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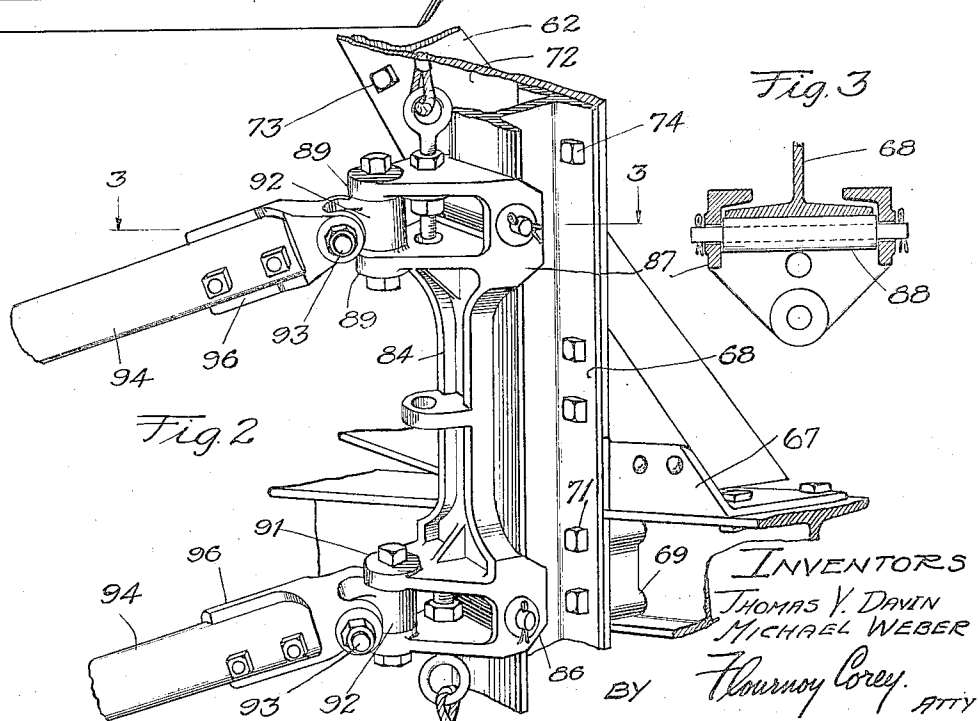
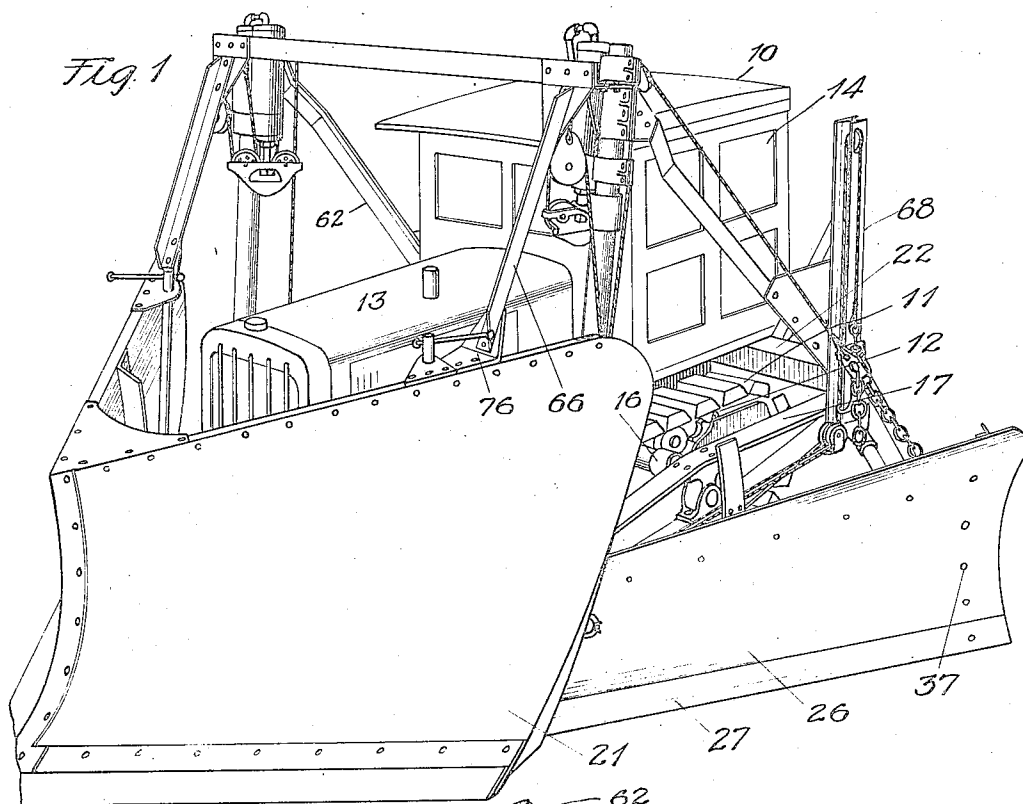
T. V. DAVIN ET AL

