

June 11, 1940.

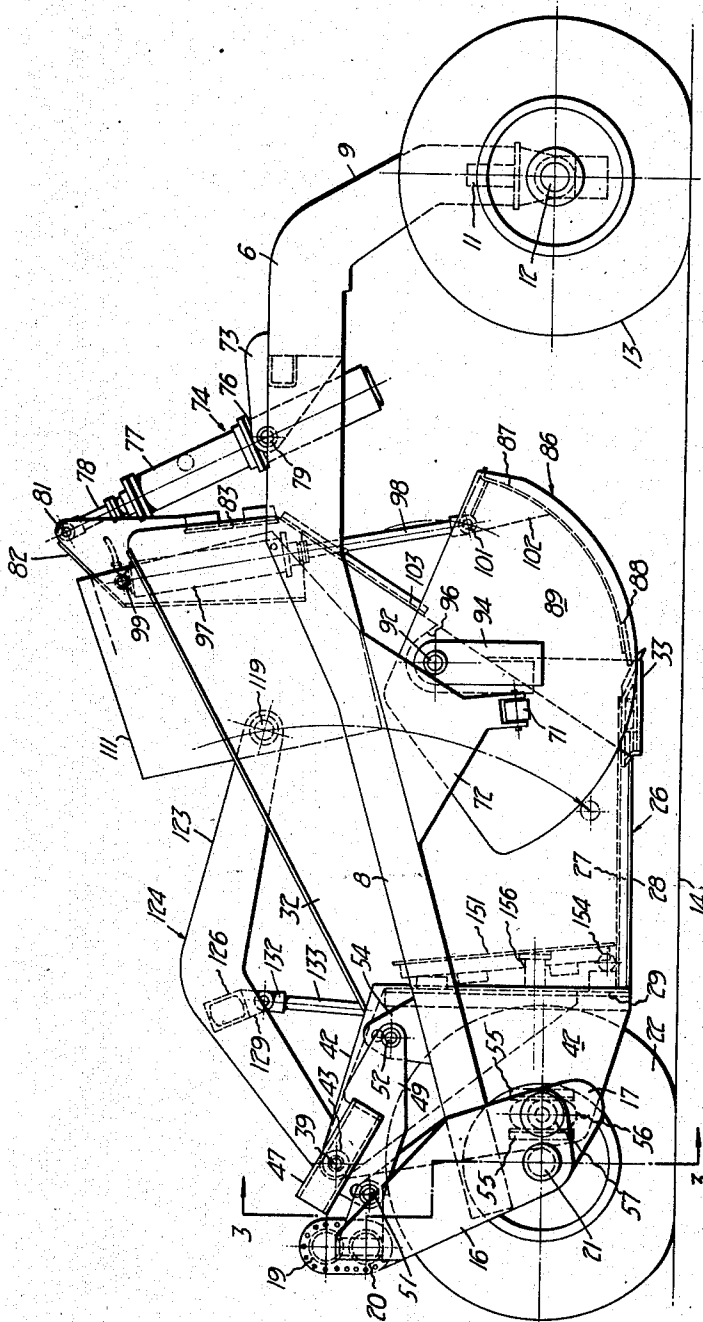
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2,203,713

