Nov. 8, 1938. J. P. HEIL 2,136,102

SCRAPER

Filed Jan. 22, 1936 3 Sheets-Sheet 1

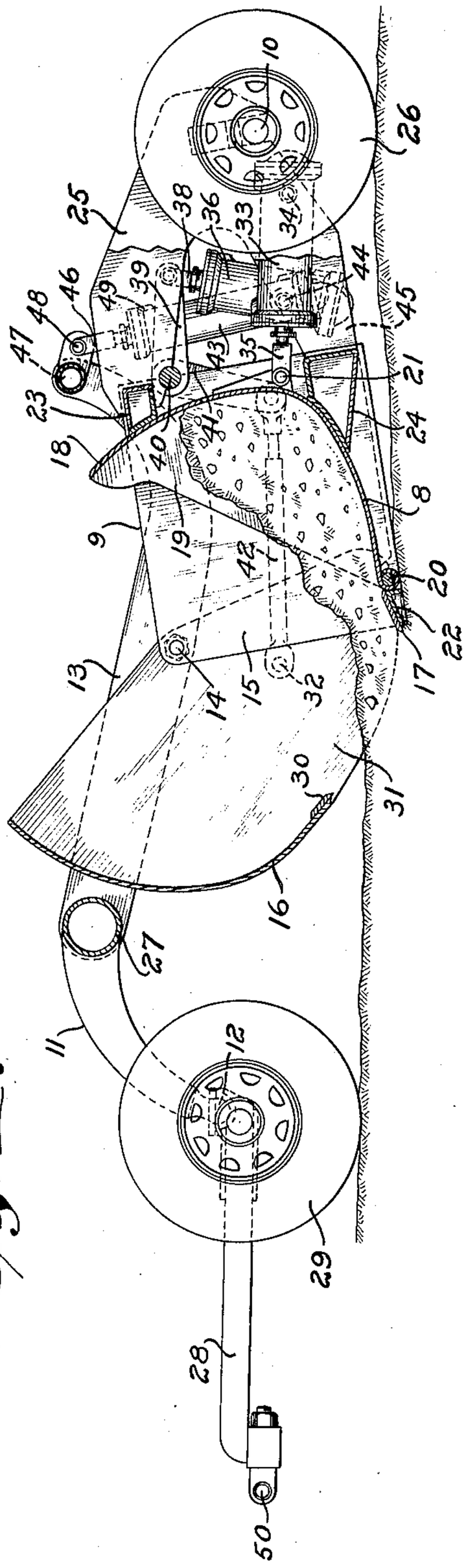


Fig. 1.

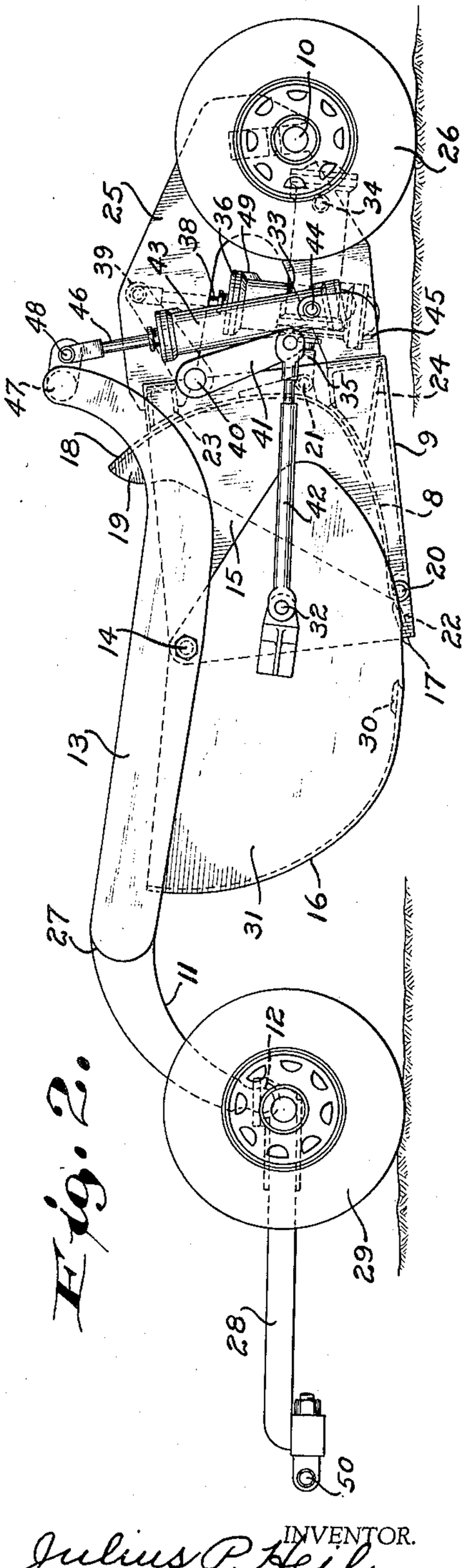


Fig. 2.

