Dec. 7, 1937. E. W. AUSTIN 2,101,666

SNOW MOVING DEVICE

Filed Jan. 2, 1936 4 Sheets-Sheet 1

Fig 1

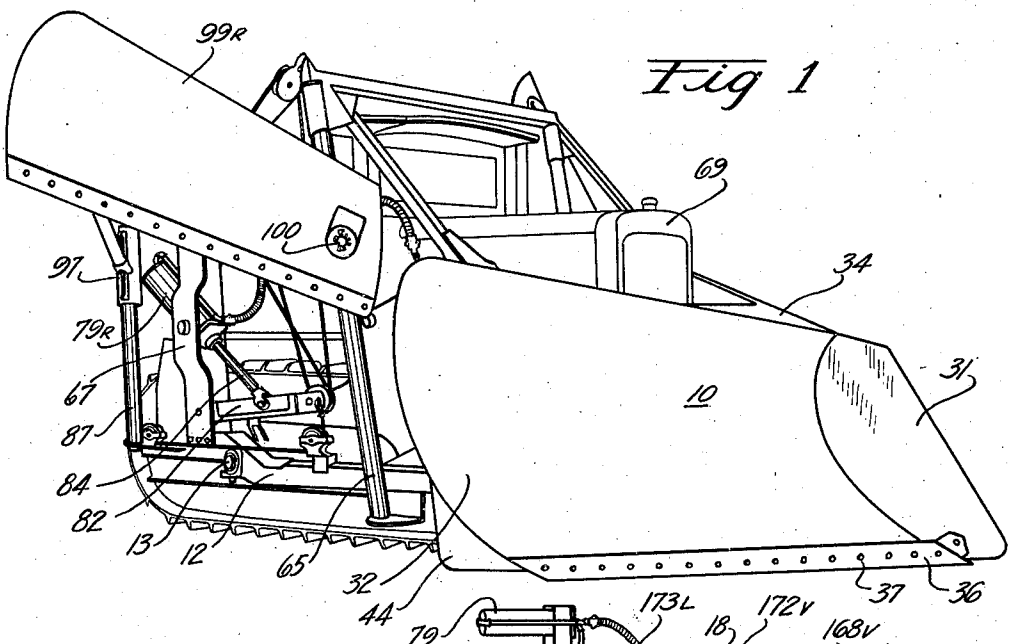


Fig 9

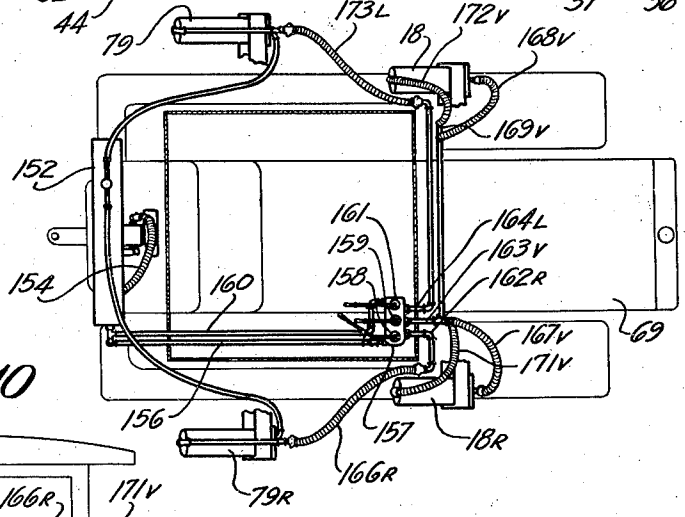
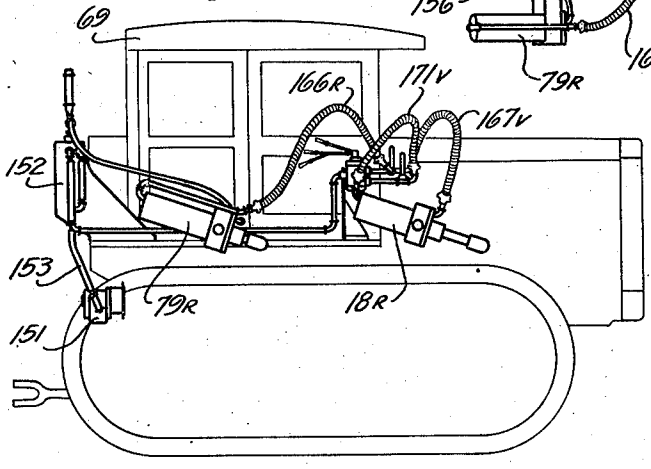