EARTH MOVER

Filed Aug. 12, 1937

6 Sheets-Sheet 1



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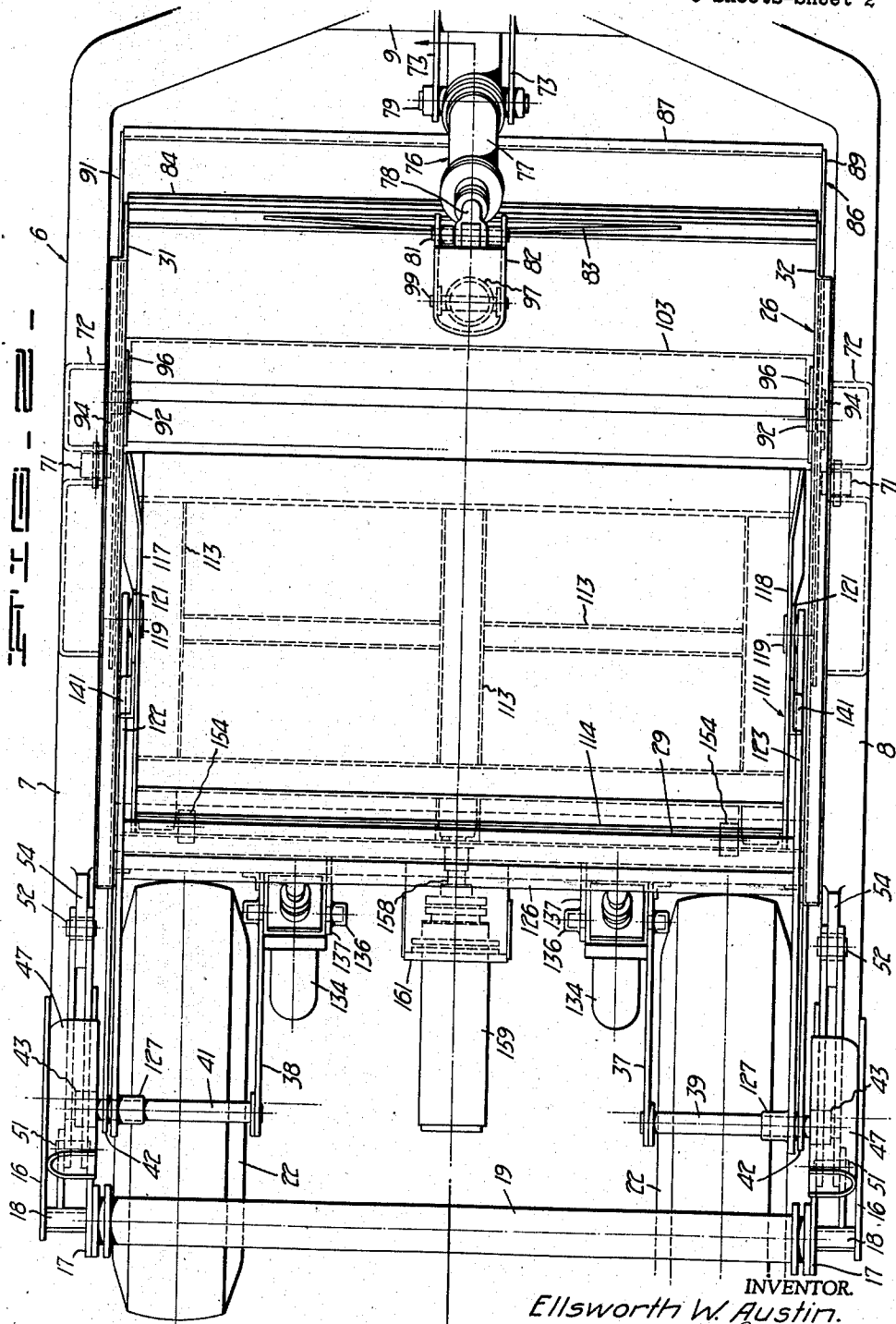
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6 Sheets-Sheet 3

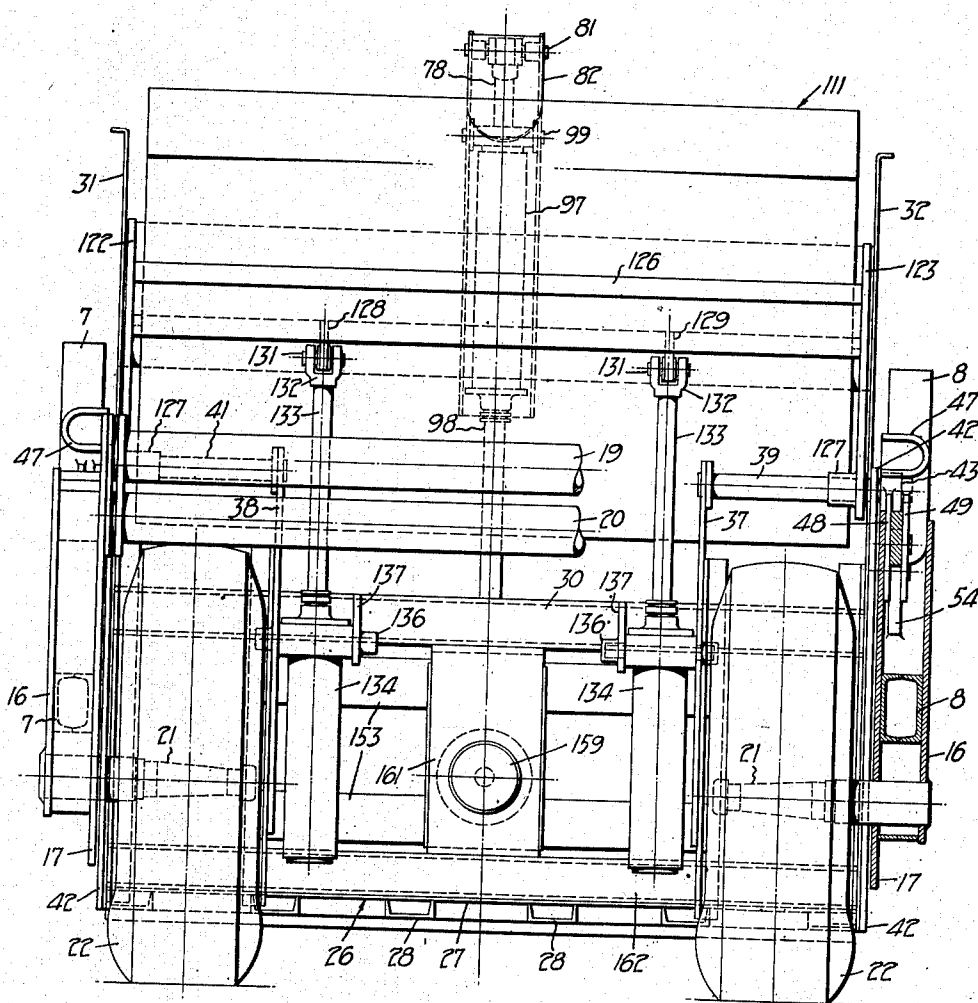


FIG. 3.