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Filed Jan. 22, 1936 3 Sheets-Sheet 2

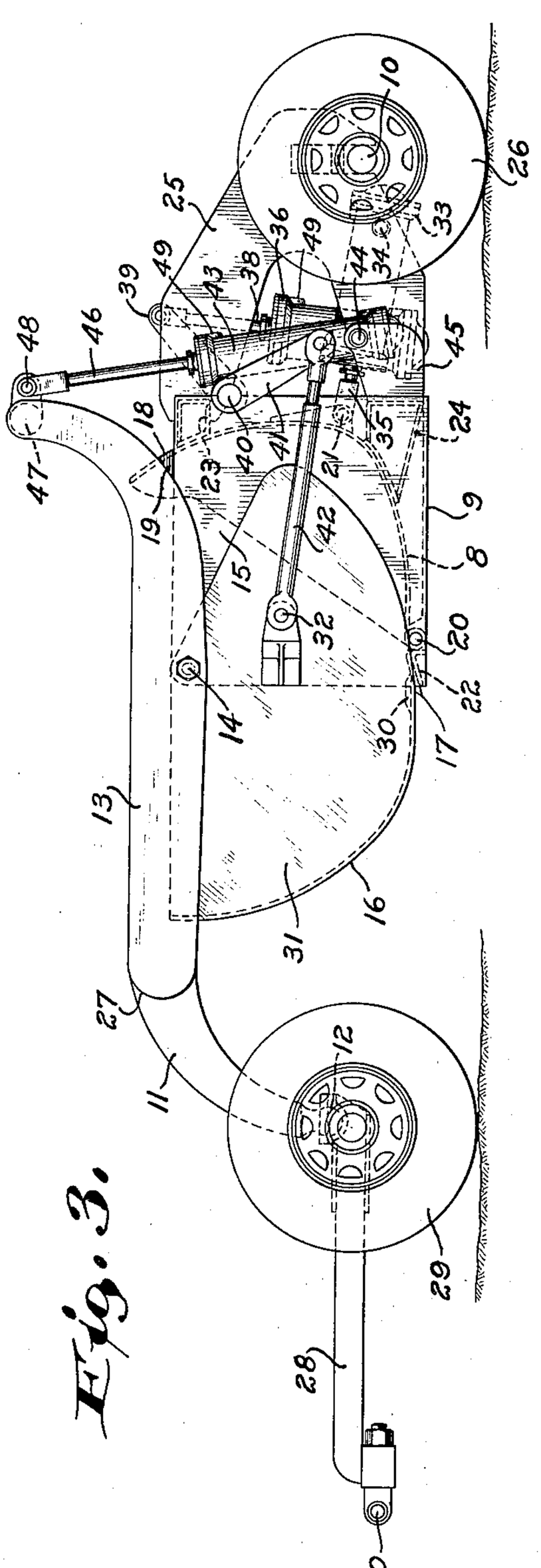


Fig. 3.

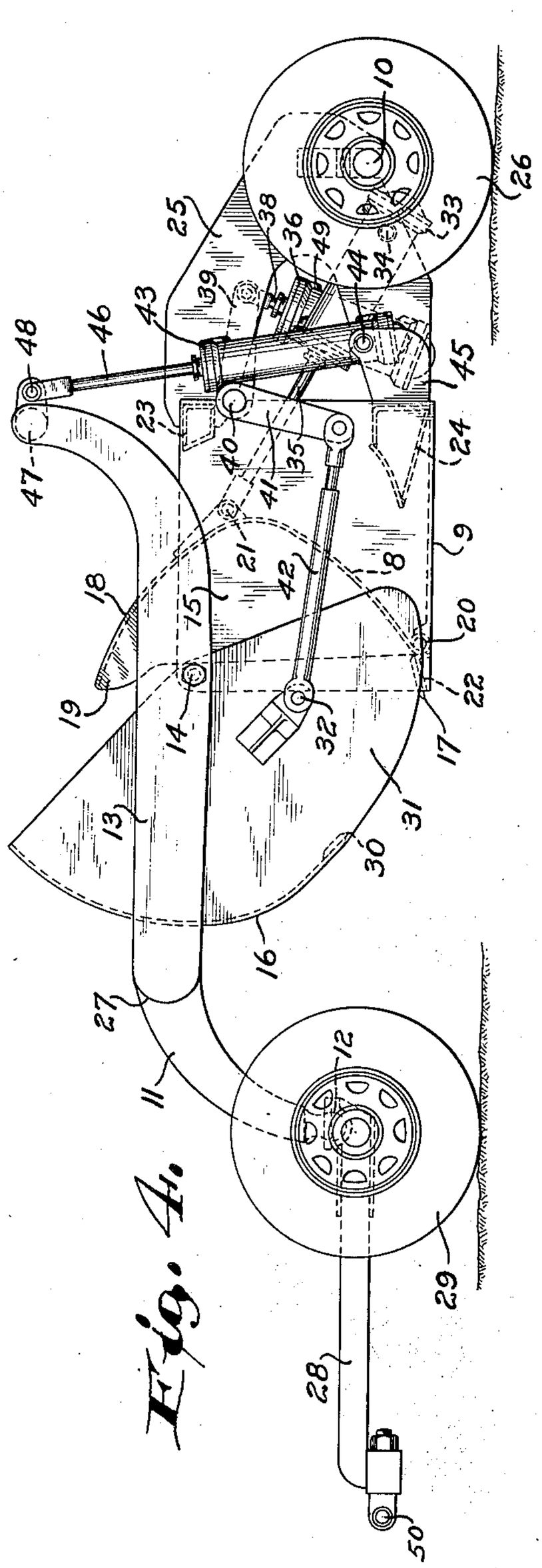


Fig. 4.

