July 18, 1939. F. COATES 2,166,424

SNOW PLOW

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Fig. 1.

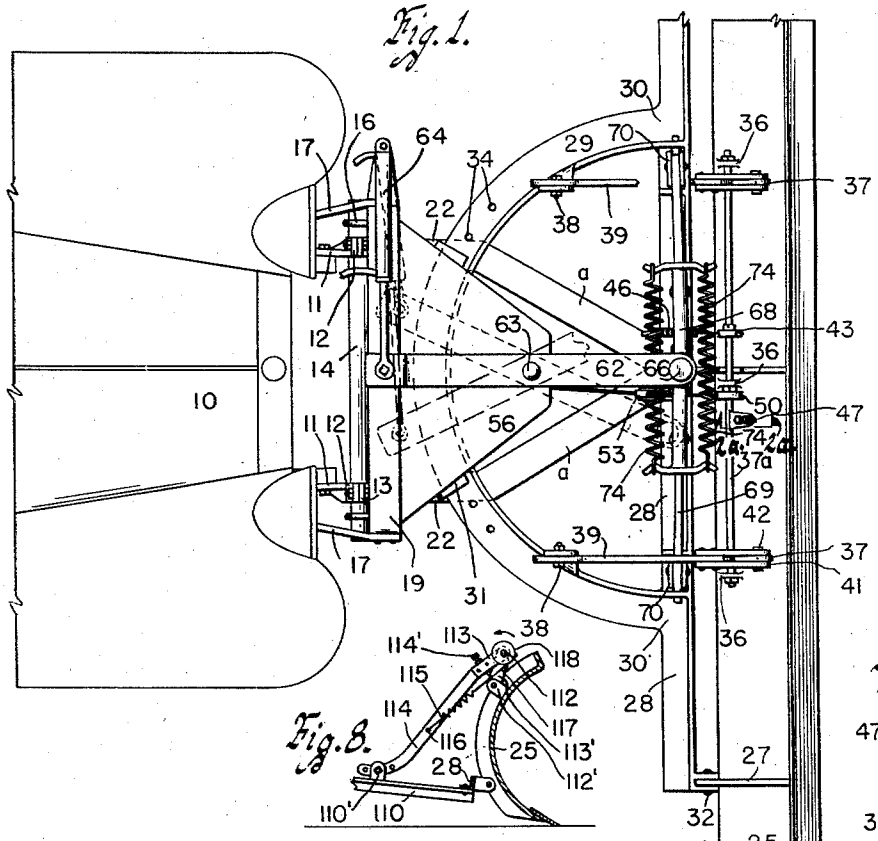


Fig. 2a.

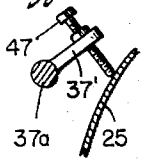
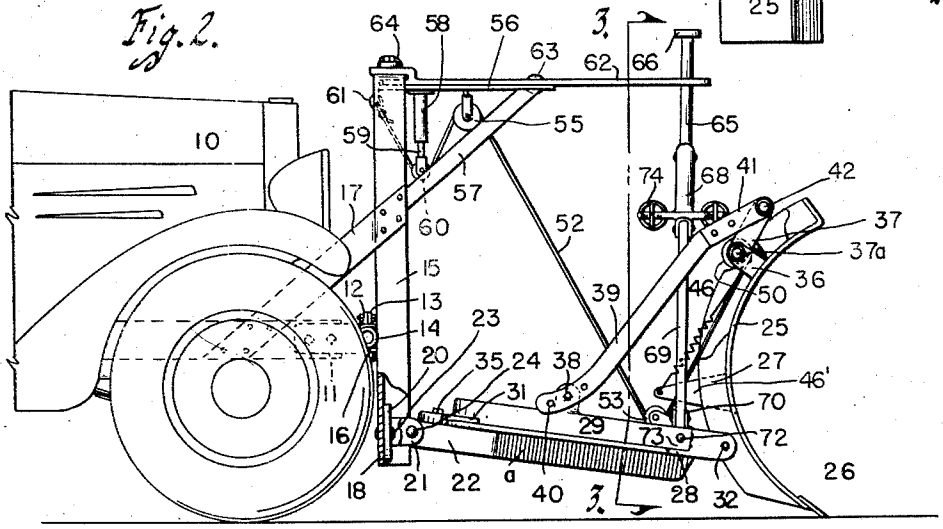


Fig. 8.

Fig. 2.



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Fig. 5.

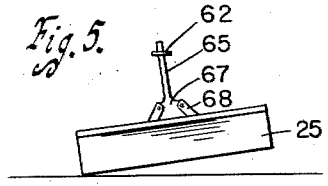


Fig. 7.