1,956,007

EARTH MOVING DEVICE

Filed Nov. 12, 1932

3 Sheets-Sheet 1



INVENTORS

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MICHAEL WEBER

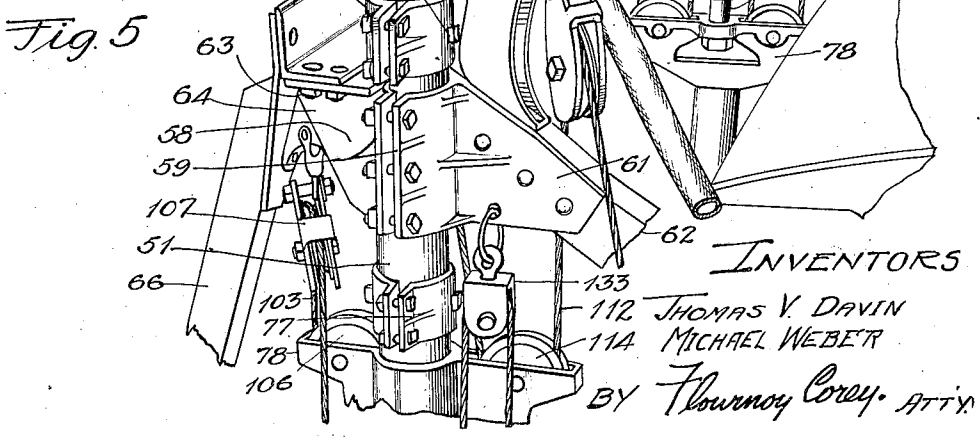
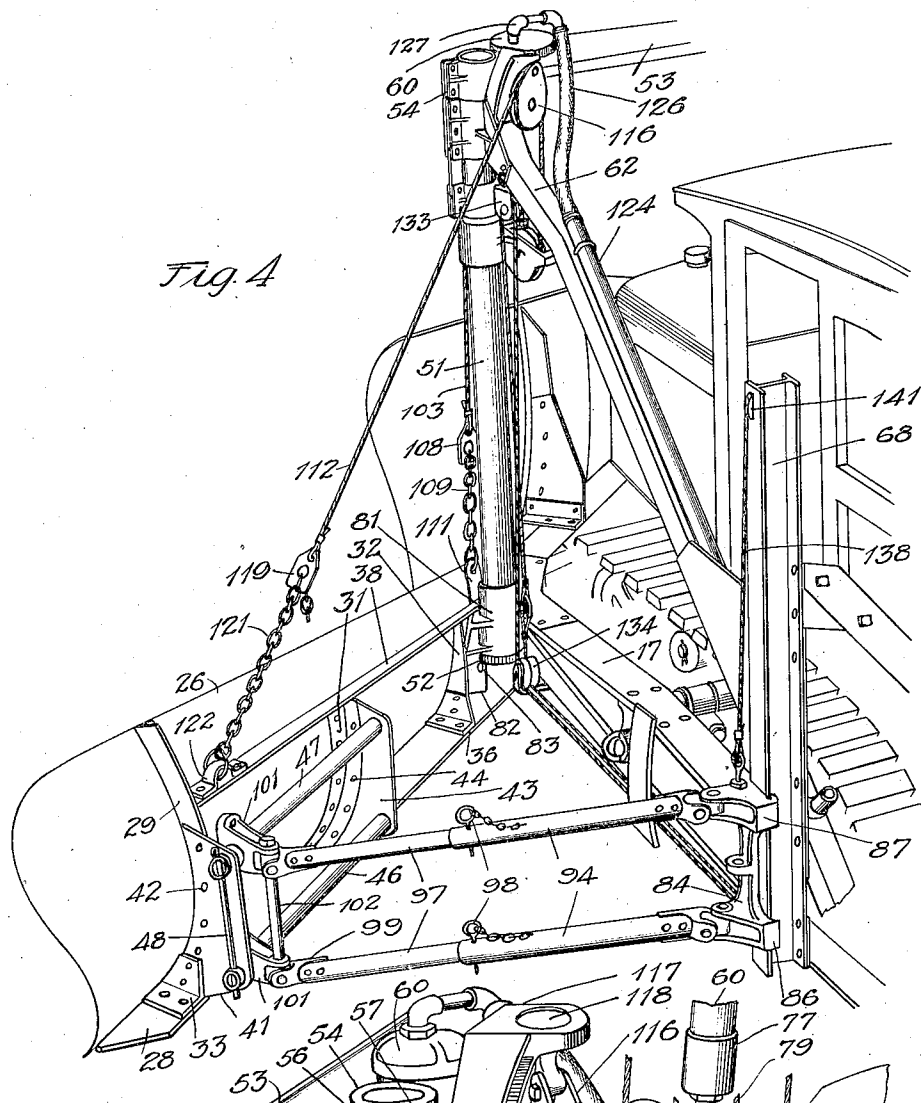
BY *Flournoy Corey* ATTY