Fig 10



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SNOW MOVING DEVICE

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Fig 2

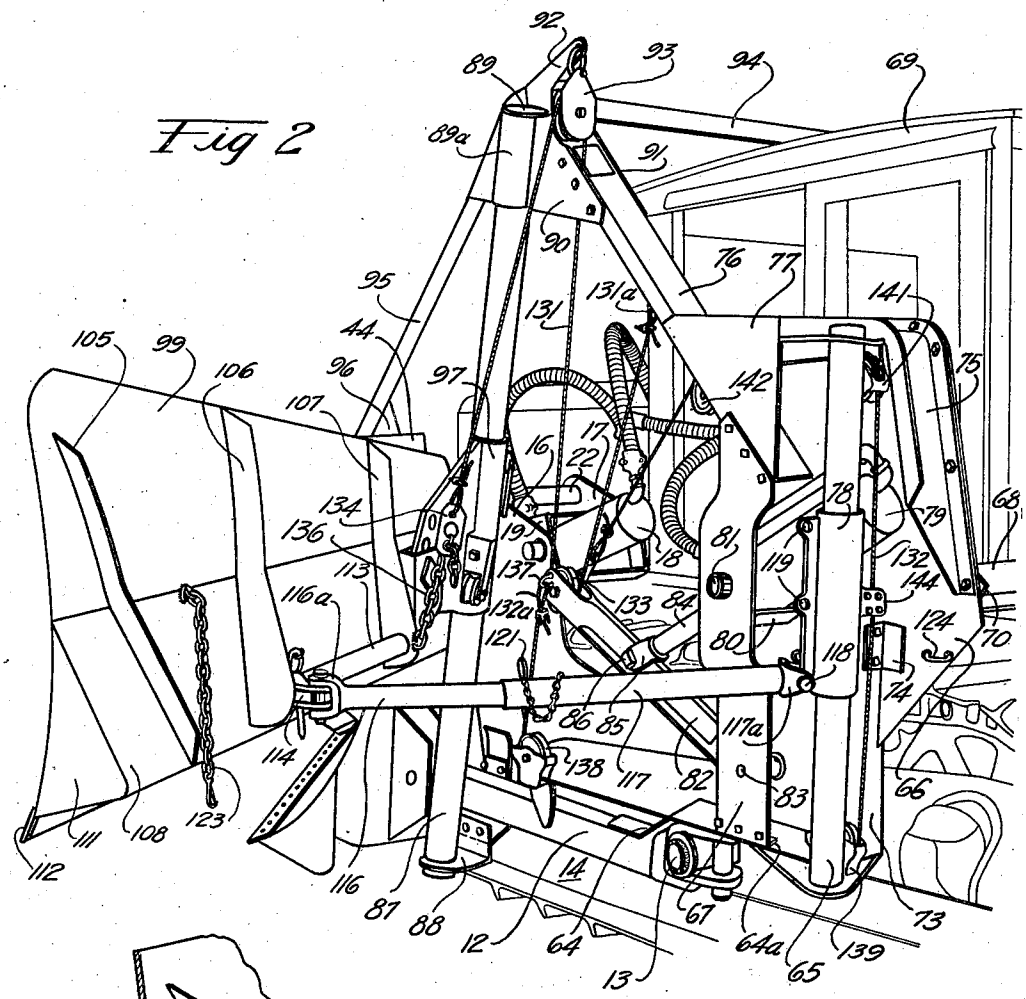


Fig 7

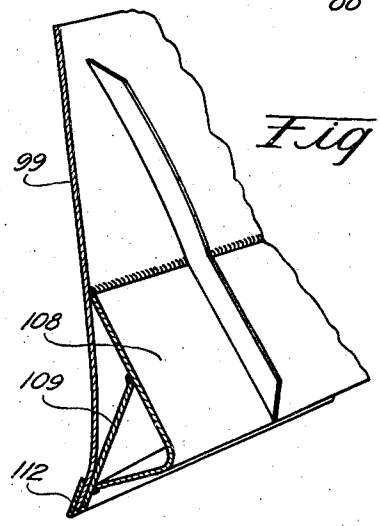
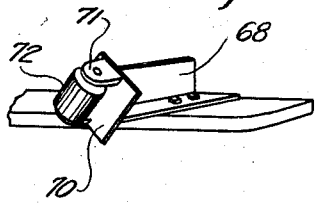


