

April 24, 1962

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3,030,713

MATERIAL HANDLING MACHINE

Filed Oct. 2, 1958

5 Sheets-Sheet 1

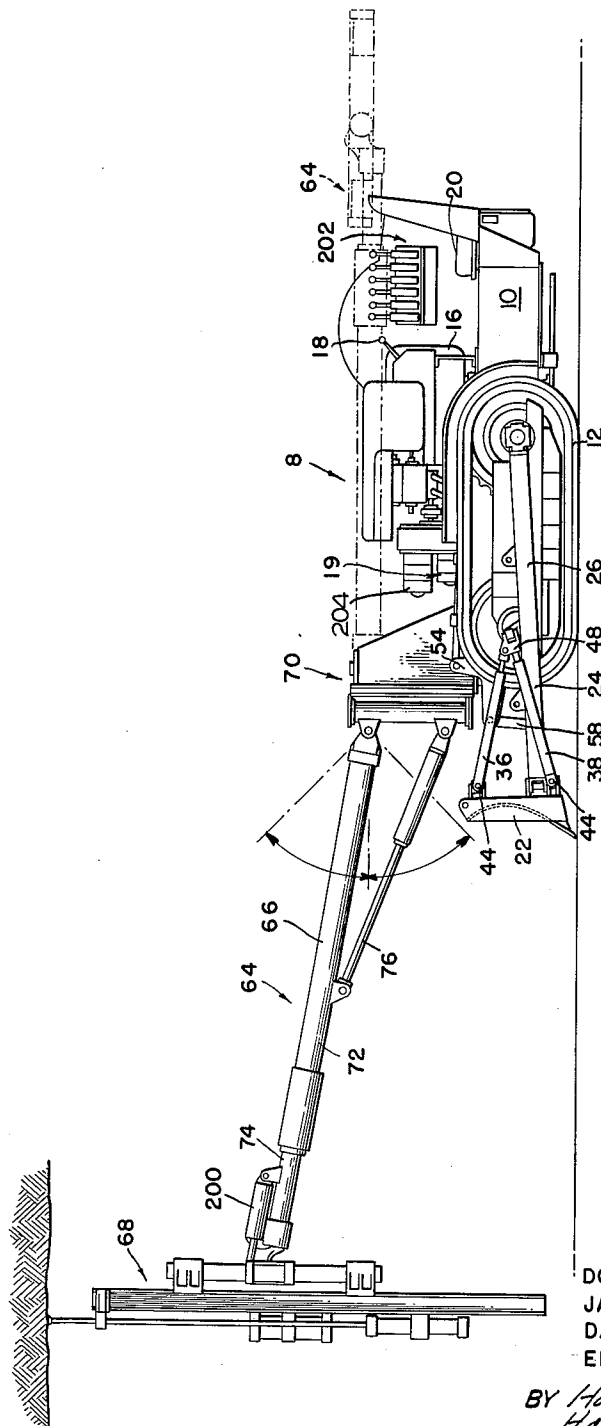


FIG. 1.