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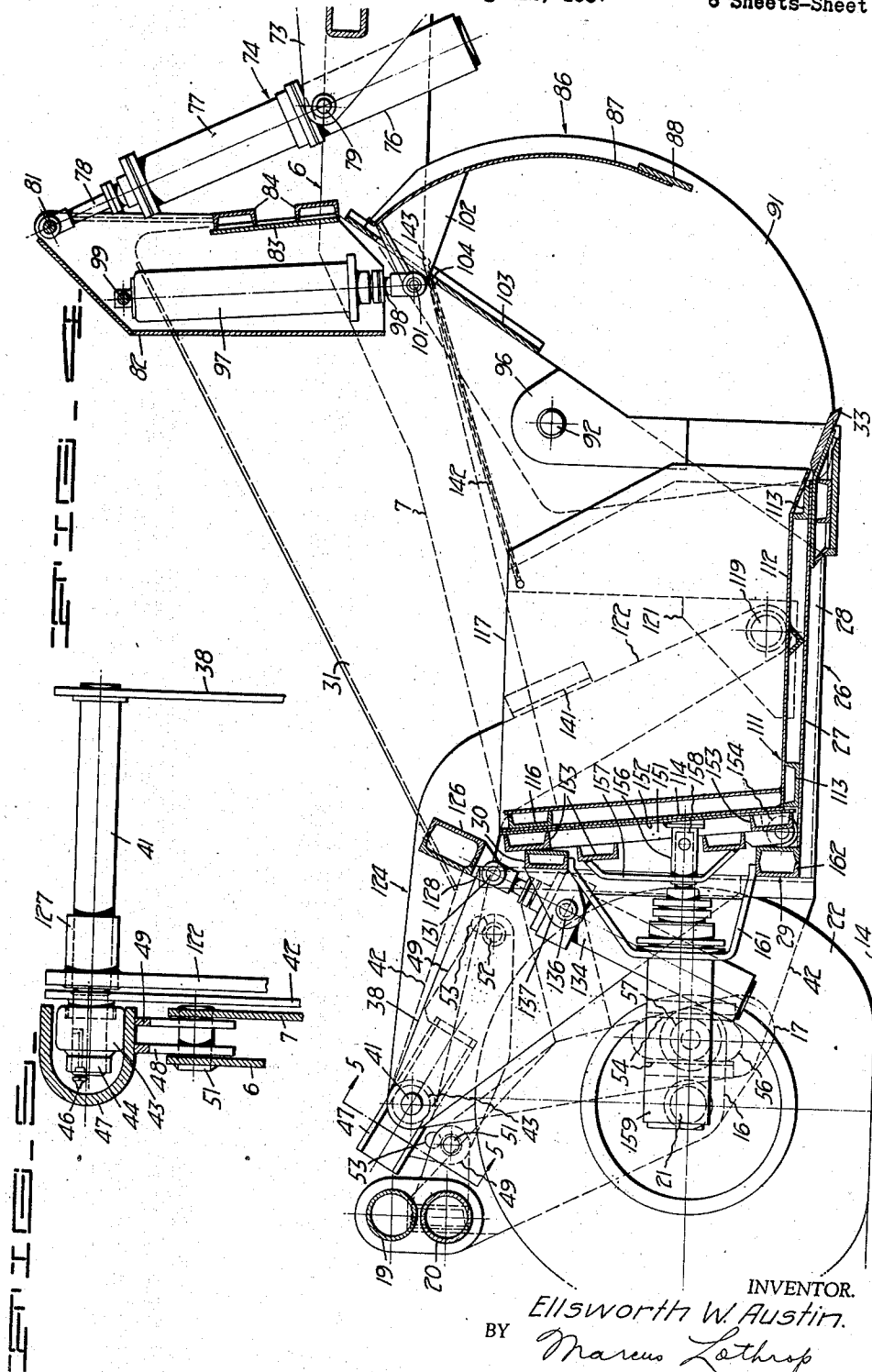
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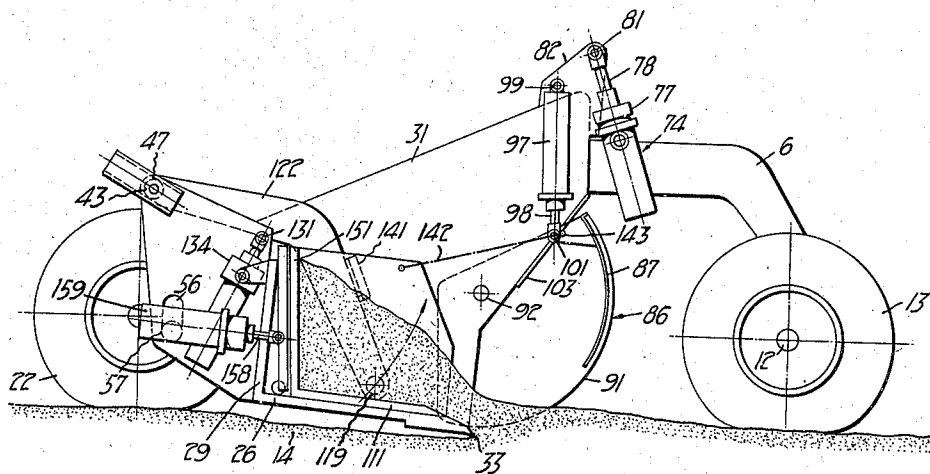


FIG. 6.