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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

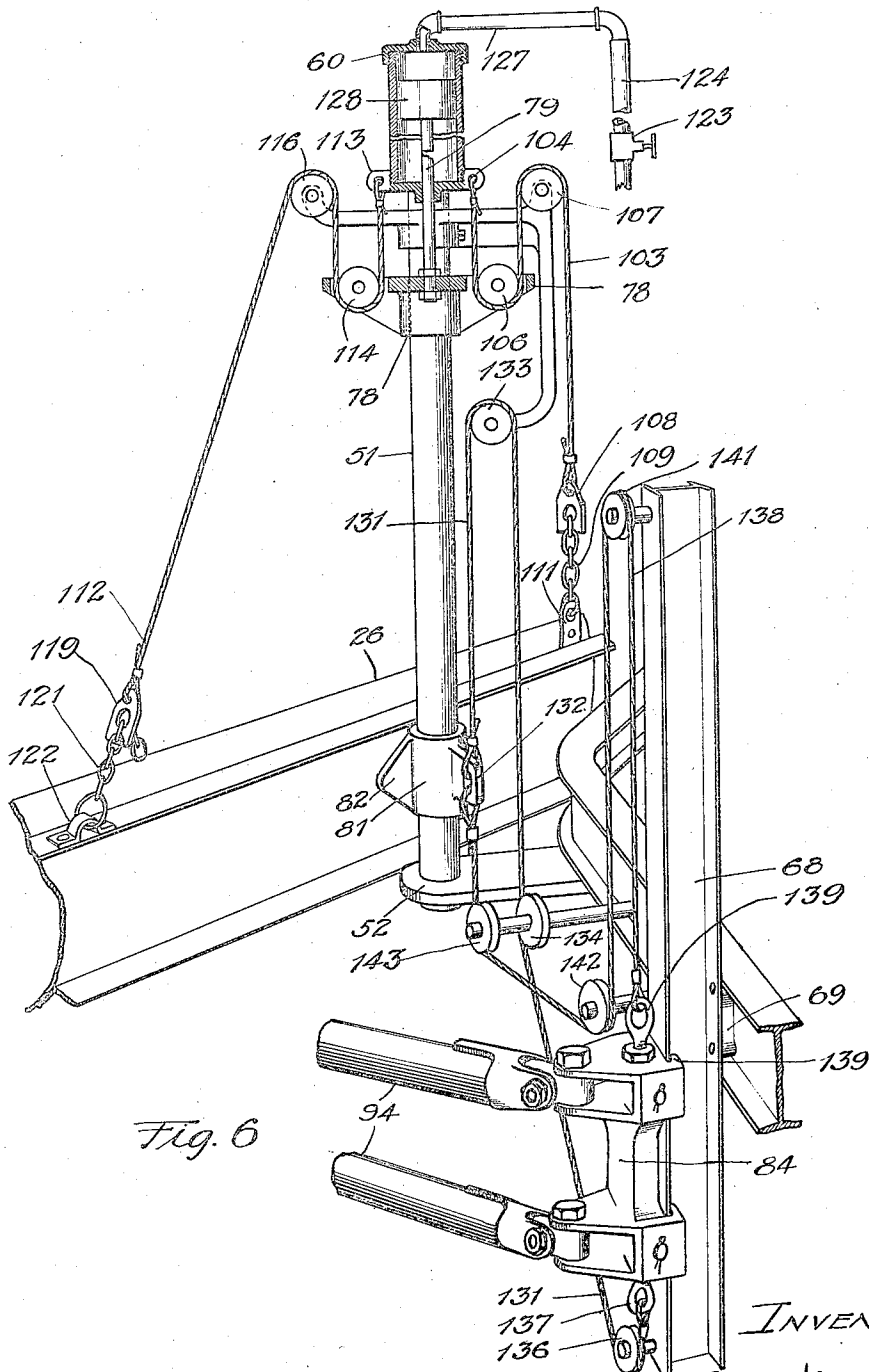


Fig. 6

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UNITED STATES PATENT OFFICE

1,956,007

EARTH MOVING DEVICE

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Application November 12, 1932, Serial No. 642,442

3 Claims. (Cl. 37-44)

This invention relates to earth or snow moving devices and has particular relation to means for raising, lowering and bracing the plow or scraper blades of such devices.

In the moving of earth or snow by means of plow blades and the like with a tractor as a prime mover, it is becoming more and more desirable that the earth moving devices be adapted for control by one operator. Furthermore it is extremely desirable that all the parts of the earth moving device, such as the plow and wing blades, be adjustable and that their adjustment be secured by power-driven means.

The power-driven means for securing adjustment of the various plow blades is preferably controllable by control means located in the cab or driver's compartment of the tractor or other prime mover, so that the operator may quickly adjust any part of the earth moving device to suit the requirements without leaving the cab, and preferably such adjusting means should be adjustable while the earth moving device is in motion.

We have observed that with the devices of the prior art, when it is necessary to tilt or raise or lower the side wings or wing blades, as they are called, it is often necessary for the operator to stop the machine, get out of the cab, and manually adjust the position of the blade and the position of the braces which hold the blade in position. The blades may be too heavy for one man to adjust or may be rusted in place. The