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5 Sheets-Sheet 2

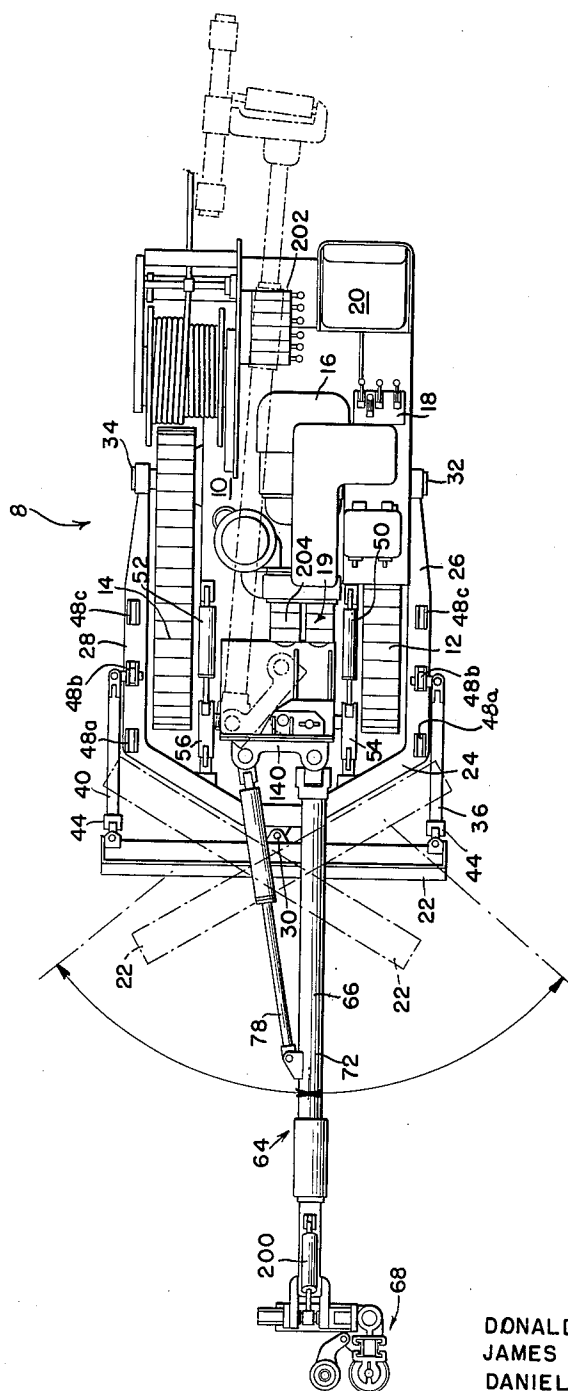


Fig. 2

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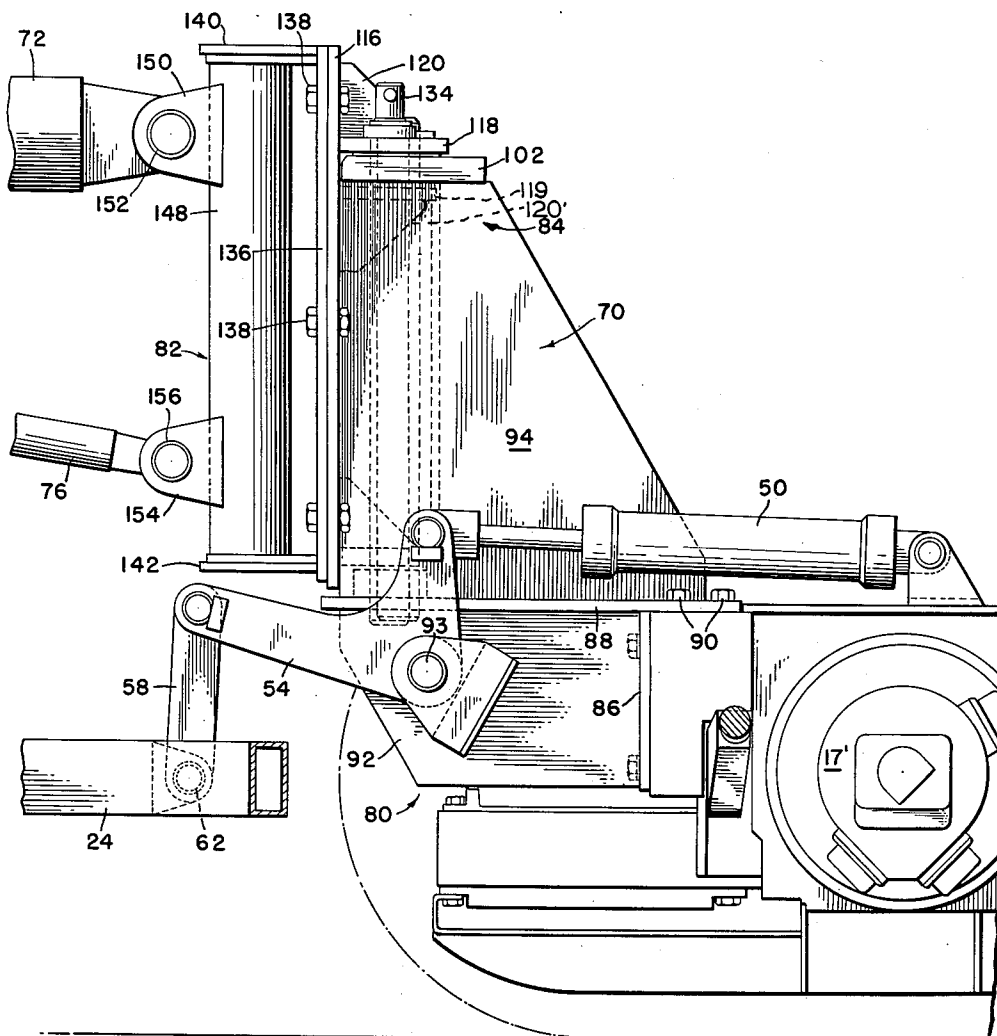
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FIG. 3.