Fig 8



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SNOW MOVING DEVICE

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Fig 3

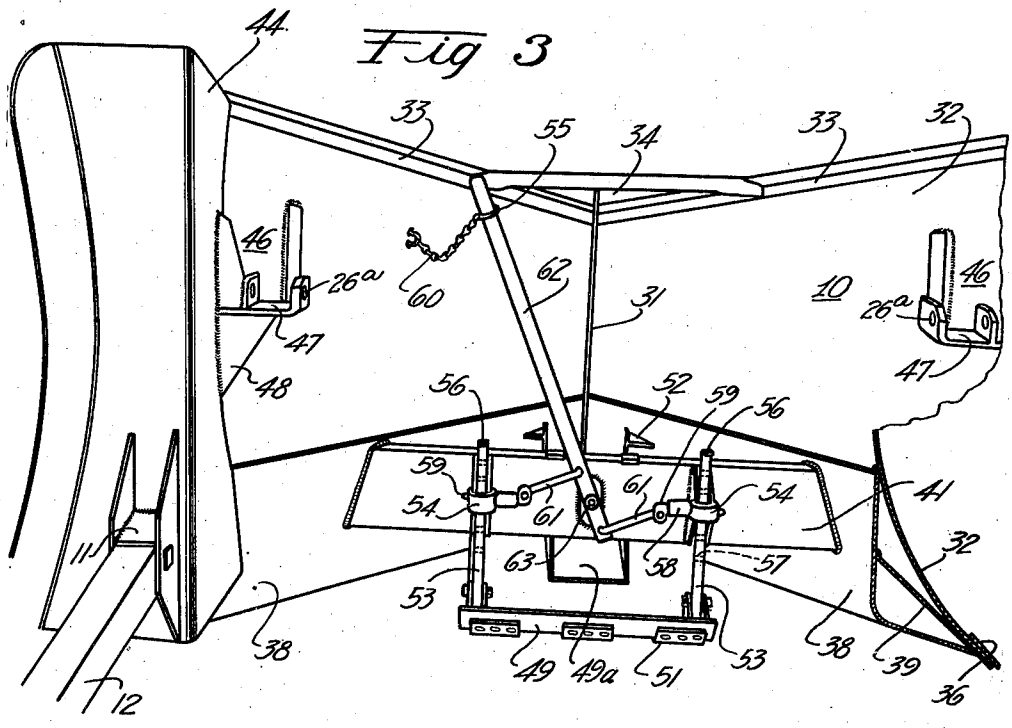


Fig 5

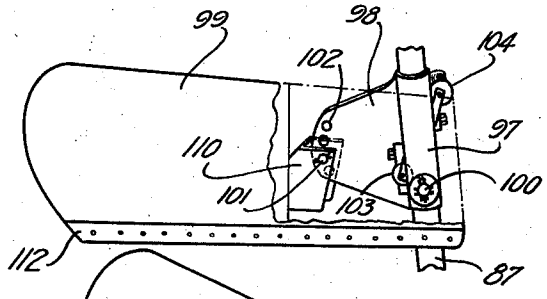


Fig 6

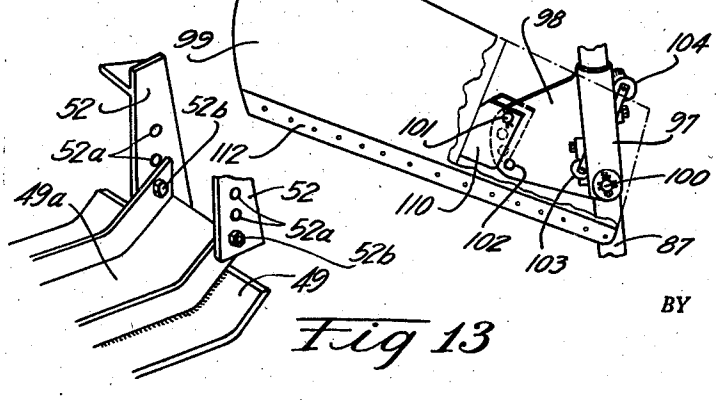


Fig 13

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SNOW MOVING DEVICE

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Fig 4

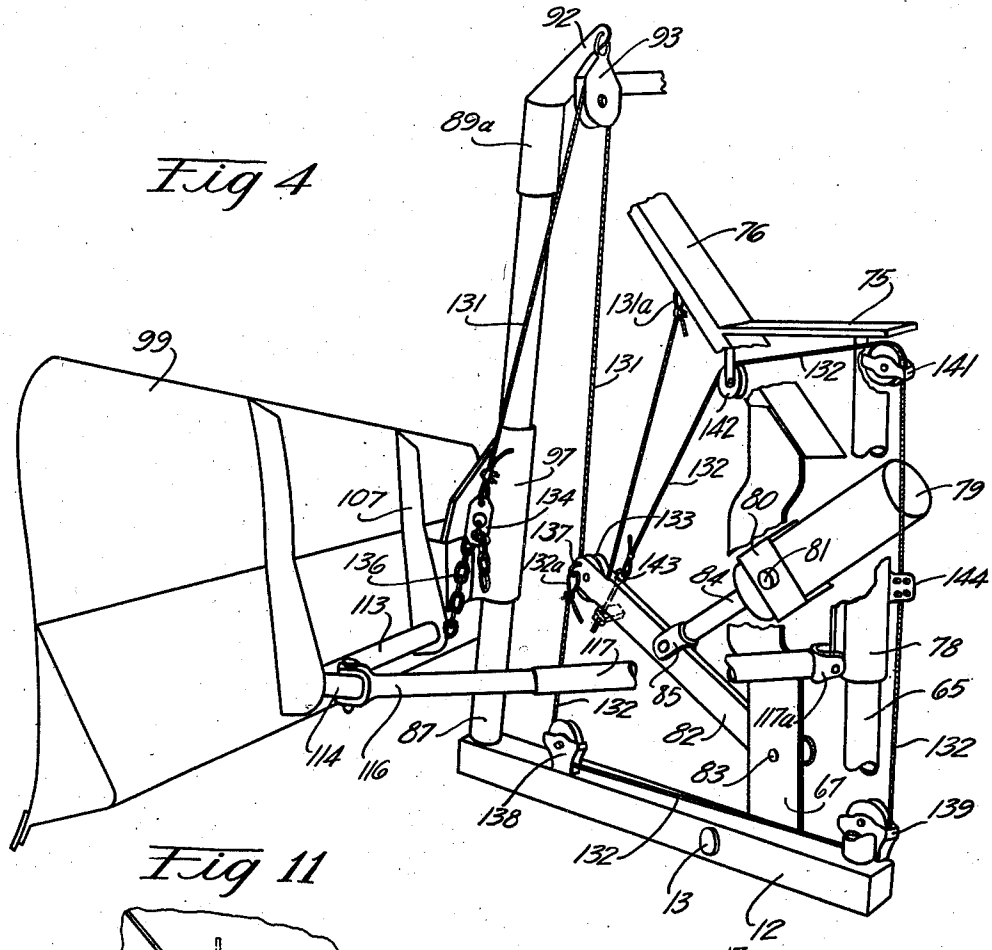


Fig 11

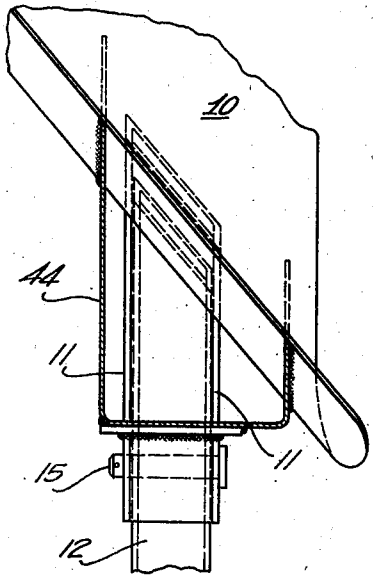
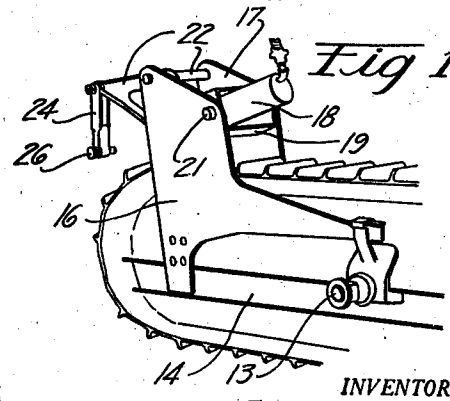


Fig 12



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Patented Dec. 7, 1937 2,101,666

UNITED STATES PATENT OFFICE

2,101,666

SNOW MOVING DEVICE

Ellsworth W. Austin, Cedar Rapids, Iowa, assignor to La Plant-Choate Manufacturing Company, Incorporated, Cedar Rapids, Iowa, a corporation of Delaware

Application January 2, 1936, Serial No. 57,091

14 Claims. (Cl. 37—44)

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

In devices of this general character it is extremely desirable that control of the blades during operation of the device be for the most part controlled from within the cab of the tractor or other prime mover. Furthermore, it is very desirable that simple means be provided for varying the position of the various blades with respect to the ground, for locking them in various positions and at times for permitting one or more of the blades to "float". Furthermore, the blades and other parts of the devices encounter tremendous loads, many of which are of a character to tend to cause wrenching of the parts of the device and means must be provided for meeting these loads.

It is, therefore, a general object of my invention to provide a new and improved snow moving device particularly suitable for moving snow, ice, earth, and the like.