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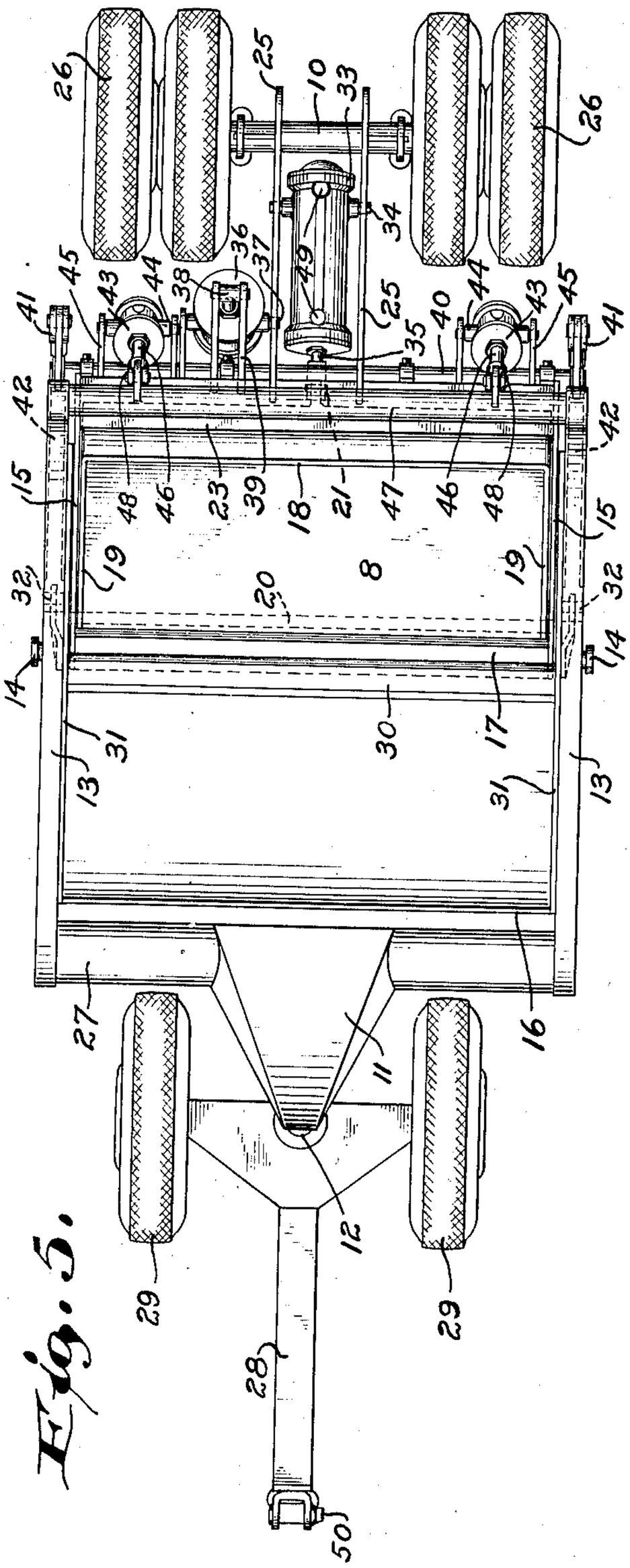


Fig. 5.