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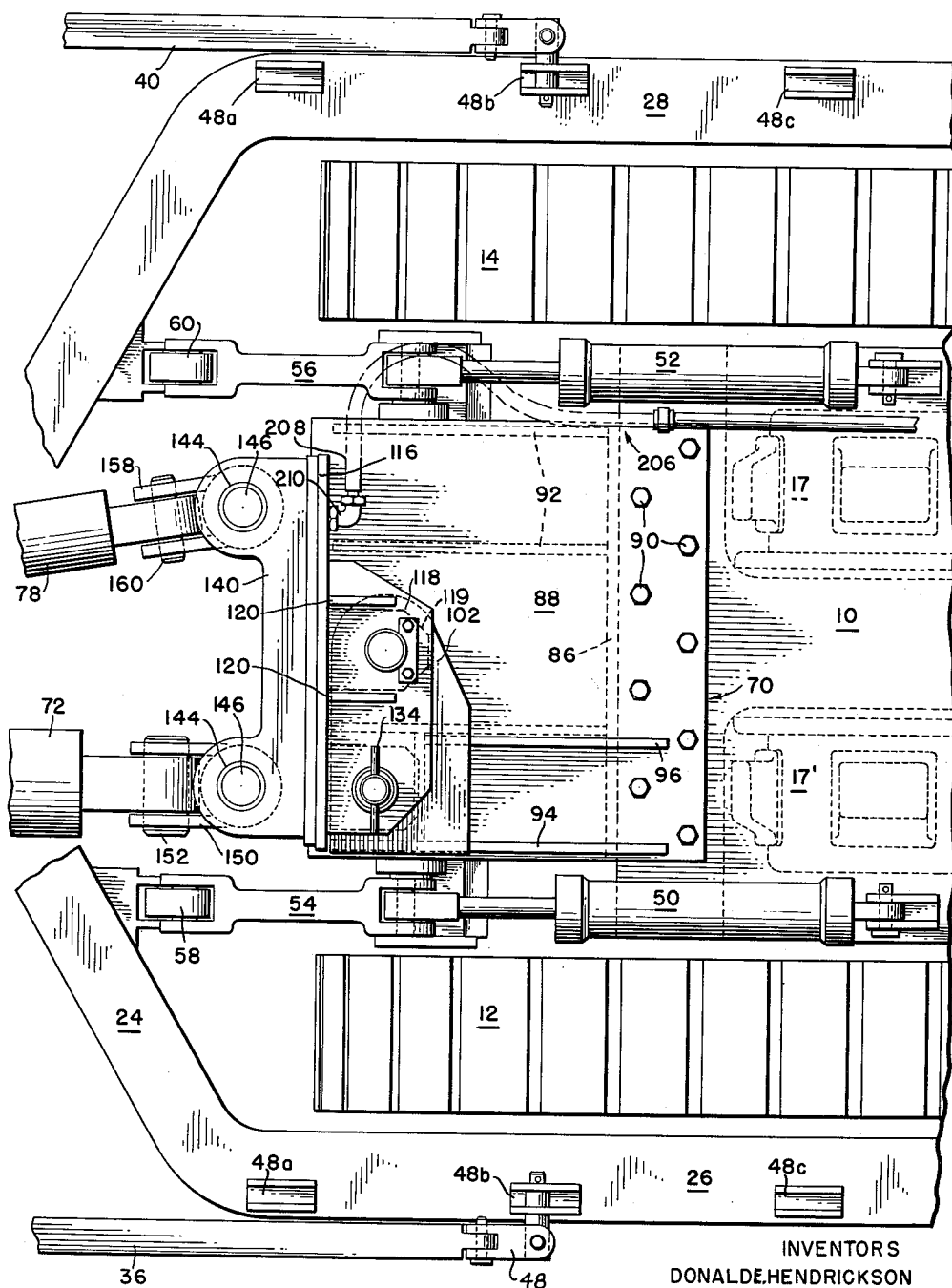


Fig. 4.