An object of my invention is to provide, in a snow moving device, a plow at the front of the device, wings at the side of the device, and means for changing the relative position of these blades with respect to the ground.

Another object of my invention is to provide means for changing the position of the various blades of a snow moving device from one central point.

Another object of my invention is to provide means for securing down pressure on the blades and particularly the V blade of a snow moving device.

Another object of my invention is to provide new and improved means for actuating and controlling the wing blades of a snow moving device of the character described.

Another object of my invention is to provide means for adjusting the wings of such a device and particularly the angle of tilt of these wings.

Another object of my invention is to provide an improved wing blade adjusting and control means.

Another object of my invention is to provide a shoe means for supporting the V blade independent of its mounting upon the tractor or other prime mover and improved means for adjusting this support.

Another object of my invention is to provide an improved blade construction and also improved means for supporting and bracing these blades.

Another object of my invention is to provide an improved means for meeting the forces set up in the blade as they are pushed along over the ground.

Other and further features and objects of my invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specifications, 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 a device constructed according to one embodiment of my invention. The V plow is in lowered position while the wing plows are in raised positions to show the wing plow supporting and actuating mechanism.

Figure 2 is a view in perspective from behind one of the wing plows and showing particularly the supporting and actuating mechanism for the wing plow and also the supporting and actuating mechanism of the V plow.

Figure 3 is a view in perspective of the V plow of the device shown in Figure 1 taken behind the plow from the position usually occupied by the tractor or other prime mover.

Figure 4 is a diagrammatic view illustrating the supporting and actuating mechanism for the wing blades. This view is taken from substantially the same viewpoint as that of Figure 2.

Figure 5 illustrates more or less diagrammatically how a wing plow is supported and locked in a substantially horizontally extending position, portions of the blade being broken away to show the structure to better advantage.

Figure 6 shows the same wing blade locked in a raised position.

Figure 7 is a view partly in perspective and partly in section of the wing blade illustrating its construction.

Figure 8 is a fragmentary perspective view of one of the rollers for guiding the rear portion of the structure used in supporting and actuating the plows.

Figure 9 is a plan view in more or less schematic diagram illustrating the various conduits and hydraulic control mechanisms employed in actuating the various plows.

Figure 10 is a view in side elevation, also in

more or less diagrammatic relation of the hydraulic control and actuating mechanism.

Figure 11 is a sectional view illustrating how the side frames or levers are attached to the V plow.

Figure 12 is a fragmentary view in perspective illustrating the actuating mechanism for operating and supporting the V plow, and

Figure 13 is a fragmentary view of the V plow shoe and adjustable shoe support.

In general a snow moving device constructed in accordance with a preferred embodiment of my invention and illustrated in the drawings, is comprised of three cooperative structures, a V plow and plow supporting and actuating structure V; a left wing scraper and scraper actuating and supporting mechanism L; and a right wing scraper and scraper supporting mechanism R. The V plow is supported and raised and lowered by a mechanism somewhat similar to that disclosed in my copending application, Serial No. 742,368, filed September 1, 1934, but various modifications of this structure are necessary to provide a structure more particularly adaptable for snow removal. One of these structures is the adjustable shoe structure, illustrated in Figure 2, which structure is adapted for determining the spacing of the cutting edge of the V plow with respect to the ground.

The wing blades and wing blade supporting and actuating structures are somewhat similar to that disclosed in Patent #1,956,007 to Thomas V. Davin et al., issued April 24, 1934. Numerous improvements have been made in this latter structure among which are the mounting of the jack in a position where it does not interfere with the extreme raising of the wing plows and the provision of a lever to act as a means for raising and lowering these wings. Other improvements are the improved V plow and wing plow structures, improved means for locking and unlocking the wing plows with reference to their supporting structure and improved means for bracing the wing plows against the forces set up in use.

In the structure here disclosed the V plow **10** is on the front ends of a pair of side frame members or lever arms **12**. This is accomplished by providing box-like receptacles **11** extending into the vertically extending box-like V plow end members for receiving the ends of the lever arms **12**, the ends of arms **12** being removably pinned within the receptacles or boxes **11** by means of pins **15**, Figure 11. These lever arms **12** are pivotally engaged in accordance with usual practice, on stub-axles **13** which are engaged to the subframe or running gear **14** of the tractor.

The V plow is thus permitted to be raised and lowered with the stub-axles **13** as pivots.

Raising and lowering of the V plow is accomplished by means of a structure, including side plates **16** and **17**, on the opposite sides of each running gear. A pair of hydraulic jacks **18** are provided and the cylinders of these jacks are engaged to cradles **19** which are in turn pivotally mounted between the side plates **16** and **17** by means of pivotal mountings indicated at **21**. Bell cranks, indicated at **22**, are pivotally mounted between the side plates at a position ahead of and above the jacks and one arm of each bell crank is pivotally engaged to the outer end of the piston rods or rams of each jack, while the other arm of each bell crank is pivotally engaged to a link **24**. The other ends of the links are pivotally engaged to the inner faces of the V plow by means of pins **26** which are received within openings **26a** in the channels **47** hereinafter described.

The jacks **18** are preferably of the double ended type and fluid is introduced into the rear ends of the jacks by means of conduits **171v** and **172v** and to the front ends of the jacks by means of conduits **167v** and **168v**, to raise, lower or hold the V plow in position as desired. It is apparent the plow may be raised to any desired angle within the operating range of the machine and may also be driven forcibly down against the ground as where it is necessary to remove ice, and the like, from the ground surface.

The blades of the V plow are preferably of built-up welded sections to afford great strength to the structure and in the preferred embodiment of the invention here shown, I provide a vertically disposed divider plate **31** at the extreme nose of the plow to divide the material being moved by the snow moving device and also to afford a stiffening member for the V plow. The divider plate is of particular advantage in widening a pathway to permit practically the entire width of one side of the V to be used in pushing snow aside. The divider plate prevents snow from falling over to the other side of the V.

The sides or mold boards of the V plow are preferably comprised of main sheets **32** suitably curved to pick up the material and roll it back upon itself until it is discharged at the rear of the mold boards. The upper edges of the mold boards **32** are stiffened by means of angle plates **33** and the upper edges are additionally braced at the nose by means of a triangular gusset **34**, the edges of which are turned over to stiffen the structure. The angle plates **33**, if desired, may be replaced by extension plates to afford greater capacity to the plow.