adjusting procedure takes time when the loss of such time means increased overhead in operating the earth moving device, and also prevents the operator from changing the position of the wing blade while the tractor is in motion, thus causing abrupt shoulders or steps in the cut made by the blade.

We have therefore devised means for adjusting the position of the wing blades of an earth moving device and at the same time adjusting the position of the braces for bracing the wing blades so that they are substantially in line with the load imposed on the blade at all times. With our invention it is unnecessary for the operator to get out of the cab to adjust the wing blades and adjustment of the blades may be carried on while the earth moving device is in motion.

Therefore, a general object of our invention is to provide means for adjusting the position of the plow and bracing of an earth moving device.

A more specific object of our invention is to provide means for raising, lowering and tilting the wing blades of an earth moving device and for raising and lowering the braces or struts used

for holding the blade in position so that the line of stress of the load on the blade is substantially parallel with the center-line of the longitudinal axis of the braces at all times, regardless of the position of the blade.

A feature of our invention is that a single frame pivotally mounted on the tractor furnishes the entire means for supporting and bracing the blade.

Another feature of our invention is that the blade is slidingly engaged upon one standard while the inner end of the brace which braces the other end of the blade is slidingly engaged on still another vertical standard and that means are provided for moving the inner end of the brace and the inner end of the wing blade up and down in unison.