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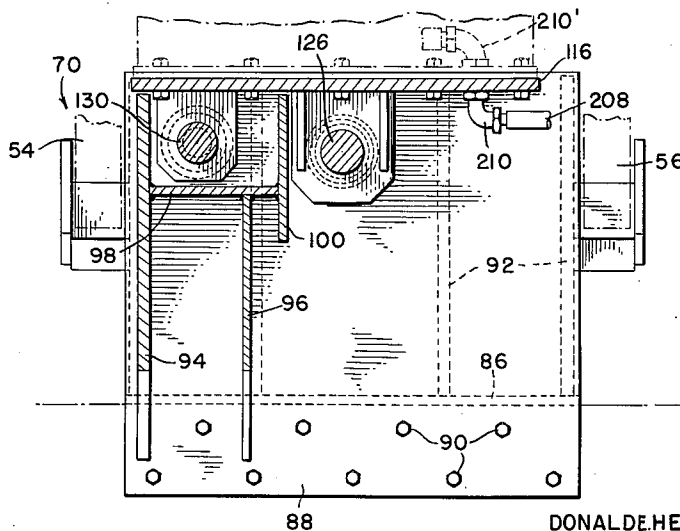
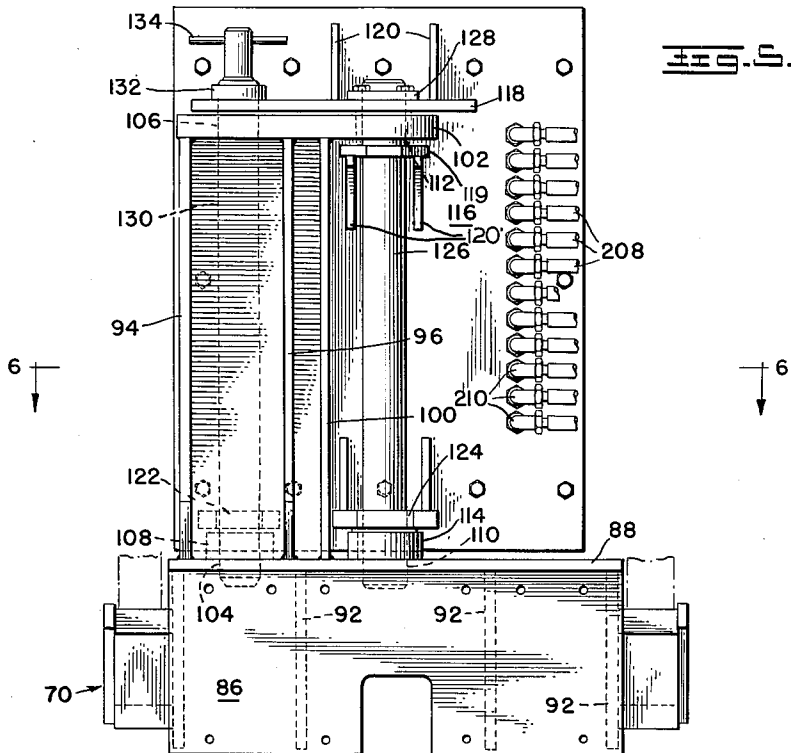


FIG. 6.

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3,030,713

MATERIAL HANDLING MACHINE

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This invention relates to a land vehicle and more particularly and specifically to a novel and improved combination material handling machine and vertical driller.

The inventive concepts herein shown and described illustrate novel and useful modifications and adaptations of a land vehicle such as disclosed and claimed in United States Letters Patent No. 2,833,361, issued May 6, 1958 to Daniel M. Schwartz.

It is a principal object of the present invention to provide an improved land vehicle of the crawler type having a boom supported driller in combination with a movable ground engaging stabilizer element in the form of an earth moving shovel blade.

A further object of the instant invention lies in the provision of a land vehicle providing in combination a pair of independently reversible ground engaging tracks and a pivotally mounted drill boom.

Still further objects and advantages of the present invention reside in the provision of unique and useful structures pivotally mounting a drill boom on a crawler type vehicle body to enable the movement of the boom from an inoperative folded position over the vehicle body to an operative range of position extending forward from the vehicle body and selective extension of the boom when in the operative range of position.