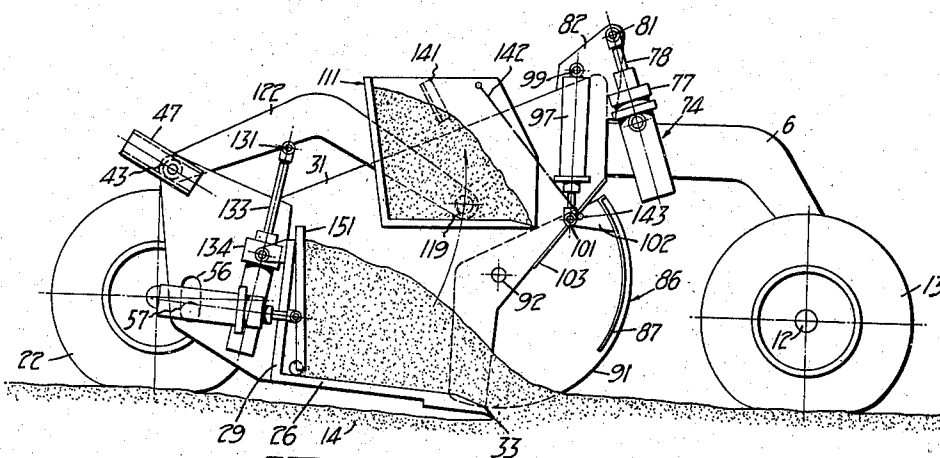


FIG. 7.

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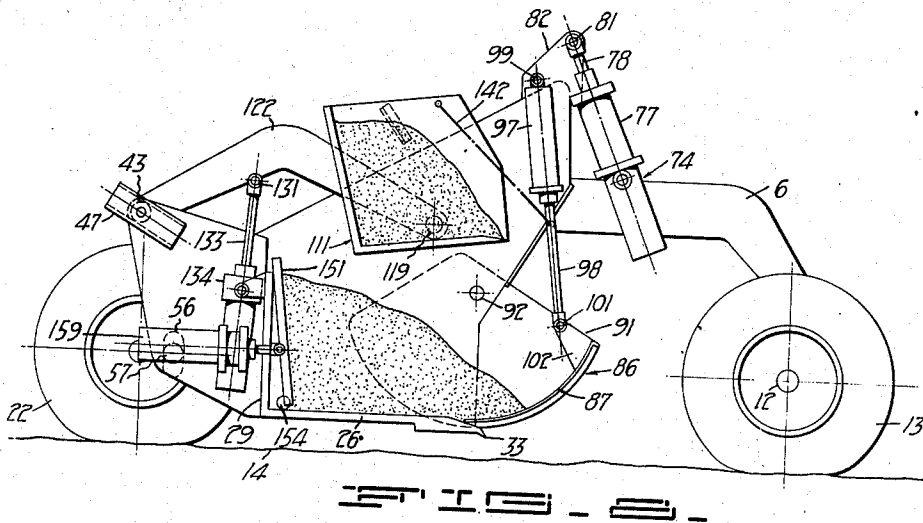
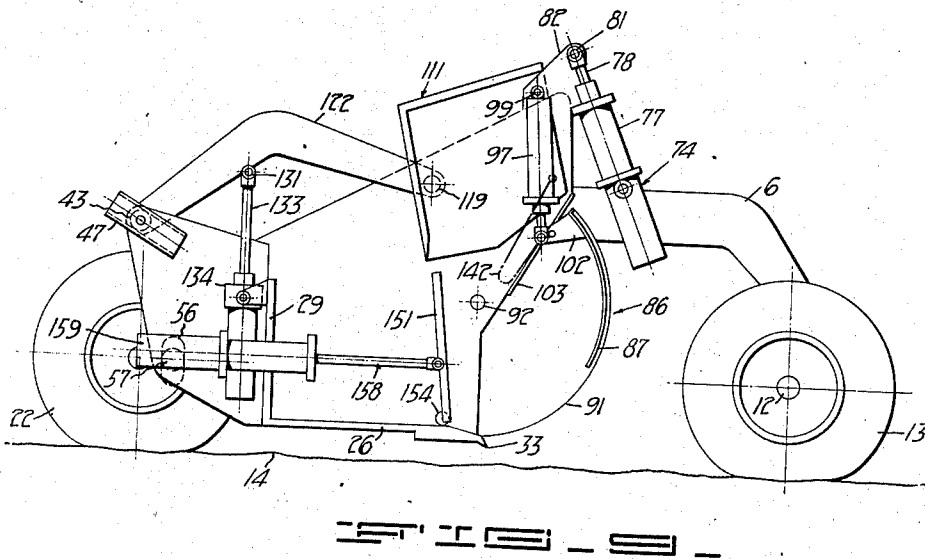
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EARTH MOVER

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,203,713

EARTH MOVER

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Application August 12, 1937, Serial No. 158,638

15 Claims. (Cl. 37—126)

My invention relates to carriages for excavating and transporting material such as earth. A structure of this general character is disclosed in my copending application entitled "Earth mover," Serial No. 103,972, filed October 5, 1936.