A pair of cutting edges **36**, of extremely hard wear resisting material, are secured to the lower edges of the mold boards by means of bolts **37**. The lower edges of the mold boards are subjected to tremendous strains and I preferably reinforce them by means of heavy horizontally extending angle beams or reinforcing sheets **38** having the upper edges thereof welded to the rear faces of the mold boards and having the front edges welded or otherwise secured to the under side of the lowermost edges of the mold boards. These angle beams are additionally reinforced by means of reinforcing plates **39** which extend from the lower edges of the mold boards at the under side thereof up at an angle to the rear wall of the angle beams or reinforcing plates. The reinforcing sheets or angle beams **38** are additionally braced against each other by means of a cross beam **41** which is welded to the opposed inner faces of the angle beams. The cross beam **41** affords means for adjustably mounting a heavy shoe at the nose of the V plow, as hereinafter described.

The rear ends of the mold boards of the V plow are possibly subjected to greater loads than any other part of the plow and these ends are reinforced and braced by heavy, vertically extending angle beams **44**, the edges of the box-like reinforcing beams **44** being concaved at the rear side edges to conform to the curvature of the mold boards and being welded or otherwise secured to the rear faces of the mold boards.

The box reinforcing members **44** serve not only for bracing the rear ends of the mold boards but also serve as means for receiving receptacles **11** in which the levers **12** are secured, the brackets

11 being secured within the rear face of the vertical box members 44 by welding or in any other suitable manner. The inside faces of the boxes 44 serve also as a means for mounting the pivot brackets 46, in which pivot pins 26 are pivotally engaged. The pivot pin brackets 46 are built up structures comprised of horizontally extending channels 47 secured to the side walls of the box members 44 and to the inside faces of the mold boards 32 and braces or gussets 48 are secured to the inside faces of the box members 44 and to the underside of the channels 47.

It is desirable in some types of snow removal work that the V plow be permitted to float freely and its position with reference to the ground be determined by means of one or more shoes. In the structure here illustrated a single, long, wide shoe 49 having a plurality of soles or runners 51 is employed at the nose of the V for adjustably supporting it with reference to the ground surface. A reinforcing channel member 49a is integrally engaged with the shoe 49 by welding or some such means. The member 49a is in turn pivotally engaged at its front end to suitable brackets 52 within the nose of the V. A plurality of engagement positions are provided by means of various holes 52a and pin 52b. The plate or shoe 49 is pivotally engaged to support members 53 at each of the rear corners of the plate 49. These support members 53 project upwardly adjacent the rear face of the cross beam 41 and pass through adjustment brackets 54 which are secured to the rear face of the cross beam 41.

Each of these support members 53 is provided with a hook 56 at its upper end to prevent the members from dropping downwardly through the adjustment brackets 54. The members 53 have a plurality of transverse openings 57 therethrough and the brackets 54 are provided with guides 58 in which pins 59 are slidingly received. The pins 59 are adapted to pass through the openings 57 when the openings register with the ends of the pins and the pins are pivotally engaged to links 61 which, in turn, are pivotally engaged to an operating lever 62 on opposite sides of the lever pivot 63.

It is apparent that when the lever 62 is pulled to the right the pins 61 are withdrawn from the openings and the shoe 49 may be raised or lowered as desired until the shoe is at the desired position below the cross beam 41, to secure any desired spacing of the cutting edge of the V plow with respect to the ground. This is usually accomplished by releasing the pins 59 from the supports 53 and moving the V plow up or down from the cab until the pins 59 drop into the desired openings 57. The lever 62 is held in closed position by dropping the ring 55 of chain 60 over the lever.

The wing plow supporting and actuating structure, which I am about to describe, is best shown in Figures 2 and 4 to 6 inclusive. In this embodiment of the invention a rearwardly extending plate 64 is secured to the upper face of each of the levers 12 to afford a platform to which cylindrical upright posts 65 and vertically extending plates 66 and 67 are secured. The plates 66 are roughly triangular in shape with the greatest dimensions extending vertically. The plates 66 form the backs of roughly box-like structures including the upright cylinders or guides 65 and the plates 67.

A pair of angles 68 are placed on top of the fenders at the rear thereof, just back of the cab 69. These angles are provided with rectangular plates 70, Figure 8, at their outer ends having brackets 71 secured thereto, and the brackets 71 rotatably support rollers 72 in such position that they roll on the inner faces of the plates 66 with the axes of the rollers substantially in line with radii passing through the stub-axles or pivots 13. These rollers roll on and thus afford guides for the plates 66 and in this way the rear of the entire plow blade supporting structure is guided and side thrust set-up in the V plow and wing plows is transferred to the main frame of the tractor.

The plates 64 are turned up at the outer edges of the horizontally extending portions, as indicated at 64a, and the vertically extending plates 67 are secured to these turned up portions 64a. The plates 66 are additionally braced by means of channels 73 to which the plates are secured, as by means of brackets 74. L-shaped channel members 75 are secured to the plates 66 at the upper edges thereof and extend downwardly along the rear upper portions of the plates 66 to cover the mechanisms supported by these structures, to afford a stiffening means for the structures, to provide means to which the upper end of the uprights 65 may be attached, and also to provide means by which the rear ends of bracing members 76 may be secured to these structures.

The upper ends of the plates 66 are secured to the rearmost portions of the bracing members 76 in any suitable manner. Triangular bracing gusset plates 77 are also secured to the rear portion of the bracing members 76 and these plates 77 are likewise secured to the forwardly extending portions of the channels 75. It is apparent that the structures just described, while made up of ordinary plates and panels, affords an extremely rigid and strong structure, the parts of which may be employed for purposes hereinafter described. I may term these last named structures and rear upright bracing structures.

