer.

In the drawings, Fig. 1 is a top plan view of one form of the invention; Fig. 2 is a front elevation of the same; Fig. 3 is a rear elevation of the same; Fig. 4 is a side elevation of the same; Fig. 5 is a top plan view of the front portion of a modified form of the device; Fig. 6 is a side elevation of the same; Fig. 7 is a top plan view of the front portion of another modification of the device; Fig. 8 is a fragmental side elevational view of the device of Fig. 7; and Fig. 9 is a fragmental front elevation of the device of Figs. 7 and 8 with parts broken away to more clearly show the blade and moldboard construction.

The present invention is designed to provide a vehicle which as it moves along loosens dirt over a large cross sectional area, say for instance of the order of nine feet wide and one foot deep. This material is then concentrated at the lower end of a conveyer and thereafter elevated by the conveyer to a point overhanging one side of the vehicle where the material may be discharged into a dump wagon or the like traveling alongside the excavating vehicle. The purpose of the invention is to excavate the dirt from the large cross sectional area and transfer it quickly up the conveyer to the waiting vehicle so that a good-size load may be obtained with a comparatively short travel of the two vehicles. The invention has been described in connection with a trailer vehicle but it will be understood that many of the features thereof might be applied to a self-propelled vehicle.

In the embodiment shown in Figs. 1 to 4, a main frame 10 supporting all of the parts is supported by wheel means on the axis 11 which is located a little to the rear of the center of the vehicle but in such a position that the load before and behind the axis 11 is in comparatively good balance so that the entire device may be pushed backward or forward somewhat after the manner of a cart, thus giving good maneuverability in either forward or reverse direction. The frame comprises heavy longitudinally extending side members 12 which are hollow beams preferably formed of channels welded flange to flange. A suitable number of cross beams are provided as indicated at 13, 14, 15 and 16. It will be noted that beam 16 is connected to beams 12 by brackets 17 so as to be well up out of the way of the excavated material. A drawbar 18 extends forwardly from the center of beam 16 and is provided with a connection 19 for attachment to a pulling vehicle.

The wheel means here shown comprises a double wheel assembly 20 on the side nearest the overhung conveyer and mounted on an axle 21 which is supported between one of the side frames 12 and a frame member 22 which extends between the cross beams 14 and 15. This double wheel assembly is not adjustable. On the other side of the vehicle is a single wheel 23 which is mounted for adjustability in a vertical direction so as to vary the angle of the cutting blade with reference to the ground, thus permitting the digging of a level surface on a side hill.

The means for thus adjusting the position of wheel 23 is best seen in Figs. 1 and 4. The axle 24 for wheel 23 is mounted in a yoke 25 which is pivotally connected at 26 with beam 15. The other end of the yoke is pivotally connected to the piston rod 27a of a fluid operated hoist or hydraulic jack 27, the cylinder of which is connected at 28 to a bracket 29 supported on beam 14. Means not shown is provided for operating the piston of the jack 27 in a vertical direction thus varying the position of the axle 24 relative to the axle 21 and providing the desired tilting of the frame in a transverse direction.

For supporting the cutting blade 30 and the conveyer 31 a movable frame is provided comprising side push beams 32 which are connected together at the rear end by a rigid hollow transverse beam 33 and at the forward end by a triangular shaped hollow beam 34 which backs up the cutting blade 30. This movable frame is pivotally mounted on the main frame at the pins 35. The supports for these pins comprise the hollow posts 36 at the rear of the vehicle having side plates 37 at their upper ends providing the mounting for the pins 35. These posts are connected across the top by a hollow beam 38 which is braced at each side by the members 39 which extend forwardly and downwardly to a point of connection with the side frame members 12.