It is an object of my invention to provide a generally improved earth mover.

Another object of my invention is to provide an earth mover in which the carrying capacity of the mover is substantially equal to its excavating capacity.

Another object of my invention is to provide an earth mover in which the discharge of material is carefully controlled.

Another object of my invention is to provide an earth mover having a very large carrying capacity yet with a relatively short wheel base.

An additional object of my invention is to provide an earth mover in which the angle of the cutting edge can be varied appreciably without unduly tipping the main bowl.

Another object of my invention is to provide an earth mover with an auxiliary bowl which is automatically dumped and righted after dumping.

Another object of my invention is to provide an earth mover the various movable parts of which are all controllable by an operator at a remote point.

The foregoing and other objects are attained in the embodiments of the invention illustrated in the drawings, in which—

Fig. 1 is a side elevation of an earth mover constructed in accordance with my invention.

Fig. 2 is a plan of the earth mover shown in Fig. 1, certain portions being broken away to reduce the size of the figure.

Fig. 3 is a rear elevation of the structure shown in Fig. 1, portions of the figure being broken away to show in cross-section on the line 3—3 of Fig. 1.

Fig. 4 is a cross-section the plane of which is indicated by the line 4—4 of Fig. 2.

Fig. 5 is a detail, in cross-section, the plane of which is indicated by the line 5—5 of Fig. 4.

Fig. 6 is a diagram, partly in cross-section, showing the earth mover of my invention in one position.

Fig. 7 is a diagrammatic view similar to Fig. 5, showing my earth mover in a different position.

Fig. 8 is a diagrammatic view similar to Fig. 6, showing the earth mover of my invention in a further different position.

Fig. 9 is a diagrammatic figure similar to Fig. 6,

showing my earth mover in a still different position.

In its preferred form, the earth mover of my invention includes a main frame on which a main bowl is mounted for movement about an axis away from the main frame and within which an auxiliary bowl is adapted to nest, being movable into an elevated position by virtue of an articulation with an auxiliary frame and being designed to dump automatically, when elevated, between the main bowl and a movable front apron.

In the form of earth mover shown in the drawings, there is preferably provided a main frame 6 constituted of side beams 7 and 8, at their forward ends merging in a yoke 9 which terminates in a swivel connection 11 supported by a front axle 12 at the extremities of which ground-engaging members, such as wheels 13, are rotatably mounted. A suitable connection (not shown) to any kind of draft mechanism, such as a tractor, is preferably provided on the axle 12. The side members 7 and 8 approach the ground 14 as they proceed rearwardly. Each of them is substantially identical with the other in construction, and terminates between an outer end plate 16 and an inner end plate 17 spaced by braces 18. The two inner plates 17 at their upper ends are spanned by a pair of stiffening tubes 19 and 20, which are conveniently bolted in place to reinforce the rear portion of the main frame. The lower parts of the side plates 16 and 17 together serve as mountings for aligned stub axles 21 directed inwardly toward each other and each serving as a support for a ground-engaging wheel 22.

Carried on the main frame 6 is a main bowl 26 for the reception of the excavated material, such as earth. This bowl is preferably made up of a bottom plate 27, suitably reinforced by longitudinally extending channel irons 28, a rear frame 29 likewise reinforced by channels 30, and a pair of similar side plates 31 and 32 arranged to be united to the rear frame 29 and the bottom plate 26, respectively, yet having adequate clearance between the side beams 7 and 8.

The leading edge of the main bowl is provided with a blade or cutter 33 for engagement with the ground 14, and in order movably to relate the leading edge 33 with the main frame 6, I provide an articulation between the main bowl and the frame in such a way that the bowl pivots about an axis or center which is horizontal and transverse of the machine but is some distance away from the frame itself. Thus the effect of

an extra long wheel base is obtained without the extra length and cumbersomeness in maneuvering that such an extended wheel base would entail.

5 On the end frame 29 is a pair of mounting plates 37 and 38, each of which is substantially triangular in side elevation and at its upper extremity serves as a support for one of a pair of stub shafts 39 and 41. Each stub shaft is likewise supported by a rearward extension 42 from the adjacent one of the side plates 31 and 32. At the outer terminus of each of the stub shafts 39 and 41 there is rotatably mounted a follower or roller 43 held in place by a lock collar 44 and 15 provided with lubricant through a fitting 46.

In accordance with my invention, the weight of the main bowl, which is transmitted to the two rollers 43, is transferred from each of them to a cam guide 47 which is a U-shaped channel of rectilinear configuration accommodating the roller 43 or cam follower with adequate clearance for free travel thereof in a path defined by the walls of the cam guide. Each guide 47 is mounted by a pair of sleeves 48 and 49, which are 20 fastened by a pair of pins 51 and 52, to the main frame 6, and alternative holes 53 are provided for changing the inclination of the cam guide 47 to vary the path of movement of the roller 43. The pin 51 pierces the inner end plate 17, while 30 the pin 52 pierces an ear 54 welded to its respective one of the side beams 7 and 8.