The uprights 65 afford guides for the cylindrical slides 78 which may travel up and down the cylinders or guides 65. Hydraulic jacks 79, termed wing jacks, are pivotally mounted in the cradles 80 between the plates 66 and plates 67, by means of pivots 81, and the opposed plates 66 and 67 also afford means by which wing blade operating levers 82 may have one end thereof pivotally engaged thereto as by means of the pivots 83. The rams 84 of the hydraulic wing jacks 79 have their outer ends pivotally engaged, as by means of clevis 85 and pins 86, to intermediate portions of the levers 82. It is apparent, from inspection of the drawings, that when the pistons of the wing jacks 79 are driven outwardly, the piston rods or rams 84 cause the levers 82 to move downwardly about the pins 83 as pivots and that when the pistons are drawn into the jacks the levers are raised. Power is thus applied to the levers and the levers are connected to the parts of the wing blade supporting and actuating mechanisms in a manner to raise and lower the wing blades as desired as hereinafter described.

Other cylindrical guides or standards 87 are mounted near the fronts of the lever arms 12 in an upright position substantially parallel to the standards 65. The lower ends of the standards 87 are engaged to the lever arms 12 by means of suitable brackets 88. Caps 89, including cupped receiving member 89a and gusset plates 90 and 91, are adapted to surmount the upper ends of the standards 87. The caps 89 are pro-

vided with rearwardly and upwardly extending support brackets 92 which are adapted to support pulley 93 for purposes hereinafter described. The caps 89 on opposite sides of the device are joined and stiffened by means of a cross brace 94. The rear ends of the plates 90 and 91 are secured to the forward end of the bracing member 76. Other bracing members 95 extend forwardly and downwardly from the caps 89 and are secured thereto by means of forwardly extending portions of the plates 90 and 91. The braces 95 are secured to the upper ends of the V blade end box sections 44 as by means of welding them thereto. Additional gusset members 96 are employed to strengthen this joint.

Cylindrical slides 97, more particularly shown in Figures 5 and 6, are mounted for vertical movement on the uprights 87. The slides 97 have roughly triangular plates 98 secured to the slides 97 and these plates afford means for holding the wing blades in various positions of tilt. The wing blades 99 are pivotally engaged to the slides 97 by means of pivots 100. The blades are held in various positions of tilt by means of pins 101 which pass through suitable openings in a box-like bracket 110 on the rear of the blade and through corresponding openings 102 in the plates 98. In this manner the blades may be supported in a substantially horizontal position as shown in Figures 2 and 5 or any one of several tilted positions as shown in Figures 1 and 6. There are heavy turning moments present due to the blades being supported at their front end, tending to twist the slides 97 on the standards 87 and I have minimized the friction produced in moving the guide up and down by supplying rollers 103 at the rear lower end of the guide and 104 at the front upper end of the guide, which rollers are rotatably mounted on the slides and bear against the side walls of the standards 87.

The rear walls of the blades 99 are braced by braces 105, 106 and 107 and their lower edges are reinforced by means of box sections formed by the angularly bent plates 108. The upper ends of the upright portion of the plates 108 are welded or otherwise secured to the rear faces of the blades 99 and the forward edges of the lower portions of the plates 108 are welded or otherwise secured to the lower edges of the blades 99. The box sections 108, like the V plow, are additionally braced by upwardly and rearwardly extending plates 109, which are also secured to the lower rear faces of the blades 99 and to intermediate portions of the vertical parts of plates 108. The ends of the reinforcing members are closed off by means of triangular plates 111, and cutting edges 112 are supplied for the forward lower edges of the blades 97.

A pipe member 113 extends between the braces 106 and 107 and this member serves as a guide to which push pole brackets 114 may be secured. These brackets 114 may be slid along the pipes 113 to any desired position and locked therein in accordance with the usual practice. The push poles are comprised of telescopic sections 116 and 117, the sections 116 having clevises 116a by which they may be engaged to the brackets 114 and the rear ends of the sections 117 having clevises 117a by which they may be secured to the slides 78 in any one of several positions by means of pins 118 and the various openings 115. The sections 116 may be slid in and out of the sections 117 and are held in any desired position by the pins 121.

The wing blades 99 may be held at any desired angle with the main framework by placing the pins 121 in any of several openings in the telescopic members 116 or the clamp 114 may be slid forward on the pipe 113 and the members 116 completely telescoped in the members 117 to permit the wing blades to be folded back against the sides of the supporting structures, the chain 123 being hooked to the eyes 124 on plates 66 to hold the wing blades in this latter position.

The mechanism for raising and lowering the wing plows and including the slides 97 and 78 will now be described. These mechanisms are illustrated in Figures 1, 3 and 4; Figure 4 being a diagrammatic illustration of the structure employed. In the present embodiment of the invention, two cables 131 and 132 are employed for each of the wing plows. The cable 131 may be employed for lifting the wing plow blades proper and the cable 132 being employed for raising and lowering the slide 78. One end of the cable 131 is fastened to the lower face of the bracing member 76 as indicated at 131a, extends downwardly and under a sheave 133 mounted on the end of the lever arm 82, up and over the padlock pulley 93 which is supported by brackets 92 on top of the framework and then downwardly to a chain lock 134.

A chain 136 is secured to the lock at any desired position and the other end of the chain is welded or otherwise secured to the lower end of the brace 107. It is apparent that when the lever arm 82 is pushed downwardly by the ram 84 of the jack 79, the sheave 133 is pushed downwardly to raise the end of cable 131 to which the wing plow is attached to thus raise the wing and that when hydraulic pressure on the ram 84 is released the weight of the wing plow drives the pulley 133 and arm 82 to permit the plow to drop under its own weight. The slide 97 slides up and down on the standard 87 and thus the wing blades may be raised and lowered by the jack 79 as desired.

It is desirable that when the wing blades are being raised and lowered that the end of the push poles 117 and the slides 78 be raised and lowered at the same time so that the push poles will be in the proper position to meet the forces exerted on the wing plows. This motion of the slide 78 and push poles is accomplished by means of the cable 132. One end 132a of the cable is fastened to a suitable eye 137 on the end of the lever arm 82. The cable 132 then passes downwardly beneath a pulley 138 on the frame member 12, rearwardly parallel to the frame member 12, beneath another pulley 139 on the rear end of the plate 64, then upwardly to a pulley 141 which is fastened to the under side of the beam 75, forwardly and over a pulley 142 which is fastened on the under side of the bracing member 76 and downwardly to a takeup eye 143, also secured to the end of the lever arm 82. This takeup device 143 may be in the nature of an eye bolt secured to the lever arm 82 and having the lower end thereof threaded so that a nut may be threaded on the eye bolt to pull the eye downwardly against the tension of the cable 132 as desired. An intermediate portion of the cable 132 between the pulleys 139 and 141 is secured to the slide 78 by means of a clamp 144 which engages the cable to an ear 78a of the slide 78.