Further objects and advantages of this invention are to provide a combination vehicle structure in which the structural and operational relationships of the plural components constituting the combination enable the attainment of new, useful and unexpected functional results.

These and other objects and advantages of the present invention will appear more clearly evident, particularly to those skilled in the art, when the following description is read in the light of the accompanying drawings.

The nature of the present invention may be stated in general terms as relating to a land vehicle consisting in combination; a body, a pair of independently reversible, powered crawler tracks supporting the body, a drill supporting boom foldably mounted on the vehicle body, and an earth moving blade supported in extended position from the body and movable to a ground engaging position.

The broad concepts of the present invention are disclosed for purposes of illustration, in an embodiment including a mine roof drilling rig boom mounted on a crawler track vehicle provided with a forwardly extending ground engaging shovel blade. However, the scope of the structural embodiments comprising the inventive concepts herein disclosed is not intended to be limited beyond the requirements of the prior art.

Referring now to the accompanying drawings in which like numerals designate similar parts throughout the several views:

FIG. 1 is a side elevation of the novel vehicle;

FIG. 2 is a top plan view of the vehicle shown in FIG. 1;

FIG. 3 is an enlarged fragmentary side elevation in partial section illustrating the drill boom support and blade actuating mechanism;

FIG. 4 is a top plan view of the fragmentary portion shown in FIG. 3;

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FIG. 5 is a fragmentary rear elevation of the drill boom mounting structure; and

FIG. 6 is a horizontal section taken on line 6—6 of FIG. 5.

In FIGS. 1 and 2 of the drawings, there is shown a land vehicle 8 embodying the present inventive concepts and comprising, in general, a main frame or body 10 pivotally mounted on independently operated crawler or endless tracks 12 and 14. The body or frame 10 carries a prime mover 16 drivably connected to pump means 19 for operating dual reversible pressure fluid motors 17 and 17' connected to the right and left crawler tracks, respectively, as disclosed in U.S. Patent 2,833,361, to D. M. Schwartz. Controls 18 adjacent the operator's seat 20 direct pressure fluid from the pump means 19 to the crawler motors 17 and 17'.

An earth moving shovel or blade 22 is supported forwardly of the vehicle body on a yoke member 24. The yoke 24 consists of a pair of legs 26 and 28 extending one adjacent each side of the vehicle and converging forwardly thereof to present a vertical pivot 30 for attachment centrally of the rear face of the shovel blade. The rearwardmost end of each of the legs 26 and 28 is rotatably secured on the extended stub of the rear drive pinion, 32 and 34, respectively, for the crawler track on that side of the vehicle.

A pair of brace members, 36 and 38, and 40 and 42, is provided for respective ends of the shovel blade 22. The brace members 36 and 38 are secured at their forward ends, top and bottom, respectively, to the rear face of the blade on horizontal fastening pins 44. Brace members 40 and 42 are similarly secured at their forward ends at the opposite end of the rear face of the blade. The other ends of the brace members in each pair on each side of the blade converge rearwardly for attachment in a coupling bracket 48 which is fastened to a bracket 48a, 48b or 48c fastened on the upper face of the adjacent side leg of the yoke 24. The bracket 48 for brace members in each pair are independently attachable to respective brackets 48a, 48b or 48c to bring about a pivotal movement of the shovel blade about its central supporting pin 30 on yoke 24 to permit angular disposition of the blade between the extreme limits generally shown in dotted lines in FIG. 2 of the drawings. For practical purposes, the limitation of pivotal movement is generally restricted within 25° in either direction from the normal perpendicular position of the blade relative to the centerline of the vehicle.

Further associated with the yoke 24 is a hydraulic lift assembly which consists of a pair of ram cylinders 50 and 52 mounted one on each side of the vehicle body. The ram of each cylinder connects to one end of a bell crank, 54 and 56, respectively, which is connected at the second end through a link, 58 and 60, respectively, to a horizontal pin 62 carried on the rearward face of the yoke to one side of the central vertical pivot 30. Through the ram cylinders controlled by the operator, the yoke and shovel blade are selectively raised or lowered relative to the ground surface.