To supplement the operation of the cam guides 47 in defining the motion of the main bowl with respect to the main frame, I provide on each side 35 of the machine an additional cam guide in the nature of a pair of parallel angles 55 arranged substantially vertically and in registry with the boundary of an elongated aperture 56 in extension plate 42. Acting as a follower, is a roller 57 40 situated between the angles 54 and journaled on an axle which spans the space between the plates 16 and 17. In addition to the foregoing restraints upon the movement of the main bowl, it is generally confined against undue transverse movement 45 by side rollers 71, each of which is carried in a depending box 72 secured to the respective one of the two side beams 7 and 8.

In order to move the main bowl in a generally arcuate manner with respect to the main frame, 50 I preferably mount between a pair of ears 73 on the yoke 9 an extensible link 74 which preferably is a telescopic hydraulic mechanism 75 having an intermediate cylinder 77 and a plunger 78. This link is mounted on trunnions 79 engaging the 55 ears 73 and carries a pin 81 at its upper end engaging a pedestal 82 on the main bowl. The pedestal is a box member made up of suitable plates secured to a front cross-plate 83 reinforced by channels 84 and extending from one to the other of the two side plates 31 and 32. By 60 proper control of the hydraulic actuating fluid of the mechanism 74, the main bowl can be raised and lowered and in effect pivoted about an axis to the rear of the stub axles 21, thus raising and 65 lowering the cutting edge 33 but varying its angularity due to change in elevation less than it would vary if the center of rotation were on the main frame 6 and closer to the cutting edge.

To co-operate with the main bowl in retaining 70 therein earth received over the cutting edge 33, I provide a front apron 86 which preferably includes an arcuate center plate 87 having an abutting strap 88 on its rearward edge to contact the cutter 33 and joined at its opposite sides to apron 75 side plates 89 and 91, respectively, extending out-

side of the side plates 31 and 32. The front apron is mounted for pivotal movement with respect to the main bowl by pins 92 passing through the side plates 89 and 91 as well as the side plates 31 and 32 and reinforced by plates 94 on the plates 89 and 91 and reinforcing plates 96 on the side plates 31 and 32. 5

In order to effectuate rotary movement of the front apron about the pivot pins 92, I preferably provide an extensible link in the form of a hydraulic cylinder 97 having a piston rod 98 movable therein under the influence of hydraulic fluid admitted to and expelled from the cylinder. The cylinder is preferably mounted upon a pin 99 acting as a trunnion and journaled in the 10 plates forming the pedestal 82, the pedestal itself serving as a partial enclosure for the cylinder 97. The piston rod 98 is connected by a pivot pin 101 to a bracket 102 secured to the arcuate center plate 87 of the front apron. Movement of the 20 piston rod 98, therefore, produces a corresponding rotary movement of the front apron with respect to the main bowl.

Since the front apron in its lowermost position does not extend for the full height of the side 25 plates 31 and 32, I preferably introduce a deflecting plate 103 between the side plates 31 and 32 and locate it just below the spanning plate 83. The deflecting plate 103 is provided with an aperture 104 through which either the bracket 102 or 30 the piston rod 98 extends during apron movement, so that when the front apron is in its lowermost position, earth can be retained in the main bowl not only by the front apron but likewise by the deflecting plate 103 and the spanning plate 83. 35

In order materially to increase the carrying capacity of my earth mover and to bring the carrying capacity into close accord with the excavating capacity of the machine, I preferably provide means for receiving and transporting 40 substantially a complete load of earth in a position out of the excavating position, thereby leaving room for an additional load. For this reason I provide an auxiliary bowl 111, adapted to nest within the main bowl and comprised of a bottom 45 plate 112 suitably reinforced by channels 113, a rear plate 114 likewise reinforced by a channel 116, and side plates 117 and 118 respectively, all suitably united by welding. The forward edges 50 of the side plates 117 and 118 and of the bottom plate 112 are flared outwardly to merge smoothly with the interior walls of the main bowl. In the position shown in Fig. 4, for example, the outward flare of the bottom 112 substantially continues the inclination of the cutting edge 33 of the 55 main bowl 26.

In order suitably to mount the auxiliary bowl out of the way of loading of the main bowl, I preferably provide each of the side walls 117 and 118 with a pivot pin 119 suitably mounted between the respective side walls and reinforcing plates 121 thereon. The pins 119 are preferably located forwardly of the center of gravity of the 60 auxiliary bowl and are received in arms 122 and 123, forming part of an auxiliary frame, generally designated 124. Incorporated in the auxiliary frame is a transverse box beam 126 comprised of a pair of spacing channels welded together for 65 effectively uniting the two arms 122 and 123 for movement in unison. Each of these arms extends rearwardly and at its rearward extremity is provided with a sleeve 127 forming a journal rotatable about the stub shaft 39 or 41, so that the auxiliary frame 124 always partakes of the 75

movement of the main bowl yet is pivotally mounted with respect thereto.