It is apparent that as the arm 82 is driven downwardly the eye bolt 143 pulls the cable 132 downwardly to raise the ear 78a and thus the slide 78 and push pole 117. When the ram 84 is

drawn inwardly to raise the lever arm 82 the eye 137 is raised to pull the cable 132a upwardly to pull the rear portion of 132 downwardly to pull the ear 78a and slide 78 and push pole 117 downwardly. The slide 97 will travel at substantially half the speed of the slide 78 and this action, resulting in varying the angle of the push pole 114 with regard to the blade 97, is desirable since a more downwardly acting component of force is desirable near the ground.

The forces set up by driving the wing blades against snow and the like is transmitted through push poles 116 and 117 to the side plates 66 and through the rollers 72 to the main frame of the tractor.

Obviously, the wing plow and wing plow actuating and supporting structure I have just described and which is particularly shown in Figures 2 and 4, is duplicated by the wing plow and wing plow supporting and actuating structure on the right side of the tractor as illustrated in Figure 1 except that the parts are in reversed position. While the same numerals apply to the parts either on the left or on the right side of the snow moving device, in some instances I have added the letter R to indicate that the devices are on the right side of the tractor; thus the numeral 18 applies to both of the jacks indicated in Figure 9, but for the purpose of the following description I have added the letter R to the numeral indicating the right-hand jack.

The hydraulic actuating and control means is more particularly illustrated in Figures 9 and 10. In accordance with the usual practice I may employ a hydraulic pump 151 at the rear of the tractor which is driven by a shaft from the motor of the tractor in accordance with the usual practice. An oil supply is maintained in the tank 152 and a conduit 153 carries oil from this tank to the pump. Oil under pressure is carried upwardly from the pump by means of a flexible conduit 154 and forwardly through the rear wall of the cab 69 by means of a conduit 160 where it is delivered to the triple valve housing 157.

The flow of oil through the valve housing 157 is controlled by the valves 158, 159 and 161 and these valves control the flow of oils selectively into the conduits 162R, 163V and 164L. The two outside valves 158 and 161 are so constructed that in one position of these valves oil is delivered under pressure to the conduits 162R and 164L respectively and in another position of these valves oil from the conduits and from the jacks 79 and 79R may flow back through the housing and through a return line 156 to the supply tank 152.

The middle valve 159 is a three-way valve so constructed that in one position of the valve oil under pressure is admitted to the conduit 163V which leads to the front ends of jacks 18 and 18R, while the fluid from the rear of the jacks 18 and 18R may pass through the conduit 169V, through the valve housing 157 and back through the return line 160 to the tank 152. In another position of the valve 159 oil under pressure is admitted to the rear ends of the jacks 18 and 18R, while oil from the front ends of the jacks passes back through the return line to the tank. In still another position of the valve 159 all the ports of the valve are connected and the V plow will "float" or find its own level through its own weight. In still another position of the valve 159 all ports are closed and the V plow is held rigidly in any selected position.

The conduit 162R is connected with the jack 79R through the flexible conduit 166R, the conduit 163V is connected with the jacks 18 and 18R through flexible conduits 167V and 168V. The conduit 169V is connected with the rear ends of the jacks 18 and 18R by means of flexible conduits 171V and 172V. The conduit 164L is connected by means of the flexible conduit 173L with the jack 79. It is now apparent that the operator, by manipulation of the valve 158, may raise and lower the wing plow 99R and may raise and lower the wing blade 99 by means of valve 161. By manipulation of the valve 159 the operator may raise the V blade or lower it or drive it downwardly as desired. He may also permit the V blade to "float" and find its own level through its own weight. In this position of the valve 159 the V blade rests on the shoe 49 and follows the contour of the ground or other surface on which these blades or shoes slide.

In operation the operator may raise all of the blades and thus drive the tractor down the road without having any of the blades touch the surface of the ground or snow, or he may lower the V plow and permit it to float of its own weight to throw snow or the like from the surface of the ground in front of the snow moving device. If desired he may drive the blade downwardly to such a position that the weight of the forward portion of the tractor is added to the weight of the V plow to force the cutting edge of the V plow down with considerable force against the surface of the ground as for removing ice and the like from the surface.

He may lower the wing blades in a position parallel to the ground and with the cutting edges of the wing blades at substantially the same level as the cutting edge of the V plow to increase the effectiveness or width of cut of the snow moving device. If desired he may tilt either or both of the wing blades at an angle as illustrated in Figure 6 and thus bank the snow at the side of the road. If desired he may leave the wing blades in position parallel to the ground but raise them above the ground to make a "benching" cut at the side of the road. This cut has the advantage that snow may drift into the benched portion of the cut without dropping down onto the main roadway until the bench is full of snow. In some sections of the country this "benching" process of snow removal is used in preference to the sloping of the sides of the cut. The operator may quickly raise and lower the wing blades and the V plow without leaving the cab as for passing over an obstacle or in removing snow from a cut or the like. The wing blades may be folded against the side of the snow moving device when they are not desired or when they are not needed as auxiliary cutters or when the snow moving device is being driven from one field of operation to another, or for storage.

It is apparent that I have provided extremely rigid blade structures which are well adapted to meet all the forces acting upon them. I have also provided a snow moving device which is extremely flexible in operation and the blades of which may be manipulated by the operator for the most part without leaving the cab.

It is apparent that modifications of my invention may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of the invention, as set forth in the appended claims.

I claim as my invention:

1. In a snow moving device, a prime mover, lever arms pivotally engaged to the running gear of the prime mover, a V plow engaged in front of

the prime mover and on the ends of the lever arms, a wing plow at the side of the prime mover, means for actuating and supporting the wing plow comprising vertically extending standards on the lever arms, the wing plow being slidably mounted on the standards, and means for actuating the wing plow including a hydraulic jack pivotally mounted in one standard, a lever arm pivotally engaged to the last-named standard, the ram of the jack being connected to the lever arm, and means for conveying movement of the lever arm to the wing plow.