The vehicle 8 is further provided with a drill boom assembly generally designated at 64 and including a hydraulically extensible and movable boom 66, a drill rig 68 on the extended end of the boom, and mounting structure 70 for the base end of the boom on the vehicle.

The boom 66 is of a typical type including a main section composed of a ram cylinder portion 72 and a ram portion 74. The cylinder section carries a pair of auxiliary ram cylinder components 76 and 78 each pivotally secured thereto, one being vertically below the cylinder and the other horizontally on one side thereof. The base ends of the main boom cylinder and the auxiliary cylin-

ders are secured to the mounting structure 70 on the vehicle as to be hereinafter described.

The drill rig 68 is again typical of pressure fluid operated rigs of the type used in underground mining operations. In the present disclosure, and for purposes of more clearly illustrating the inventive concepts, the rig is shown as a roof or overhead drilling assembly.

Turning to the boom mounting structure 70, best illustrated in FIGS. 3-6 of the drawings, it is seen that the mounting structure is carried on the forwardmost end of the vehicle slightly projected in advance of the front ends of the crawler tracks 12 and 14.

The boom mounting structure 70 consists of a bracket assembly 80 for attachment to the vehicle, a boom supporting assembly 82, and a lock assembly 84 (FIG. 3).

The bracket assembly 80 is composed of a back plate 86 secured vertically to the upper, forward end of the vehicle frame, a bed plate 88 secured to project horizontally forward from the upper end of the back plate and to extend rearwardly for a short distance to overlie and be bolted, as at 90, to the frame, and plural stiffening plates 92 arranged vertically in spaced relationship transversely of the back plate and secured to the back plate and to the underside of the bed plate. The endmost stiffening plates 92 support the pivot pins 93 upon which the bell cranks 54 and 56 of the blade control assembly are mounted.

Two upright bracket plates 94 and 96 are secured vertically in spaced relationship on the upper surface of the bed plate 88 adjacent one side thereof. Plate 94 extends along the left side edge of the plate 88, looking forwardly from the vehicle. Plate 96 is spaced inwardly from plate 94 and terminates short of the front edge of bed plate 88 where it is connected in one direction transversely of the plate 88 to plate 94 by a short rib plate 98 secured vertically on the bed plate, and by the same rib plate 98 in the opposite direction to a vertical brace plate 100 secured vertically to bed plate 88 in parallel with plates 94 and 96 and extending for a spaced distance rearwardly from the front edge of the bed plate.

A heavy top bracket plate 102 is secured transversely above the front end of bed plate 88 on and across the top ends of plates 94, 96 and 100. Bed plate 88 and top bracket plate 102 are provided with vertically aligned circular openings 104 and 106 within the area generally defined within plates 94, 100 and rib plate 98. A ring bearing boss 108 is positioned and secured on the plate 88 concentrically about opening 104.

The bed plate 88 and top bracket plate 102 are provided with a second set of vertically aligned openings 110 and 112 respectively, inwardly from vertical plate 96, and the lower bed plate opening is provided with a bearing boss 114 like that at 108.

A front wall plate 116 is positioned vertically above the front end of bed plate 88 to extend above the top bracket plate 102. The front wall plate is provided with a horizontally disposed lock plate 118 secured thereto by right-angular buttress ribs 120 interconnecting the upper surface of the plate 118 and the upper extended rear face of the front plate 116. The buttress ribs 120 are disposed in parallel spaced relationship one on either side, generally, of the opening 112 in the top bracket plate 102. By the foregoing structure the lock plate 118 is rigidly secured to the front wall plate partially overlying top bracket plate 102 and is provided with spaced openings therein aligned vertically with openings 106 and 112 in the top bracket plate when lock plate 118 and boom 66 are in the forward pivoted position. The front wall plate 116 is provided with a horizontal lock plate 119 rigidly secured thereto which extends under top bracket plate 102. Horizontal lock plate 119, which has an opening aligned with opening 112 and which has downwardly extended buttress ribs 120', comparable to buttress ribs 120, is provided to limit upward reactive movement of plate 116 and the drill boom assembly 64 when, for example, drill rig 68 is drilling down. This upward

movement is limited by contact of lock plate 119 with the under side of top bracket plate 102.