To move the auxiliary frame 124 with respect to the main bowl and with respect to the main frame, I preferably mount on the transverse box beam 126 a pair of depending ears 128 and 129 each of which is connected by its pivot pin 131 with a clevis 132 on a piston rod 133 extending from and constrained to move with respect to a hydraulic cylinder 134. Each cylinder is on a trunnion mounting 136 between a plate 137 extending from the rear frame 29 of the main bowl and the adjacent one of the mounting plates 37 and 38. Operation of the cylinders 134 in unison raises and lowers the auxiliary frame 124 by rotation about the stub shafts 39 and 41 as pivotal axes and raises and lowers the pivot pins 119. Since the center of gravity of the auxiliary bowl is to the rear and above the pivotal axis of the pins 119, the auxiliary bowl is unstable. The tendency is toward anti-clockwise rotation, as seen in Fig. 4, of the auxiliary bowl with respect to its supporting beams. This movement is precluded by stop angles 141 extending from the sides 117 and 118 of the auxiliary bowl and in the normal position of the bowl lying against the arms 122 and 123.

The auxiliary bowl is movable out of nested position by operation of the hydraulic cylinders 134, and ordinarily is carried considerably above the main bowl when loaded. To discharge the auxiliary bowl from elevated position, I provide means for automatically inverting it as it is elevated. To each of the side plates 117 and 118 I fasten one of a pair of chains 142, which is likewise secured at a suitable point 143 to the deflector plate 103. As the auxiliary bowl is elevated, it is inverted by the pull of the chains 142. During inversion, the center of gravity shifts forwardly of the pivot pins 119 and the auxiliary bowl then remains in inverted position until such time as the auxiliary frame 123 is lowered, whereupon the forward edges of the side plates 117 and 118 abut against the deflector plate 103 and rotate the auxiliary bowl in a counterclockwise direction. As soon as the center of gravity passes to the rear of the pins 119, the auxiliary bowl returns gravitally to normal position with the stop angles 141 abutting the arms 122 and 123.

As a means for assisting in the discharge of the material accumulated in the main bowl, I preferably provide an earth barrier 151 composed of a suitable plate 152 reinforced by channels 153. This barrier is located transversely between the side walls of the main bowl and is partially supported by rollers 154 bearing upon the bottom plate 27 of the main bowl. Extending from the earth barrier is a hub 156, reinforced by an arch plate 157 welded to the rear of the barrier. Within the hub is pinned the piston rod 158 of a telescopic piston and cylinder 159. The cylinder 159 is carried by an arched plate frame 161 secured to transverse reinforcing channels 162 spanning the rear frame 29 of the main bowl. By operation of the cylinder 159, the earth barrier can be moved forwardly within the main bowl to discharge earth therefrom and can be retracted into a quiescent position interposed between the main bowl and the auxiliary bowl nested therein.

In the general operation of the device, as especially shown in Figs. 6 to 9, the structure first occupies an excavating position substantially as shown in Fig. 6, with the earth barrier interposed between the main bowl and the auxiliary bowl,

and the auxiliary bowl nested within the main bowl to receive the earth. The front apron is raised to admit the earth freely, and the main bowl is oriented with respect to the main frame in order to give the desired depth of cut. When the auxiliary bowl has been substantially charged with material by continued operation, the extensible link controlling the operation of the auxiliary frame is extended so that the auxiliary frame is raised and the auxiliary bowl is lifted 10 above the loading line of the main bowl. The auxiliary bowl is stable in such position, since its center of gravity is well behind the axis of pivotal support.

As the earth mover is further advanced, the 15 main bowl itself is then charged. There is the substantial equivalent of two loads of earth excavated and carried by my earth carrier in distinction to the single load which ordinarily it is possible to transport. During the latter part of 20 the loading of the main bowl, the front apron is gradually closed to accommodate the forward spill which accumulates during excavation. The main bowl is then elevated into the general carrying position as shown in Fig. 8.

When the earth mover is to be discharged, the 25 front apron is raised, permitting material to be released over the cutting edge of the main bowl, and the auxiliary frame is further raised so that the taut chains 142 move the auxiliary bowl in 30 a clockwise direction until its center of gravity passes forwardly of the pivot pins and the bowl tips to discharge the load therefrom. The load in spilling is confined against the plates 83 and 103 and discharges between the cutting edge and 35 the front apron, so that the front apron is available for regulation of the discharge onto the ground of the load from the auxiliary bowl. Finally, after the auxiliary bowl has been discharged and is still in elevated position, the earth 40 barrier is moved forwardly from its rearmost position and gradually discharges the entire load of the main bowl over the cutting edge, this discharge likewise being controllable by suitable manipulation of the front apron.

At the conclusion of discharge of the earth mover, the earth barrier is moved rearwardly in the main bowl to its normal position, the auxiliary frame is lowered, permitting the auxiliary bowl to be rotated in an anti-clockwise position 50 about its pivotal mounting on the arms 122 and 123 by reason of contact with the wall 103, and upon further lowering movement the auxiliary bowl comes to rest nested within the main bowl with the earth barrier interposed between the 55 auxiliary and main bowls. The front apron is moved into a suitable position for excavating, and the main bowl is moved into a suitable angle for further work.

I claim:

1. An earth mover comprising a frame, a main bowl mounted upon said frame, an auxiliary bowl nested within said main bowl, an earth barrier between said nested bowls, means for moving said auxiliary bowl out of nested position, and means 65 for moving said earth barrier.