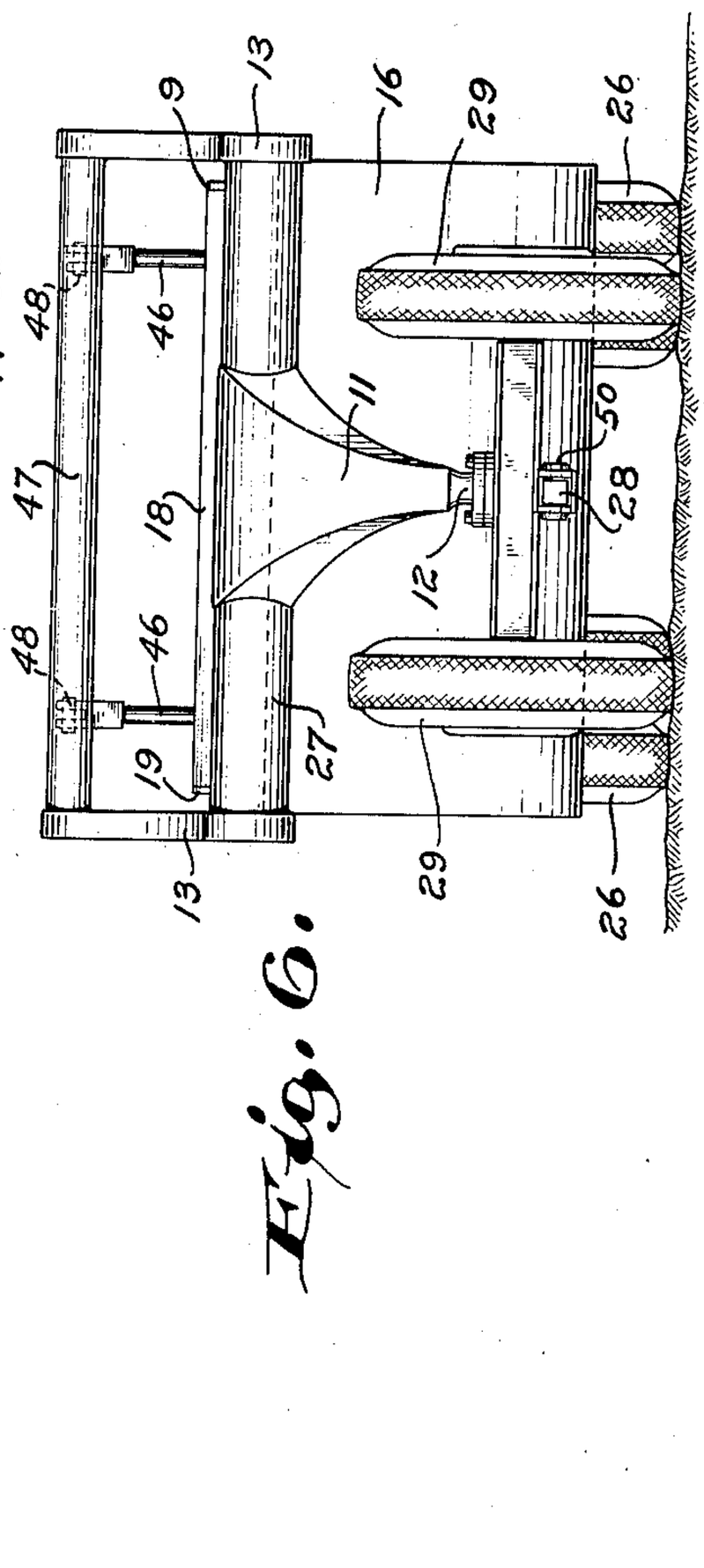


Fig. 6.

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Patented Nov. 8, 1938 2,136,102

UNITED STATES PATENT OFFICE

2,136,102

SCRAPER

Julius P. Heil, Whitefish Bay, Wis., assignor to The Heil Co., Milwaukee, Wis., a corporation of Wisconsin

Application January 22, 1936, Serial No. 60,245

23 Claims. (Cl. 37—126)

My present invention relates generally to improvements in the art of grading, and relates more specifically to improvements in the construction and operation of mechanical scrapers for leveling and transporting ground.

Generally stated, an object of my present invention is to provide an improved scraper assemblage which is simple, compact and durable in construction, and which is moreover highly efficient and flexible in operation.

As shown and described in the prior application of Earl B. Maloon, Serial No. 43,137, filed October 2, 1935, Patent No. 2,095,759, it has heretofore been proposed to provide a mechanical scraper assemblage comprising a main dirt receiving bowl open at its opposite ends and tiltable about a rear pivot, a main frame tiltable about a front pivot and having spaced rearwardly extending rigid arms the medial portions of which are pivotally connected to the front end of the bowl, a front apron swingable toward and away from the front of the bowl, a rear apron swingable longitudinally within the bowl, and means for relatively moving the frame and bowl and the aprons during normal operation of the machine. In this prior machine, the function of the front apron is to confine dirt within the main bowl by closing the front end of the latter during transportation of the loads, and the purpose of the rear apron is to enclose the rear end and to eject the load from within the main bowl when the front apron has been withdrawn. The aprons are swingable back and forth by means of hydraulic jacks, and because of the fact that the rear apron must travel a considerable distance in order to insure complete removal of the dirt, it requires an actuating jack having a relatively long stroke especially in scrapers of large capacity. Then too, because of the fact that this rear apron must shift the entire charge directly along the bottom of the main bowl during the unloading operation, it necessitates provision of a relatively large and powerful jack for advancing the rear apron, thus making this prior structure relatively cumbersome and costly in construction especially with reference to the rear upon assemblage.

It is therefore a more specific object of my present invention to provide an improved scraper of the above defined general type, having new and useful mechanism of simplified construction for unloading the charges with minimum power consumption.

Another specific object of the present invention is to provide an assemblage wherein the main dirt receiving and carrying bowl and the rear apron are combined into a single unit which is merely tilted during the unloading operation so as to effect removal of the charge by gravity, thereby materially facilitating and hastening the delivery of the load.

A further specific object of my invention is the provision of a hydraulically actuated jack assemblage for delivering the charges from a scraper bowl, which is simple and compact in construction, and which is furthermore extremely effective in operation.

Still another specific object of this invention is to provide improved bowl supporting and actuating structure especially applicable to dig and carry scrapers of large capacity, and which greatly facilitates the manipulation of such machines.

These and other specific objects and advantages of my present invention, will be apparent from the following detailed description.

A clear conception of an embodiment of my present invention, and of the mode of constructing and of manipulating scrapers built in accordance with the improvement, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a part sectional side view of one of the improved scrapers, showing the same in digging or loading position with the front apron elevated;

Fig. 2 is a side elevation of the scraper unit showing the same just after final loading but prior to complete elevation of the cutting edge, the front apron having been moved to partially closed position;

Fig. 3 is a side elevation of the scraper assemblage, showing the parts in load transporting position with the front apron completely closed;

Fig. 4 is a side elevation of the scraping machine, showing the front apron and the main bowl in charge unloading position;

Fig. 5 is a full top view of the improved scraper; and

Fig. 6 is a front view of the machine.