The lower rear face of front wall plate 116 is provided at a spaced distance above the bed plate 88 with two horizontal lock plates 122 and 124 extending rearwardly one above each of the bearing bosses 108 and 114. These plates are securely attached to the rear face of the front wall plate, and each is provided with a circular opening, one opening always aligned, when plate 116 is assembled in place, and the other opening normally aligned vertically with the boss encompassed openings in the bed plate 88 therebeneath.

A rigid pivot shaft 126 is positioned to extend from above the lock plate 118 and through the opening therein, thence through the opening 112 in the top bracket plate 102, the opening in lock plate 119, the opening in lock plate 124, the bearing boss 114 and opening 110 in the bed plate 88. This pivot shaft 126 is vertically fixed in place by retainer means 128 engaging the shaft and the upper face of the top lock plate 118, whereby the front wall plate 116 is hinged to rotate with said shaft.

A cylindrical lock pin 130 is dropped vertically through an opening in the lock plate 118, the opening 106 in the top plate thence through the opening in lock plate 122, the bearing boss 108 and the opening 104 in the bed plate 88. The upper end of the lock pin 130 is provided with an enlarged head portion 132 which seats on the upper surface of the lock plate 118 when the pin is in its fully dependent vertical position, and a T-handle 134 on the extreme upper end of the pin facilitates the slidable insertion and withdrawal of the pin relative to the vertical aligned openings enumerated. By reason of the engagement of the lock pin with the lock plate 118, the top bracket plate 102, the lower back plate 122, and the bed plate 88, the front wall plate 116 is restricted against pivotal movement with shaft 126 until such time as lock pin 130 is removed from the position described.

Associated with the front wall plate 116 is a boom mounting plate 136 which is of substantially identical configuration to the front wall plate 116 and is secured to the front face thereof by means of a plurality of lock bolts 138 extending through both of said plates.

The boom mounting plate 136 is provided along its upper and lower edges with horizontally, forwardly extending bracket plates 140 and 142 which are rigidly secured to the boom mounting plate, in coincidental vertical alignment. Each of the bracket plates 140 and 142 is provided adjacent each end thereof with an enlarged portion having a central opening 144. The vertically aligned openings 144 in the plates 140 and 142 at adjacent ends thereof receive the remote ends of pins 146 which are secured in rigid fixed relationship between the upper and lower plates. Each of the pins 146 carries a tubular shaft 148 thereabout and in rotatable relationship therewith. The tubular shaft 148 on the left side of the boom mounting plate carries a bracket 150 adjacent the upper end thereof mounting a horizontal bearing pin 152 on which the base end of the cylinder portion 72 of the main drill boom is pivotally connected. A second mounting bracket 154 is secured adjacent the lower end of the left-hand tubular shaft 148 which bracket mounts a bearing pin 156 on which the base end of the auxiliary ram cylinder assembly 76 is pivotally mounted.

The tubular shaft 148 on the right-hand side of the boom mounting plate carries a bracket 158 substantially aligned horizontally with the main boom bracket 150. Bracket 158 carries a pin 160 rotatably mounting the base end of the auxiliary ram cylinder assembly 78.

Thus, by the foregoing description of the boom mounting structure it is seen that the main boom assembly is pivotal vertically about the pin 152 in the mounting bracket 150 which pivotal movement is controlled through the positioning of the main boom assembly in a vertical direction by the operation of the auxiliary ram cylinder assembly 76 engageable beneath the main boom assembly

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and having pivotal base connection on the vehicle vertically aligned beneath the base connection of the main boom assembly.

The horizontal positioning of the main boom assembly relative to the centerline of the vehicle is controlled within restricted limits by operation of the auxiliary ram cylinder assembly 78 acting laterally of the main boom assembly by reason of the positioning thereof relative to the main boom as hereinbefore described.

The drill boom rams 72, 76 and 78 and drill rig ram 200 are operatively connected through control valve 202, adjacent the operator's seat 20 to hydraulic fluid from pump 204 by a hydraulic line system generally designated 206, FIG. 4, which extends between these elements. The pump 204, like pump means 19, is driven by the prime mover 16.

The hydraulic line system includes flexible conduits 208 illustrated only in FIGS. 4, 5 and 6 which terminate in fixed connections 210 on the rear of front wall plate 116 of the boom support assembly. Further flexible conduits (not shown) connect the plural rams 72, 76, 78 and 200 to their respective fixed connections 210' on the front of the boom mounting plate 136.