The conveyer here illustrated is of the endless belt type comprising a frame 40 which is supported at its upper end by a bracket 41 mounted on beam 33. The conveyer frame is also supporetd where it crosses the push beam 32 and at at its lower end is further supported by means of the moldboard 42 which will be later described. At its upper end the conveyer frame supports a head pulley 43 and at its lower end is a tail pulley 44. Around these pulleys passes the usual endless conveyer belt supported by suitable idler rollers (not shown) along the entire length of the conveyer. At least one of the pulleys 43, 44 is adjustable longitudinally for tightening the conveyer belt. In the present instance the tail pulley 44 has its shaft 44*a* mounted in slots in the frame brackets 40*a*. At its upper end the conveyer is provided with a small discharge chute 45 which aids in directing the discharged material into a vehicle beneath the overhanging end of the conveyer. Construction of this partial chute may be clearly understood from Figs. 1 and 4. It has one side wall only, which begins near the upper end of the conveyer on that side thereof which is nearer the path of travel of the conveyer loader, and this side wall then extends outwardly from the end of the conveyer and toward the center line of the conveyer extended. The bottom plate of the chute is generally triangular in form, as clearly appears, having one side connected with the bottom edge of the above described side wall, having a second side extending across the head end of the conveyer, and having its third side extending substantially parallel to the path of travel of the conveyor loader, as clearly seen in Fig. 1. It results from this construction that the earth discharged from the side of the conveyor which is nearer the path of travel of the loader is diverted into the earth discharged from the other side of the conveyer, thus concentrating the stream which is deposited in the receiving vehicle alongside. Because this chute is of small triangular form there is no tendency for it to clog.

The moldboard 42 provides means for conducting and directing earth excavated for the full width of blade 30 to a zone at the lower end of conveyer 31. The blade 30 is preferably slightly curved as indicated best in Fig. 2 and the moldboard 42 is provided with the necessary warped surfaces to direct the loosened dirt upwardly at a fairly steep angle, say approximately 45° to the conveyer belt and with the necessary lateral movement at the points 42*a* and 42*b* so that all of the dirt from the full width of the excavating blade converges to a relatively limited zone near the tail pulley of the conveyer. One of the advantages of the diagonal arrangement of the conveyer relative to the main frame is that it gives more available area at the lower end of the conveyer crosswise of the main frame and positioned to receive the material from the blade 30 with the minimum of travel. At the same time the angle of vertical inclination of the conveyer is fixed by the safe angle at which the dirt may be conveyed without rolling back down the conveyer. Therefore the diagonal arrangement gives the shortest conveyer for achieving the desired maximum height at the head pulley 43 while keeping the main frame of the vehicle within minimum dimensions. It will be seen that the center of the tail pulley is on the right side of the center line of the main frame as viewed in Fig. 1 while the top of the conveyer overhangs the left side of the vehicle. This arrangement is the best possible one for getting dirt excavated by a wide blade to the lower end of the conveyer with the minimum travel of the dirt over the moldboards.

Means is provided for raising and lowering the movable frame about the pivots 35 so as to control the cutting blade 30. Obviously the moldboard and the conveyer move with the cutting blade as the movable frame is oscillated. The means for controlling the elevation of the blade comprises a power cylinder and piston motor such as the hydraulic jack 46 having its cylinder pivotally mounted at 47 on a bracket connected with the drawbar 18 and having its piston rod 46*a* connected to the crank arm 48 which is rigidly connected with the blade control yoke 49. This yoke comprises a crossbar in the form of a cylindrical tube 49*a* having rigidly connected to its opposite ends the arms 49*b* which are pivoted at 49*c* to brackets on the beam 16. The outer end of each arm 49*b* is connected by a lift link 50 with one of the vertical side plates 42*c* of the moldboard. Thus the operation of the jack 46 by means not shown will raise and lower the blade 30 relative to the main frame of the trailer vehicle.

Drive means for the conveyer as well as pressure fluid for operation of jacks 27 and 46 may be provided on the trailer vehicle itself. In the present instance an internal combustion engine 51 is mounted on beams 52 which are supported between beams 13 and 14. This engine drives a shaft 53 which through bevel gearing 54 drives shaft 55 which in turn through gearing in housing 56 rotates the head pulley 43. The engine also drives a suitable compressor or pump to provide the pressure fluid for the jacks 27 and 46. The details of this construction form no part of the present invention and therefore need not be further described.

The second modification shown in Figs. 5 and 6 was designed for the same purpose as the first form but with the added advantage of shortening the travel of the dirt excavated toward the sides of the cutting blade to the conveyer belt. Since the design of this second form is like that of the first form except as regards the moldboard means, similar parts have been given similar reference characters and will not be further described here.