Another feature of our invention is that a single power means is adapted to move all the parts of the device.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification, wherein is disclosed several exemplary embodiments of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention. The device may be used or adapted for use for other purposes.

In the drawings:

Figure 1 is a view in perspective of an earth moving device including a tractor, a plow pivotally mounted upon the tractor at the front thereof, and side wings mounted one on each side of the tractor. The side wings are adjustably mounted in accordance with one embodiment of our invention.

Figure 2 is a view in enlarged perspective of the means for slidingly engaging the braces or struts, which hold the wing blades in position, with the supporting framework which supports the wing blades.

Figure 3 is a view in section of a portion of the device shown in Figure 2 and taken along the line 3-3 of the figure.

Figure 4 is a rear quartering view in perspective of one wing blade and the means for adjustably mounting the wing blade on the plow-supporting framework.

Figure 5 is a view in enlarged perspective of the hydraulic jack used for adjusting the position of the wing blade and its supports, and

Figure 6 is a schematic diagram of the jack,

the wing blade, the wing blade supports and braces, and the means whereby the relation of the parts may be changed and adjusted by the hydraulic jack. This figure may be better understood by comparing it with Figure 4, as the parts in these two figures are in substantially the same relation.

It will be apparent as the description of our invention proceeds, that our device may be used or modified for use in adjusting other blades and plows of an earth moving device, as for instance a single scraper blade placed across the front of the tractor, not only for moving such a blade up and down, but for moving it in and out. It is apparent also that while the device has been shown in connection with a tractor it may readily be used in connection with other power means such as a locomotive or car, or a vehicle pushed by a power means.

Referring now more particularly to Figure 1 there is shown at 10 generally a tractor having the usual link belt treads 11 and wheels 12 upon which the treads 11 are mounted. These wheels are provided with suitable axles (not shown) upon which the power plant located at 13 and the cab 14 of the tractor are mounted.

A cross shaft 16 extends beneath the frame of the tractor and through the link belts on either side in accordance with the usual practice, and this cross shaft is secured to the tractor frame or the sub-frame upon which the wheels 12 are mounted, in the usual manner. A pair of truss frames 17, which may be said to constitute the plow-supporting framework, are pivotally mounted upon the outer ends of the cross shaft 16 in such a manner that the frames 17 pivot about a transverse axis of the tractor at substantially the mid-point of the tractor. A heavy plow frame 21, preferably V-shaped in horizontal section, is mounted upon and connects the front ends of the pair of frames 17. The rear ends of the frames 17 are usually connected by a cross-beam 22 and hydraulic means (not shown), located at the rear of the tractor, raise and depress the cross-beam 22 for correspondingly lowering and raising the plow 21. In the present instance we are not immediately concerned with the frames 17 and plow 21 except in their connection with the wing blades hereinafter described and they need not be further explained.

It is to be understood that the frame structure, the wing blades, and the wing blade supporting, actuating and bracing structure hereinafter described is duplicated in reverse arrangement on the other side of the machine.

Referring now to Figures 4 and 6 the wing blades or scraper blades 26 are mounted upon the frames 17 so that the front or inner end of the blade is behind the outer rear of the plow 21, and so that the longitudinal axis of the scraper blade is substantially parallel with the side wall of the plow 21. The scraper blade is preferably curved in vertical section with the lower edge in an advance position with reference to the remaining part of the blade. The lower edge of the blade is preferably reinforced with a strip 27 of extremely hard metal adapted to resist the wear imposed by the scraping operation of the blade.

A longitudinally-extending horizontal plate 28 at the lower and inner side of the blade further reinforces the blade at the point where the greatest stress occurs and also acts to prevent the blade from becoming buried in the earth. This reinforcing strip further acts as a means by which vertically-extending angle irons 29, 31,

and 32 may be braced with respect to one another and the angle irons are secured to the strip by means of suitable brackets 33 and 36. The angle irons 29, 31 and 32 are curved to conform to the curvature of the blade 26 and are secured to it in any desired manner as by means of rivets 37.