While the invention has been shown and described herein as having been applied specifically to a road scraper of the dig and carry type having the front apron and the main bowl hydraulically actuated, it is not desired to unnecessarily restrict the scope by virtue of this specific embodiment.

By referring to the drawings, it will be noted that the present improved scraper assembly com-

prises in general a main receptacle or bowl 8 which is swingably mounted within a bowl support 9, the latter being pivotally mounted to swing about the rear axle 10; a main frame 11 supported to tilt or swing about a front fulcrum 12 and having rearwardly projecting spaced integral side arms 13 extending along the opposite sides of the bowl support 9; alined pivots 14 connecting the opposite side walls 15 of the support 9 with medial portions of the arms 13; a front apron 16 swingably suspended from the pivots 14 and movable toward and away from the transverse cutter 17 carried by the support 9; a plurality of independently functioning hydraulic jacks for actuating the bowl 8 and apron 16, and for relatively moving the support 9 and the frame 11; and power means of well known construction for operating the jacks.

The main scoop or bowl 8 is preferably formed of relatively heavy sheet metal and has a rear wall 18 and opposite side walls 19 formed rigid or integral with the bottom, the forward portion of the latter being swingably secured to the bowl support 9 closely adjacent to the cutter 17 by means of a stiff pivot 20. The side walls 19 of the bowl 8 are adapted to slide in substantial engagement with the internal surfaces of the side walls 15 of the support 9, and the rear wall 18 of the bowl is provided with integral ears which carry a pivot 21.

The bowl support 9 which is pivotally mounted to swing about the rear axle 10, is also preferably formed of heavy sheet metal plates welded or otherwise rigidly united. The spaced side walls 15 of the support 9, between which the bowl 8 is mounted, are definitely spaced and rigidly interconnected by means of a cutter supporting beam 22 at the lower front portions; and by upper and lower beams 23, 24 respectively, at the rear. These rear beams 23, 24 provide a firm seating for the bowl 8 when the latter is swung rearwardly and downwardly as far as possible about its pivot 20, and other transverse beams may also be provided for the purpose of supporting the rear wall 18 and the bottom of the bowl 8 when the latter is in loading position. The cutter 17 which is shown as being reversibly attached to the beam 22, may if desired, be attached to and carried directly by the bowl 8, this being an obvious modification of the present assembly. The rear beams 23, 24 of the support 9 are also provided with rearwardly extending spaced rigid plates 25 which are swingably associated with the medial portion of the rear axle 10 between the rear wheels 26, as clearly shown in Fig. 6.

The main frame 11 is also preferably formed of heavy steel plate welded or otherwise rigidly united, and the side arms 13 of the frame are of tubular construction being rigidly attached at their forward ends to the opposite ends of a hollow cross-beam 27 the medial portion of which is likewise connected to the front goose-neck which carries the front fulcrum 12. The fulcrum 12 rests upon a suitable draw bar 28 which is supported by the axle of the front wheels 29 in a well known manner. This suspension of the main frame 11 upon the fulcrum 12, and the similar suspension of the bowl support 9 upon the rear axle 10, combined with the attachment between these elements afforded by the pivots 14, provides a toggle whereby the cutter 17 may be raised and lowered relative to the ground.

The front apron 16 which is swingably suspended from the alined pivots 14, is also formed of heavy steel plate and comprises a curved forward wall having a cutter 30 secured to the lower edge thereof, and parallel side plates 31 provided with rear extensions which are slidably cooperable with the external surfaces of the side walls 15 of the bowl support 9. The mounting of this front apron 16 upon the spaced pivots 14, obviously avoids obstruction to loading of the bowl 8 to its fullest extent and above the tops of the walls 15, and the cutter 30 is adapted to cooperate with the main cutter 17 in order to insure complete closure of the front of the bowl 8 when the scraper is loaded. The outer side of each of the side plates 31 is provided with a bracket which carries a pivot pin 32 for effecting manipulation of the apron 16 in a manner to be subsequently described.

The hydraulic jack mechanism for actuating the bowl 8 and the apron 16, and for relatively moving the support 9 and the frame 11, comprises independently operable hydraulic jacks preferably controllable from a remote station such as the operator's seat of a propelling tractor. The main bowl 8 is capable of being swung about its supporting pivot 20 to unload the charges by means of a single double-acting hydraulic jack disposed between the plates 25 of the bowl support 9, and comprising a substantially horizontal cylinder 33 mounted to swing on trunnions 34, and a piston movable within the cylinder 33 and having a rod 35 attached to the pivot 21 carried by the rear wall 18 of the bowl 8. The front apron 16 is swingable about its suspension pivots 14 by means of a single double-acting hydraulic jack disposed adjacent the outer side of one of the plates 25, and comprising a substantially vertical cylinder 36 mounted to swing on trunnions 37, and a piston movable within the cylinder 36 and having a rod 38 pivotally attached to the swinging end of an arm 39 secured to the medial portion of a cross-shaft 40. The cross-shaft 40 is journalled in bearings secured to the rear ends of the side plates 15, and has a lever 41 secured to each of the opposite ends thereof; and each of these levers 41 is pivotally attached to the rear end of a connection or link 42 the front end of which coacts with the corresponding pivot pin 32 carried by the adjacent apron plate 31. The support 9 and frame 11 are relatively movable about the pivots 14 to raise and lower the cutter 17, by means of twin double-acting hydraulic jacks disposed near the rear ends of the frame-arms 13, and each comprising a substantially upright cylinder 43 mounted to swing upon trunnions 44 journalled in ears 45 formed integral with the lower cross-beam 24, and a piston movable within the cylinder 43 and having a rod 46 attached to a cross-beam 47 which rigidly connects the rear ends of the arms 13, by means of a pivot 48. The hydraulic jacks are of relatively standard construction and the cylinders 33, 36, 43 thereof are provided with liquid inlet and exhaust ports 49 at their opposite ends which may communicate with a hydraulic control system of the type forming the subject of a patent, No. 2,112,466, to Earl B. Maloon. The manually operable control valves of this system may, as previously indicated, be located upon the propelling tractor attached to the draw-bar 28 by a coupling pin 50, and may be connected with the ports 49 by means of flexible conduits and piping passing rearwardly through the hollow frame beams 27, 47 and arms 13 so as to avoid interfer-