Substantially centrally of the front end of the vehicle and directly in front of the lower end of the conveyer is a cutting blade 57. This blade as shown is approximately one-third the total width of the cutting blade means but need not necessarily be limited to that exact dimension. A moldboard 58 conducts the material cut by this blade directly to the lower end of the conveyer 31. Two other blades 59 and 60 are located one on each side of the blade 57 and offset therefrom in a fore and aft direction. As here shown these blades are rearwardly of blade 57 so as to cut down the necessary travel of the dirt along the moldboards 61 and 62 respectively, which discharge on the conveyer 31 above the point where the dirt from blade 57 drops onto the conveyer. Suitable warped surfaces are provided at the points 61*a* and 62*a* to give the necessary lateral movement of the dirt onto the conveyer. Vertical side boards 61*b* and 62*b* confine the dirt on the moldboards and serve as connecting points for the links 50. Preferably other vertical dividing boards 63 are provided between moldboards 58, 61 and 62 so as to direct the dirt in three substantially parallel streams rearwardly for the first portion of its course.

A third modification is shown in Figs. 7, 8 and 9 where the parts are again generally similar to those already described in connection with the first modification and therefore only the differences need be described here. One change has been made in the frame wherein the side frame members 12 have upwardly inclined rigid forward portions 12a extending up to the cross beam 16' to which the drawbar 18' is attached. This gives a stronger construction than that shown in the first described form and gives greater clearance over the cutting blades.

Here a cutting blade 64 is arranged centrally of the forward end of the vehicle and directly in front of the conveyer 31. A short moldboard 65 directs excavated material to the lower end of the conveyer. Wing blades 66 and 67 are provided one on each side of and ahead of the blade 64. These wing blades are inclined inwardly and rearwardly so as to direct earth excavated thereby to a zone in front of the blade 64. Thus the dirt loosened by the wing blades is piled upon the ground excavated by the blade 64 and all of the dirt is conducted by moldboard 65 to the conveyer. The blades 66 and 67 are preferably concave forwardly in a generally vertical direction as best indicated in Fig. 8. Vertical side boards are provided at 66a and 67a and other vertical walls 68 provide supporting members between blade 64 and each of the wing blades. These plates 68 are extended at 68a to provide skirt boards where the dirt is discharged on the lower end of the conveyer belt. Other strengthening and reinforcing plates 69 are secured horizontally between plates 68 and plates 66a and 67a respectively so as to provide a stronger construction at this point.

Similar means is provided for controlling the height of the cutting blades relative to the main frame of the vehicle. A jack 46' supported by drawbar 18' has its piston rod connected to the lift yoke 49' which is connected by links 50' to the vertical side boards 66a and 67a.

What we claim is:

1. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined endless belt conveyer mounted on said frame, said conveyer having its lower end near the ground near the forward end of said frame, a scraper blade located at the forward end of said frame ahead of said conveyer, a scraper blade laterally at one side of and to the rear of said first named blade, both of said blades being adapted to enter the ground, and moldboard means adapted to receive earth from both of said blades and to conduct and direct the same to a zone near the lower end of said conveyer.

2. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined endless belt conveyer diagonally mounted on said frame at an angle to said path of travel, said conveyer having its lower end near the ground near the forward end of said frame, said conveyer having its upper end overhanging one side of said frame near its rear end sufficiently to discharge conveyed material into a vehicle alongside said apparatus, scraper blade means located at the forward end of said frame ahead of said conveyer and adapted to enter the ground, said blade means including nonalined blades spaced one ahead of the other and laterally offset from each other, and moldboard means adapted to receive earth from said blades and to conduct the same to a zone near the lower end of said conveyer.

3. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined endless belt conveyer diagonally mounted on said frame at an angle to said path of travel, said conveyer having its lower end near the ground near the forward end of said frame, said conveyer having its upper end overhanging one side of said frame near its rear end sufficiently to discharge conveyed material into a vehicle alongside said apparatus, scraper blade means located at the forward end of said frame ahead of said conveyer and adapted to enter the ground, said blade means including a central blade extending transversely of said path of travel and a blade on each side of said central blade and rearwardly thereof, and moldboard means adapted to receive earth from said blades and to conduct the same to a zone near the lower end of said conveyer.

4. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined endless belt conveyer mounted on said frame, said conveyer having its lower end near the ground near the forward end of said frame, a scraper blade located at the forward end of said frame ahead of said conveyor, a scraper blade laterally at one side of and extending forwardly of said first named blade, said second named blade being inclined rearwardly toward said first named blade to direct earth excavated by said second named blade generally toward said conveyor, both of said blades being adapted to enter the ground, and moldboard means adapted to receive earth from both of said blades and to conduct and direct the same to a zone near the lower end of said conveyer.

5. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined endless belt conveyer mounted on said frame, said conveyer having its lower end near the ground near the forward end of said frame, a scraper blade located at the forward end of said frame ahead of said conveyer, two scraper blades located forwardly of said first named blade one at each side thereof, each of said two last named blades being inclined rearwardly toward said first named blade to direct earth excavated by said last named blades generally toward said conveyer, all of said blades being adapted to enter the ground, and moldboard means adapted to receive earth from all of said blades and to conduct the same to a zone near the lower end of said conveyer.

6. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined endless belt conveyer mounted on said frame, said conveyer having its lower end near the ground near the forward end of said frame, a scraper blade located at the forward end of said frame ahead of said conveyer, two scraper blades located forwardly of said first named blade one at each side thereof, each of said two last named blades being inclined rearwardly toward said first named blade to direct earth excavated by said last named blades to a zone in front of said first named blade, and moldboard means between said first named blade and the lower end of said conveyer.

7. Earth handling apparatus comprising a frame, drawbar means at the front end of said frame whereby said apparatus may be pulled along a path, an inclined conveyer diagonally mounted on said frame at an angle to said path

of travel, said conveyer having its lower end near the ground and nearer one side of said frame near the forward end of said frame, said conveyer having its upper end overhanging the other side of said frame near the rear end thereof and high enough to discharge earth into a vehicle alongside said frame, scraper blade means wider than said conveyer located at the forward end of said frame head of said conveyer and adapted to enter the ground, moldboard means adapted to receive earth from said entire blade means and to conduct and direct the same to a zone near the lower end of said conveyer, coaxial wheel means spaced transversely across said frame nearer the center than to either end thereof, said wheel means constituting the sole support for said frame other than said drawbar means, so that said apparatus may be rapidly moved backward and forward like a cart while loading a vehicle drawn alongside under the discharge end of said conveyer.

8. Earth handling apparatus provided with wheel means for travel in a path and comprising an inclined conveyer mounted at an angle to said path of travel, said conveyer having its lower end near the ground, said conveyer having its upper end located at one side of said path and high enough to discharge earth into a vehicle traveling parallel to said path, earth excavating means ahead of said conveyer and adapted to load loosened earth on the lower end of said conveyer, and a partial chute immediately in rear of the upper end of said conveyer and on that side nearer said path only, said chute having one side wall only and a bottom, said side wall beginning near the upper end of said conveyer on the side thereof nearer said path and then extending outwardly and toward the center line of said conveyer extended, whereby the earth discharged from the side of said conveyer nearer said path is diverted into the earth discharged from the other side of said conveyer to form a concentrated stream without clogging of the chute.

9. Earth handling apparatus comprising a frame, wheel means supporting said frame for travel in a path, an inclined conveyer diagonally mounted on said frame at an angle to said path of travel, said conveyer having its lower end near the ground and nearer one side of said frame near its forward end, said conveyer having its upper end overhanging the other side of said frame and high enough to discharge earth into a vehicle alongside said frame, scraper blade means wider than said conveyer located at the forward end of said frame ahead of said conveyer and adapted to enter the ground, and moldboard means adapted to receive earth from said entire blade means and to conduct and direct the same to a zone near the lower end of said conveyer, said blade means extending entirely in front of said wheel means so that when said apparatus is travelling forward said wheel means travels solely on ground cut by said blade means.

10. Earth handling apparatus comprising a frame, drawbar means at the front end of said frame whereby said apparatus may be pulled along a path, an inclined conveyer diagonally mounted on said frame at an angle to said path of travel, said conveyer having its lower end near the ground and nearer one side of said frame near the forward end of said frame, said conveyer having its upper end overhanging the other side of said frame near the rear end thereof and high enough to discharge earth into a vehicle alongside frame, scraper blade means wider than said conveyer located at the forward end of said frame ahead of said conveyer and adapted to enter the ground, moldboard means adapted to receive earth from said entire blade means and to conduct and direct the same to a zone near the lower end of said conveyor, coaxial wheel means spaced transversely across said frame nearer the center than to either end thereof, said wheel means constituting the sole support for said frame other than said drawbar means, and said blade means extending entirely in front of said wheel means so that when said apparatus is travelling forward said wheel means travels solely on ground cut by said blade means, and said apparatus may be rapidly moved backward and forward like a cart while loading a vehicle drawn alongside under the discharge end of said conveyer.

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