2. An earth mover comprising a frame, a main bowl mounted upon said frame, an earth barrier movable within said main bowl, and an auxiliary bowl movable into a position in the path of said 70 earth barrier and within said main bowl.

3. An earth mover comprising a main frame, a main bowl on said main frame in a position to receive excavated earth through the front of said bowl, an auxiliary frame articulated with said 75

main frame, an auxiliary bowl articulated on said auxiliary frame, means for elevating said auxiliary bowl from an earth-receiving position within said main bowl to an earth-carrying position above said main bowl with respect to said main frame, and means for dumping said auxiliary bowl when said auxiliary bowl is in said elevated carrying position.

4. An earth mover comprising a main bowl, a front apron pivoted on said main bowl, an auxiliary bowl nested within said main bowl, means for elevating said auxiliary bowl with respect to said main bowl, and means for dumping said auxiliary bowl when elevated into said main bowl and said front apron.

5. An earth mover comprising a main bowl, a front apron movable into a position to close said main bowl, an auxiliary bowl within said main bowl and movable into a position above said main bowl, and means for discharging a load from said elevated auxiliary bowl onto a load retained by said main bowl and said front apron.

6. An earth mover comprising a main bowl, a front apron movable from a position closing said main bowl to a position spaced from said main bowl, an earth barrier movable within said main bowl to a position adjacent said front apron, an auxiliary bowl, and means for discharging a load from said auxiliary bowl between said earth barrier and said front apron.

7. An earth mover comprising a main bowl having a discharge edge, a front apron movable against and away from said edge, an earth barrier movable within said main bowl to and away from said edge, and an auxiliary bowl adapted to discharge over said edge between said earth barrier and said front apron.

8. An earth mover comprising a frame, a main bowl movably mounted on said frame in a position directly to receive excavated earth, an earth-receiving auxiliary bowl mounted on said frame for movement into and out of a position intercepting receipt of earth by said main bowl, an earth barrier movably mounted between said bowls to discharge earth from said main bowl when said auxiliary bowl is out of intercepting position, a front apron mounted on said main bowl for movement out of and into a position intercepting receipt of earth by both said auxiliary bowl and said main bowl, and means for individually moving said main bowl, said auxiliary bowl, said earth barrier and said front apron.

9. An earth mover comprising a main frame, a main bowl, means mounting said main bowl on said main frame for movement about an approximate center beyond the physical limits of said main frame, an auxiliary frame movably mounted on said main frame, an auxiliary bowl movably mounted on said auxiliary frame to move into and out of nested position with said main bowl, means for individually moving said main bowl with respect to said main frame, and means for individually moving said auxiliary frame with respect to said main bowl.

10. An earth mover comprising a frame, a main bowl, an extensible link connecting said main bowl and said frame, and means for mounting said main bowl on said frame including a cam

guide and roller connection between the bowl and the frame and supplemental guide means between the bowl and the frame, the cam guide being disposable at different angles with respect to the bowl and to the frame for confining said bowl to approximately pivotal movement about any selected one of several axes.

11. An earth mover comprising a frame, means for supporting said frame upon the ground, a bowl, an articulation between said frame and said bowl including at each side of said bowl a pair of cam guides and cam followers disposed to confine movement of said bowl to rotation about an axis to the rear of said frame, and an extensible link connecting said bowl and said frame.

12. An earth mover comprising a frame, a main bowl having a bottom and an open front mounted upon said frame, an auxiliary bowl having a bottom and an open front mounted upon said frame, means mounting said auxiliary bowl for movement from a first position within said main bowl and in which there is a minimum perpendicular distance between said bowl bottoms to a second position in which there is an increased perpendicular distance between said bowl bottoms, and means for moving said auxiliary bowl between said first and said second positions.

13. An earth mover comprising a frame, a main bowl having side walls, a bottom and an open front mounted upon said frame to receive earth excavated by the forward movement of said earth mover, an auxiliary bowl having a bottom and an open front and of a size to be nested within said main bowl between the side walls thereof, and means for moving said auxiliary bowl in a direction perpendicular to said bottom into a nested position between said side walls to receive earth excavated by the forward movement of said earth mover and in a direction perpendicular to said bottom out of nested position whereby excavated earth is received by said main bowl.

14. An earth mover comprising a main bowl having side walls and a bottom, an auxiliary bowl nested within said main bowl between said side walls, means for elevating said auxiliary bowl with respect to said main bowl in a direction perpendicular to said bottom, and means for automatically dumping said auxiliary bowl into said main bowl during elevation thereof.

15. An earth mover comprising a main frame adapted to advance over the ground, a main bowl having a cutting edge and adapted directly to receive excavated earth as said frame advances, means for moving said main bowl with respect to said main frame, an auxiliary frame movable between a raised position and a lowered position with respect to said main frame, means for moving said auxiliary frame with respect to said main frame between said positions, and an auxiliary bowl mounted on and movable with respect to said auxiliary frame, said auxiliary bowl in said lowered position of said auxiliary frame being nested within said main bowl and in said raised position of said auxiliary frame being located over and apart from said main bowl.

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