ing with the normal operation of the mechanisms.

During normal digging operation of my improved scraper unit, the assemblage is being transported along the ground by a tractor attached to the draw-bar 50, and the main bowl 8 and front apron 16 are positioned as shown in Fig. 1. The cutter 17 is then being forced through the ground, and the material which is pried loose by this cutter is caused to advance rearwardly into the bowl and to build up against the rear wall 18 thereof as clearly shown in the drawings. This loading operation of the scraper may continue until the bowl 8 is completely filled so that some of the material will fall forwardly into the front apron 16. When a proper charge has been admitted, the front apron 16 may be lowered by the operator located on the tractor, and the arms 13 of the main frame 11 may be simultaneously elevated to raise the cutter 17 away from the ground, as indicated in Fig. 2. When the piston rod 38 is elevated, the arm 39 and the levers 41 are swung about the axis of the cross-shaft 40, thereby causing the connecting rods 42 to swing the apron 16 toward closed position. When the piston rods 46 are elevated, the arms 13 of the frame 11 will cause the pivots 14 to rise, thereby lifting the cutter away from the ground as previously referred to. During this closing movement of the apron 16, and elevation of the cutter 17, the main dirt carrying bowl 8 remains undisturbed, and the elements eventually resume carrying position as shown in Fig. 3. The load may thereafter be transported by the tractor to any convenient place, and will be effectively confined during such transportation.

When it becomes desirable to unload the scraper, the hydraulic jacks may again be manipulated to position the various parts as shown in Fig. 4. When it is desired to unload, the apron 16 should first be elevated by operation of its actuating jack, whereupon the central substantially horizontal jack may be actuated to tilt the main bowl 8 to the position shown in Fig. 4. As the bowl 8 is tilted upwardly, away from its normal supporting beams 23, 24, the charge will be delivered by gravity over the cutter 17 and will be distributed over the underlying surface of the earth. If the material within the main bowl 8 tends to cling to the bottom, rear and side walls, the operator may jolt the main bowl so as to insure complete removal of the charge, whereupon the bowl 8 may again be returned to a position of engagement with the beams 23, 24 and is ready for subsequent loading.

From the foregoing description it will be apparent that the improved scraper may be quickly and conveniently manipulated by an operator positioned upon the tractor, to effect every desired operation. The several hydraulic jack mechanisms which are independently operable, may be manipulated to rapidly position the bowl 8, apron 16, and the cutter 17, in any desired position. The charge is effectively confined within the bowl 8 by virtue of the fact that the rear wall 18 is formed integral with the bottom, and that the side walls 19 slidably cooperate with the inner surfaces of the walls 15. The portion of the charge which is deposited into the front apron 16, is likewise effectively confined therein by virtue of the fact that the side walls 31 of the apron 16 have slidable coaction with and overlap the outer surfaces of the walls 15. It will also be apparent that by tilting the main bowl 8 to deliver the charges, a relatively short cylinder 33 may be utilized in the actuating jack for the main bowl, and this tilting of the main bowl also effectively delivers the successive charges by gravity and with minimum power consumption. The frame 11 cooperating with the bowl support 9, provides simple and effective means for raising and lowering the cutter 17, and by suspending the apron 16 on the same pivots 14 which connect the frame 11 with the bowl support 9, a simplified structure results. The improved scraper is moreover entirely free from obstruction above the bowl 8 and apron 16, thereby permitting filling of the scraper to an extent far beyond the rated capacity thereof.

It should be understood that it is not desired to limit the present invention to the exact details of construction and to the precise mode of operation herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

I claim:

1. In a scraper, a bowl having a bottom and a rear wall and an open front end, a support upon which said bowl is pivotally mounted, said support having a rear sustaining pivot, means for tilting said bowl relative to said support to deliver material therefrom, a frame tiltable about a front fulcrum and having arms extending along said support, a pivotal connection between said arms and said bowl support, an apron swingable about said connection toward and away from the front of said bowl, and means coacting with said arms for relatively moving said support and frame about said pivotal connection to bodily raise and lower said bowl.

2. In a scraper, a bowl support tiltable about a rear pivot, a bowl having a rear wall and a bottom pivotally attached near its forward end to the front end of said support, means for tilting said bowl relative to said support to deliver material therefrom, a frame having a front fulcrum and a rearwardly extending portion pivotally attached to said support near the front of said bowl, an apron swingably suspended from the pivotal attachment between said frame and support, and means interposed between said frame and said support for bodily raising and lowering said bowl.