With this arrangement of parts as the boom assembly is swung to the rearward storage position clearing cable reel 214, it may be lowered by power to the position shown in phantom lines in FIGS. 1 and 2. The power raising or lowering of the boom assembly is made possible by the flexible conduits 208 which are maintained intact and not disconnected as the boom assembly is moved to and from the rearward storage position.

In FIGS. 1 and 2 of the drawings the boom assembly is shown in an operational position forwardly extended from the vehicle in which position it is locked by the lock pin 130. However, upon removal of the lock pin 130 the front wall plate may be rotated with the pivot shaft 126 causing rotation of the entire boom assembly supported from the boom mounting plate 136 to the right and rear of the pivot shaft 126 to bring the boom to lie in a folded position rearwardly over the main body of the vehicle as shown in phantom lines in FIGS. 1 and 2. To return the boom to operational position, the entire assembly is swung forwardly through an arc about the center of pivot shaft 126 until the openings in lock plates 118 and 122 are brought into registry with the lock openings 106 and 104 whereupon the lock pin 130 is dropped into place securing the front wall plate and boom support assembly against movement relative to the vehicle.

The operation of the drill rig in overhead drilling work, as generally depicted in FIG. 1 of the drawings, permits the positioning of the drill rig at a remote location forwardly of the vehicle whereby the operator of the vehicle remains at a safe distance away from the immediate vicinity of the drilling. The ground engaging shovel blade 22 is operable from the remote position of the operator of the vehicle to bring the shovel blade into engagement with the ground at a point forwardly from the vehicle and beneath the boom to establish an upward thrust in the direction of the drilling movement thereby stabilizing the vehicle with respect to the downward thrust of the drilling operation.

Further, the combination of the boom supported drilling assembly and the crawler track supported vehicle facilitates the use of the apparatus within narrow confines such as are found in underground mining operations. For example, where the lateral width of a mine tunnel is insufficient to permit the folding of the boom rearwardly over the vehicle to the phantom line position shown in FIGS. 1 and 2, the vehicle may be turned beneath the boom to bring the boom to a folded position over the vehicle. This unique operational function is accomplished

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by the removal of the lock pin 130 from the lock assembly freeing the front plate and its associated boom mounting plate for rotation with the pivot shaft 126.

Then, holding the boom stationary, the vehicle may be turned through 180° by reverse operation of the two supporting crawler tracks for a spin turn to the left thereby completely pivoting the vehicle relative to the position of the boom and bringing the boom to lie in a rearwardly extended, folded position over the body of the vehicle.

Further, the ability of the apparatus to permit the boom to be positioned rearwardly over the body of the vehicle greatly facilitates manipulation and movement of the vehicle through mine tunnels from one position of drilling to another without encumbering the movement by the presence of a forwardly extending boom supported drill rig.

It is to be further noted that when the boom assembly is adjusted laterally from the centerline of the vehicle by use of the auxiliary ram cylinder assembly 78 the stabilizing effect obtainable from the ground engaging shovel is still maintained.

Having thus described and explained the illustrative embodiments of the invention herein disclosed, and having exhibited that the inventive concepts herein described attain and satisfy all of those objects and advantages hereinbefore set forth, what is desired to be claimed is:

1. A land vehicle comprising a main frame, a pair of lateral crawler tracks supporting said main frame, drive means for selectively and independently driving said tracks for forward or reverse operation of the vehicle crawler tracks, an implement support frame secured at the forward end of the main frame, a forwardly extending ground engaging shovel blade operatively connected to said implement and main frames, means for moving said blade horizontally and vertically relative to said implement frame, a vertical pin mounted on said implement frame, a plate hinged to rotate with said pin, a drill boom mounted on and extending from said plate and latch means securing said plate to said implement frame to maintain said drill boom in forward extension over said blade.

2. A land vehicle comprising a frame, a pair of crawler tracks supporting said frame, drive means for selectively and independently driving said tracks for forward or reverse operation of the vehicle crawler tracks, a forwardly extending ground-engaging shovel blade pivotally connected to said frame, means for moving said blade horizontally and vertically relative to said frame, a vertical pin mounted at the forward end of said frame, a plate hinged to rotate with said pin, a drill boom mounted on and extending from said plate and latch means securing said plate to said frame to maintain said drill boom in forward extension over said blade.

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