2. In a snow moving device, a prime mover, side frame members pivotally engaged on the prime mover, a V plow mounted on the side frame members, a wing plow, standards on the frame members for supporting the wing plow, a supporting structure for bracing the standards, a lever arm and a jack both pivotally engaged to the supporting structure, an operative connection engaged between the jack and lever arm and another between the lever arm and the wing plow for raising and lowering the wing plow by means of the jack.

3. In a snow moving device, a tractor, side frame members pivotally engaged on the running gears of the tractor and extending forwardly therefrom, a wing blade, vertically extending members on at least one of the frame members, means for slidably engaging the wing plow on the vertically extending members, one of said members being comprised of several vertically extending parts, a hydraulic jack pivotally engaged between two of the last named vertically extending parts and lever means for imparting motion of the jack to the wing blade for raising and lowering it.

4. An earth moving device including a tractor, a side frame member pivotally engaged to the running gear of the tractor, a wing blade mounted on the side frame member for substantially vertical movement with reference thereto, a pair of upright members on the side frame member, a hydraulic jack pivotally engaged within the upright members and lever means for imparting movement of the ram of the jack to the blade to secure vertical movement of the wing blade.

5. An earth moving device including a tractor, a side frame member pivotally engaged on the tractor, a wing blade mounted on the side frame member for substantial vertical movement with reference thereto, a pair of upright plates on the side frame member, a jack and a lever arm pivotally engaged between the upright plates with the lever arm pivotally engaged to the end of the ram of the jack and means for imparting movement of the lever arm to the wing blade to secure up and down movement thereof.

6. In a snow moving device, a tractor, a side frame member pivotally engaged to the running gear of the tractor, a pair of vertically extending guide members on the side frame member, slides on each of the guide members, a wing blade pivotally engaged at the front end to the slide member on the front guide member, a push pole for connecting the rear of the wing to the slide on the other guide member, a pair of upright members secured to the rearmost of the guide members, a hydraulic jack pivotally engaged between the upright members, a lever also pivotally engaged between the upright members, means for connecting the ram of the hydraulic jack to the lever member, and means for connecting the free end of the lever to the slides on the respective guide members to raise and lower them to thus raise and lower the wing blade.

7. In a snow moving device, a tractor, a side frame member pivotally engaged to the running gear of the tractor, a pair of vertically extending guide members on the side frame member, a pair of vertically extending plates adjacent the rear guide member and secured to the upper and lower ends thereof, a cradle pivotally mounted between the plates, a hydraulic jack mounted in the cradle, a lever arm having one end pivotally engaged between the plates, means for connecting the ram of the jack to the lever arm, and means for connecting the lever arm to the wing blade to slide it up and down on the guide members.

8. In an earth moving device, a tractor, a support pivotallly engaged on the tractor, a scraper blade slidingly mounted for vertical movement on the support, a lever pivotally engaged to the support, power means for moving the lever, and means operatively engaging the ends of the scraper blade to the lever, one of said means including a direct connection between the lever and one end of the scraper blade and the other including a speed reducing means for connecting the lever with the other end of the scraper blade.

9. In an earth moving device, including a vehicle, means for mounting a wing blade on the vehicle for substantial vertical movement with reference thereto, a pair of upright plates on the wing blade mounting means, a jack and a lever arm pivotally engaged between the upright plates, with the lever arm pivotally engaged to the end of the ram of the jack, the jack being inclined downwardly and the lever arm upwardly to form two sides of a triangle with the plates as the third side, and means for imparting movement of the lever arm to the wing blade to secure up and down movement thereof.

10. In a snow moving device, a vehicle, a pair of vertically extending guide members mounted on the vehicle, slides on each of the guide members, a scraper blade pivotally engaged at the front end to the slide member on the front guide member, a push pole for connecting the rear of the scraper blade to the slide on the other guide member, a pair of upright members secured to the the rear guide member, a hydraulic jack pivotally engaged between the upright members, a lever also pivotally engaged between the upright members, means for connecting the ram of the hydraulic jack to the lever member, and means for connecting the free end of the lever to the slides on the respective guide members to raise and lower them to thus raise and lower the scraper blade.

11. In a snow moving device, a vehicle, a pair of vertically extending guide members mounted on the vehicle, a scraper blade mounted on the guide members, a pair of vertically extending plates adjacent to the rear guide member and secured to the upper and lower ends thereof, a cradle pivotally mounted between the plates, a hydraulic jack mounted in the cradle, a lever arm having one end pivotally engaged between the plates, means for connecting the ram of the jack to the lever arm, and means for connecting the lever arm to the scraper blade to slide it up and down on the guide members.

12. In a snow moving device, a vehicle, a vertically-extending guide member mounted on the vehicle, a scraper blade mounted for vertical movement on the guide member, a pair of verti-

cally extending oppositely-disposed plates mounted at one side of the vehicle, a hydraulic jack pivotally mounted between the plates, a lever arm pivotally engaged between the plates, means for connecting the ram of the jack to the lever arm, and means for connecting the lever arm to the scraper blade to move it up and down with reference to the tractor.

13. In a snow moving device, a tractor, a side frame member pivotally engaged on the tractor, a scraper blade engaged to the side frame member to permit vertical movement of the scraper blade with reference to the vehicle, and means for moving the scraper blade including vertically disposed plates mounted on the side frames, a jack with the cylinder thereof pivotally mounted between the plates, a lever pivotally engaged to the plates below the pivotal engagement of the jack, and the ram of the jack being pivotally engaged to the lever.

14. In a snow moving device, a vehicle, a scraper blade mounted for vertical movement with reference to the vehicle, and means for moving the scraper blade including supporting plates on the vehicle, a jack having the cylinder thereof pivotally engaged between the supporting plates, a lever arm pivotally engaged between the supporting plates at a point below the jack, a pivotal connection between the ram of the jack and the lever, and means for conveying movement of the lever to the scraper blade.

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