A narrower horizontally-extending strip 38 is secured to the rear of the blade 26 near the upper edge thereof and is also secured to the angle irons 29, 31 and 32. The horizontally-extending strips 28 and 38 and the angle irons 29, 31 and 32 thus constitute a box-like reinforcing structure for the blade 26 and also afford means by which the blade may be attached to the framework 17, as hereinafter described.

A substantially rectangular plate 41 is secured to the angle iron 29 and the bracket 33 as by means of rivets 42 and extends rearwardly therefrom in a vertical plane. A like plate 43 is secured to the angle iron 31 as by means of rivets 44 and tubes 46 and 47, extending parallel to the blade 26, pass through suitable openings in the plates 41 and 43 and are held by means of locking pins 48 which pass through suitable openings in the outer ends of the tubes 46 and 47.

A vertically-extending tube 51, of comparatively large diameter, is secured at its lower end to the lower side of the frame 17 by means of a bracket 52. One of these tubes is mounted on each of the frames 17 on both sides of the tractor and the upper ends of the tubes on each side of the tractor are connected by means of a cross-brace 53 shown to the best advantage in Figure 5.

One side only of the plow and wing blade supporting and bracing structure will now be described. In the present construction the upper end of the tube 51 is surmounted by a clamp 54 which is clamped in place by means of bolts 56 and which is further secured by means of a set screw 57. These clamps extend inwardly from the tube 51 and are adapted to engage and support the cylinder 60 of a hydraulic jack.

An irregularly-shaped bracket 58 is also provided with clamping members 59 so that it may be clamped to the tube 51 at a position below the clamp 54. The bracket 58 is provided with a rearwardly-extending ear 61 in order that a downwardly and rearwardly extending brace 62 may be fastened to the bracket. A forwardly and horizontally extending flange 63 of the bracket 58 affords a means by which the cross-beam 53 may be secured to the bracket, and a vertically and forwardly-extending ear 64 affords means by which a forwardly and downwardly-extending brace 66 may be secured to the bracket.

The rearwardly-extending brace 62 extends downwardly to the rear of the frame 17 and is connected therewith by means of a bracket 67. A vertically-extending I-beam 68 is fastened to the frame 17 at a point just in front of the bracket 67 as by means of pads 69 and bolts 71 and the beam 68 is secured to the brace 62 by means of a gusset 72 which is bolted to the brace by means of bolts 73 and to the beam 68 by bolts 74. The I-beam is thus held in vertically-extending position with reference to the frame 17. The forwardly-extending brace 66 is secured to the plow 21 by means of a bracket 76. It is apparent that this system of bracing thus affords a stiff framework upon which the plow 21 and side wings 26 are supported.

A third clamp number 77 is engaged to the tube 51 below the bracket 58 and this clamp affords means for holding and supporting the lower end of the hydraulic jack cylinder 60 on the tube 51. A horizontally-extending yoke 78 is slidingly engaged for vertical movement on the tube 51 and the lower end of the piston rod 79 is attached to the yoke 78 whereby in and out movement of the piston rod in the cylinder causes corresponding up and down movement of the yoke 78 on the tube 51 for moving the wing blades down and up as hereinafter described.

A long collar 81 is slidingly engaged upon the tube 51 and a flat bracket 82 at the front of the collar is pivotally secured to the scraper blade 26 by means of a pivot pin 83. The scraper blade may thus be permitted to pivot about the point 83 for tilting movement.

A bracket 84 is provided with flanges or fingers 86 and 87 whereby the bracket is adapted to slidingly engage the outer flange of the I-beam 68 and the bracket is adapted to move up and down on the flange of the I-beam. Inasmuch as the greatest pressure occurs between the bracket and the beam, by reason of compressive stress on the blade 26, rollers 88 are provided on the inside of the flanges 86 and 87 for engaging the outer flange of the I-beam 68 to permit the bracket to easily roll up and down the I-beam. Forwardly-extending flanges 89 and 91 on the respective flanges 87 and 86 afford means by which universal joints 92 may be pivotally attached to the bracket 84. The universal joints 92 are provided with pivot pins 93 to which compression braces or tubes 94 are pivotally engaged as by means of clevises 96.