3. In a scraper, a bowl support tiltable about a rear pivot, a bowl having a rear wall and a bottom pivotally attached near its forward end to the front end of said support, means for tilting said bowl relative to said support to deliver material therefrom, a frame having a front fulcrum and a rear portion adjacent said support, a pivotal connection between said rear frame portion and the forward portion of said support, an apron swingable about said connection toward and away from the front of said bowl, and means for relatively moving said frame and support about said pivotal connection to bodily raise and lower said bowl.

4. In a scraper, a bowl support tiltable about a rear pivot and having side walls, a bowl having a bottom and rear and side walls the latter of which are slidably cooperable with the inner surfaces of said support walls, a pivot connecting the front lower portion of said bowl with the forward portion of said support, means for swinging said bowl about said pivot and relative to said support, means for tilting said support about said rear pivot to bodily lower said bowl, and an apron movable toward and away from the front of said bowl, said apron having side walls slidably

cooperable with the external surfaces of said support walls.

5. In a scraper, a bowl support having rigidly connected parallel side walls tiltable about a rear pivot, a cutter rigidly attached to the lower front portion of said support, a load carrying bowl pivotally secured to said support near said cutter and having a bottom and rear and side walls extending upwardly from said bottom, said side bowl walls being slidably cooperable with said parallel side walls, means for swinging said bowl relative to said support to precipitate material therefrom over said cutter, and means for tilting said support to lower said cutter.

6. In a scraper, a bowl support having rigidly connected parallel side walls tiltable about a rear pivot, a cutter rigidly attached to the lower front portion of said support, a load carrying bowl pivotally secured to said support near said cutter and having a bottom and rear and side walls extending upwardly from said bottom, said side bowl walls being slidably cooperable with said parallel side walls, means for swinging said bowl relative to said support to precipitate material therefrom over said cutter, means for tilting said support to lower said cutter, and a front apron pivotally suspended from said side walls and movable toward and away from said cutter.

7. In a scraper, a bowl support having parallel side walls and beams rigidly connecting the front and rear portions of said walls, said support being movable toward and away from the ground, a cutter rigidly attached to the lower front portion of said support, a load receiving and supporting bowl having a bottom and integral rear and side walls, said rear wall being cooperable with said rear beams to support said bowl in loading position and said side bowl walls being slidably cooperable with said parallel side walls, and means for swinging said bowl within said support about a lower pivotal axis.

8. In a scraper, a bowl support having parallel side walls and beams rigidly connecting the front and rear portions of said walls, said support being movable toward and away from the ground, a cutter associated with the lower front portion of said support, a bowl having a bottom and integral rear and side walls, said rear wall being cooperable with said rear beams to support said bowl in loading position and said side bowl walls being slidably cooperable with said parallel side walls, means for swinging said bowl within said support about a lower pivotal axis, and a front apron pivotally suspended from the upper front portions of said parallel side walls and movable toward and away from said cutter.

9. In a scraper, a support tiltable about a rear pivot and having side walls, a cutter carried by said support, a frame tiltable about a front fulcrum and having rigid rearwardly extending arms pivotally attached to said support walls, means for relatively moving said support and said frame to raise and lower the cutter, a load carrying bowl having side walls slidably cooperating with the internal surfaces of said support walls to eject material from said support, and an apron having side walls slidably cooperable with the external surfaces of said support walls for closing the front of said support.

10. In a scraper, a support tiltable about a rear pivot and having parallel side walls, a cutter associated with said support at the lower front portion of said walls, a frame tiltable about a front fulcrum and having rearwardly extending arms, pivot means connecting the medial portions of said arms to the upper front portion of said walls, means for relatively moving said support and said frame about said pivot means to raise and lower said cutter, a load carrying bowl having side walls slidably cooperable with the internal surfaces of said support walls to eject material from within said support, and a front apron swingably suspended from said pivot means and having side plates slidably cooperable with the external surfaces of said side support walls for closing the front of said support.

11. In a scraper, a bowl having a bottom and a rear wall and an open front end, a rear support upon which said bowl is pivotally mounted, means for tilting said bowl relative to said support to deliver material from the bowl, a front frame having rearwardly extending arms connected by alined pivots to said support, an apron pivotally suspended directly from the same pivots which connect said frame and said support, said apron cooperating with said bowl to confine material therein, and means cooperable with said arms and said support for relatively moving said parts to raise and lower said bowl.

12. In a scraper, a movable bowl support having material engaging and confining side walls, a bowl having a bottom and rear and side walls the latter of which are slidable along and cooperable with the inner surfaces of said support walls to confine material within said bowl, a pivot connecting said bowl with said support, means for swinging said bowl about said pivot to deliver material therefrom, an apron pivotally suspended from said support and having side walls slidable along and cooperable with the outer surfaces of said support walls to confine material within said bowl, means for moving said apron toward and away from said bowl, and means for moving said support to raise and lower said bowl and said apron.