Other tubes 97 of lesser diameter than the tubes 94 telescope into the tubes 94 and the tubes are held with respect to each other by means of pins 98 which pass through suitable openings in the tubes. As there are a plurality of corresponding openings in the tubes, the over-all length of the brace may thus be altered as desired.

Universal joints 99 are located on the front or outer ends of the tubes 97 in substantially the same manner as are the universal joints 92 just described. A pair of clamps 101 are mounted upon the tubes 46 and 47 at the rear of the scraper blade 26 and are pivotally engaged to the universal joints 99 by means of a long pin 102 which holds the clamps 101 in substantial alignment. It is apparent that if the clamps are moved along the tubes 46 and 47 they will cause the outer end of the blade 26 to move forward or back and that in this manner the braces may be moved to a position where the horizontal thrust of the load upon the scraper blade is substantially balanced against the braces or is distributed as desired between the braces and the collar 81.

The scraper blade 26, as has been previously stated, is adapted to be raised and lowered by means of the hydraulic jack 60. The operation of the blade raising and lowering means may probably be best understood by reference to Figures 4 and 6. The inner or front end of the blade 26 is supported by means of the cable 103. One end of the cable 103 is preferably secured to any stationary point such as a bracket 104 on the hydraulic jack 60. The cable passes over a pulley 106 on yoke 78 and over a stationary pulley 107 which is preferably secured to the bracket 58. The cable then passes downwardly to the front of the scraper blade 26 and is at-

tached thereto by means of a slotted link 108, a chain 109, and a fastening plate 111 which is secured to the scraper blade above the horizontal strip 38. The slotted link 108 permits the chain 109 to be engaged at any link along its length and therefore tilting adjustment of the scraper blade may be secured.

Another cable 112 is fastened at one end to any stationary part such as the ear 113. The cable 112 passes downwardly over the pulley 114 which is also rotatably mounted on the yoke 78 and up over a stationary pulley 116 which is supported on the upper end of the brace 62 by means of a swivel bracket 117. The swivel bracket 117 permits the pulley 116 to swivel about on the pivot 118 so that the cable 112 as it passes downward to the scraper blade 26 is always in alignment with the pulley. The lower end of the cable 112 is secured to the outer end of the blade 26 by means of a slotted ear 119, a chain 121, and a bracket 122 in substantially the same manner as the cable 103 is fastened to the inner end of the blade. The slotted link or ear 119 permits engagement of the chain 121 at any link along its length and thereby permits tilting adjustment of the scraper blade at the outer end.

The admission of fluid under pressure into the hydraulic jack is controlled by means of a valve 123 located in the cab of the tractor. A pipe line 124, hose connection 126, and pipe line 127 conducts fluid into the hydraulic jack.

It is apparent that if fluid under pressure is admitted into the hydraulic jack by opening the valve 123, the piston 128 moves downwardly forcing the piston rod 79 out of the cylinder. The piston rod causes the yoke 78 to move downwardly on the tube 51 and thereby increases the effective length between the pulleys 116 and 114, and 107 and 106 to cause the blade 26 to be raised. The collar 81 is of course raised on the tube 51 since it is pivotally attached to the blade 26.

It is extremely desirable that the braces for holding the rear end of the scraper blade in position be substantially in line with the line of thrust on the blade. We therefore provide means for raising and lowering the bracket 84 on the I-beam or standard 68, thereby raising or lowering the inner end of the braces in accordance with the movement of the outer end of the blade 26. To secure this coordinated motion of the bracket 84, we preferably provide a system of pulleys and cables. It is apparent that any other suitable mechanical means may be employed to secure this result, such as racks and pinions actuated by a hydraulic jack, or screws and gears. The cable and pulley arrangement is probably the simplest and most dependable.

In a preferred structure we employ two cables. One of the cables 131 is secured to an ear 132 on the collar 81, passes upwardly over a pulley 133 which is fastened to the rearwardly-extending portion 61 of the bracket 58, downwardly over a pulley 134 which is fastened to the frame member 17, rearwardly to a pulley 136 which is likewise fastened to the frame 17 at a position just in front of the standard 68, and upwardly to an eye 137 which is in turn fastened to the lower side of the bracket 84. The other cable 138 is fastened to the upper end of the bracket 84 by means of the eye 139 and the cable passes upwardly to a pulley 141 located at the top of the standard 68, down to a pulley 142 located beside the pulley 136, forwardly to a pulley 143 located beside the pulley 134, and upwardly to

the ear 132 on collar 81, where it is fastened to the ear.

It is now apparent that movement upwardly of the collar 81 pulls on the cable 138 and causes the bracket 84 to move correspondingly upward. The tension on the cable 131 is decreased by upward movement of the collar 81 and thus the end of the cable at the bracket 84 is permitted to move upwardly. A downward movement of the collar 81 causes a corresponding downward movement of the cable 131 at the standard 68 and a consequent downward movement of the bracket 84. At the same time the tension on the cable 138 is decreased and of course the cable 138 moves downwardly to permit the downward movement of the bracket 84.

It is apparent therefore that movement up or down of the collar 81 by reason of movement of the blade 26 causes a corresponding upward or downward movement of the bracket 84 thus causing the braces 96 and 97 to be adjusted up or down so that in operation they are always substantially in line with the line of thrust on the blade.

It is apparent that we not only provided means whereby the blade 26 may be tilted up or down as desired, but that we have also provided means for adjusting the angular position of the blade by moving the clamps 101 along the tubes 46 and 47 and by making the length of the braces 96 adjustable.

The braces 94 are always in substantial alignment with the line of thrust on the blade and a single hydraulic jack, controlled from the cab of the prime mover, is adapted to move the entire assembly. The construction is relatively inexpensive and is extremely strong and reliable.

Although we have described one embodiment of our invention it is apparent that modifications thereof may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of our invention as set forth in the appended claims.

We claim as our invention:

1. In an earth moving device, a prime mover, a framework extending around the front and sides of the prime mover and having pivotal engagement therewith, a standard vertically mounted on the framework, a plow blade, means for slidably engaging the plow blade on the vertical standard, a second vertically-extending standard also mounted on the framework, a bracket slidably engaged for vertical movement on the second named standard, a brace pivotally engaged with the plow blade and having pivotal engagement with the bracket whereby as the plow blade is moved up and down on the first named standard the bracket may be moved up and down

on the second named standard to permit the brace to be located in substantial alignment with the load on the blade, and means for causing movement of the bracket in accordance with the vertical movement of the plow blade comprising cables and pulleys arranged with a cable connected to the plow and extending upwardly over a pulley located near the top of the first named standard, downward over a pulley located near the bottom of the first named standard, rearwardly to a third pulley located near the bottom of the second standard and up to the bracket, and a second cable connected to the plow extending downwardly to a pulley located near the base of the first named standard, rearwardly to a pulley located near the base of the second named standard, upwardly to a pulley located near the top of the second named standard, and downwardly to the bracket.

2. In an earth moving device a prime mover, a pair of vertical standards mounted on the prime mover, a plow blade mounted at its ends for vertical movement on the standards, and means for moving the ends of the blade on the standards comprising a pair of cables one of which cables is connected to one end of the plow blade and passes upwardly on the adjacent standard, downwardly on the same standard, over to the other standard, and upwardly to the other end of the plow blade, and the other cable of the pair being attached to the other end of the plow and associated with the standards in the same manner but in the reverse order to the first cable.

3. In an earth moving device, a prime mover, a cylindrical standard mounted near the front of the prime mover, a collar slidably engaged on the standard, a wing plow one end of which is pivotally mounted on the collar, a second standard vertically mounted near the rear of the prime mover, a brace pivotally engaged to the other end of the wing plow, a bracket slidably engaged on the second standard for vertical movement, the brace being pivotally engaged to the bracket, and hydraulic means, for moving the plow, mounted on top of the cylindrical standard, and a pair of cables one end of each of which is attached to the ends of the plow blades and the other ends of which are associated with the hydraulic jack in such a manner that the operation of the jack raises and lowers the blade on the cylindrical standard, and another pair of cables operatively engaged to the collar and adapted to move the bracket up and down on the second standard in substantial unison with the movement of the collar on the first standard.

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