13. In a scraper, a bowl support having parallel laterally spaced material engaging and confining side walls, a bowl having a bottom and integral parallel side walls the latter of which are slidable along and cooperable with the inner surfaces of said support walls to confine material within said bowl, means movably connecting said bowl and said support, means for moving said bowl about said connecting means to deliver material therefrom, an apron movably suspended from said support and having integral parallel side walls slidable along and cooperable with the outer surfaces of said support walls to confine material within said bowl, and means for moving said apron toward and away from said bowl.

14. In a scraper, a bowl support having material engaging and confining side walls, a bowl movably suspended from said support and having side walls slidable along and cooperable with the inner surfaces of said support walls to confine material within said bowl, and an apron movably suspended from said support and having side walls slidable along and cooperable with the outer surfaces of said support walls to confine material within said bowl.

15. In a scraper, a supporting frame movable about a rear fulcrum and having a transverse scraper blade and side walls adjoining the blade ends, a bowl carried by and tiltable relative to said frame and having side walls slidably cooperable with said frame walls, means for supporting said bowl in a position to receive the material removed by said blade, means for tilting said bowl to dump the load toward said blade, and means for effecting movement of said frame

about said fulcrum to lower and raise said blade.

16. In a scraper, a supporting frame tiltable about a rear pivot and having a transverse scraper blade and side walls at the ends of said blade, a bowl swingable relative to said frame about an axis located forwardly of said pivot and near said blade and having side walls slidably cooperable with said frame walls, means for supporting said bowl in a position to receive the load passing rearwardly over said blade, means for swinging said bowl upwardly about said axis to dump the load forwardly over said blade, and means for effecting swinging of said frame about said rear pivot to lower and raise said blade.

17. In a scraper, a supporting frame movable about a rear fulcrum and having a transverse scraper blade and side walls at the ends of said blade, a bowl carried by and tiltable relative to said frame and having side walls slidably cooperable with said frame walls, means for supporting said bowl in a position with its bottom extending approximately horizontally away from said blade to receive the material removed by said blade, means for tilting said bowl to dump the load toward said blade, and mechanism for effecting movement of said frame about said fulcrum to lower and raise said blade, said mechanism being operable from a remote station located forwardly of said bowl.

18. In a scraper, a supporting frame tiltable about a rear pivot and having a transverse scraper blade and side walls at the ends of said blade, a bowl swingable relative to said frame about an axis located forwardly of said pivot and near said blade, said bowl having integral side walls extending upwardly from its bottom and slidably cooperable with said frame walls, means for supporting said bowl in a position with its bottom extending approximately horizontally away from said blade to receive the load passing rearwardly over said blade, means for swinging said bowl upwardly about said axis to dump the load forwardly over said blade, and mechanism for effecting movement of said frame about said fulcrum to lower and raise said blade, said mechanism being operable from a remote station located forwardly of said bowl.

19. In a scraper, a frame having a transverse scraper blade supported in fixed position thereon and also having side walls at the ends of said blade, a bowl pivotally supported on said frame and having a bottom and integral side walls slidably cooperable with said frame walls, mechanism for swinging said bowl to precipitate material therefrom over said blade, a front draft wheel for supporting said frame, a rear trailer wheel for supporting said frame, mechanism for raising and lowering said blade with respect to said wheels during normal advancement of the scraper, and means for controlling the operation of said mechanisms from a remote station located near said draft wheel.

20. In a scraper, a frame having a transverse scraper blade supported in fixed position thereon and also having fixed side walls at the opposite ends of said blade, a bowl pivotally supported on said frame and having side walls slidably cooperable with said frame walls, mechanism for swinging said bowl to precipitate material therefrom over said blade, a front draft wheel for supporting said frame, a rear trailer wheel for supporting said frame, mechanism for raising and lowering said blade with respect to said wheels during normal advancement of the scraper, said mechanisms coacting with the rear of said bowl and with the rear extremity of said frame, and means for controlling the operation of said mechanisms from a remote station located near said draft wheel.

21. In a scraper, a frame having a transverse scraper blade rigidly attached thereto and also having side walls rigidly attached to the blade ends, a bowl pivotally suspended from said frame and having side walls slidably cooperable with said frame walls, a front draft wheel for supporting said frame, a rear trailer wheel for supporting said frame, mechanisms for swinging said bowl to precipitate material therefrom over said blade and for raising and lowering said blade with respect to said wheels during normal advancement of the scraper, and means for controlling the operation of said mechanisms from a remote station located near said draft wheel.

22. In a scraper, a frame having a transverse scraper blade rigidly attached thereto and also having side walls rigidly attached to the blade ends, a bowl pivotally suspended from said frame and having side walls slidably cooperable with said frame walls, a front draft wheel for supporting said frame, a rear trailer wheel for supporting said frame, mechanisms for swinging said bowl to precipitate material therefrom over said blade and for raising and lowering said blade with respect to said wheels, said mechanisms coacting respectively with the rear of said bowl and of said frame.

23. In a scraper, a frame having a transverse scraper blade rigidly attached thereto and also having side walls at the blade ends, a bowl pivotally suspended from said frame and having side walls slidably cooperable with said frame walls, mechanism for swinging said bowl to precipitate material therefrom over said blade, a front apron pivotally suspended from said frame and being movable toward and away from said blade, supporting wheels for said frame, mechanism for raising and lowering said blade with respect to said wheels during normal advancement of the scraper, and means for controlling the operation of all of said mechanisms from a remote station located forwardly of the scraper.

JULIUS P. HEIL.