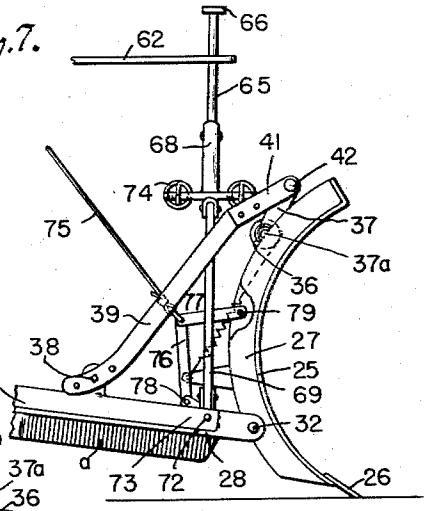


Fig. 4.

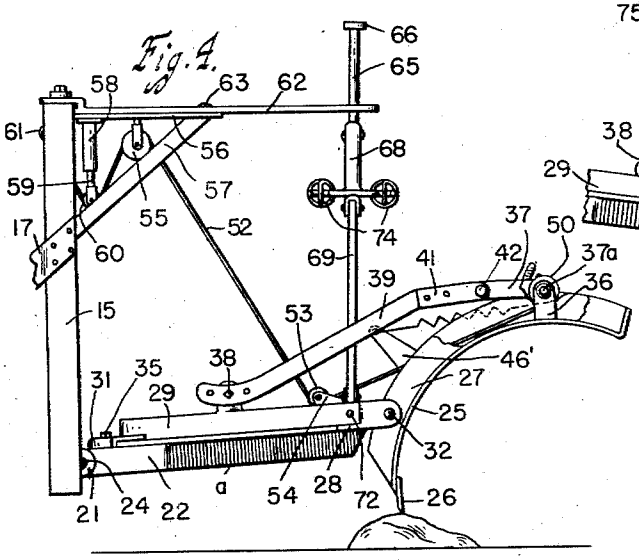


Fig. 6.

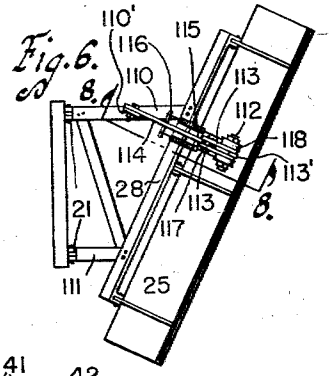
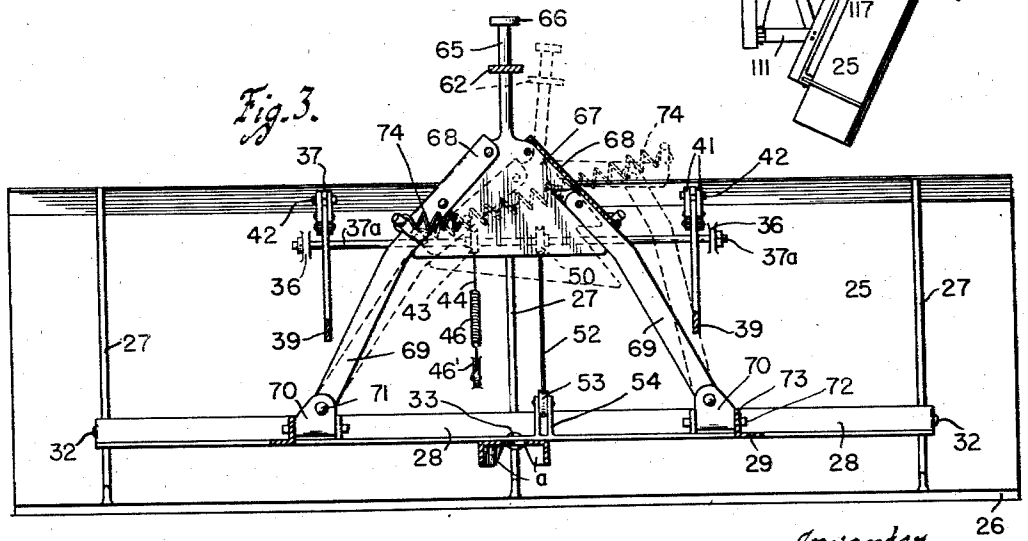


Fig. 3.



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UNITED STATES PATENT OFFICE

2,166,424

SNOW PLOW

Frank Coates, Corydon, Iowa, assignor of one-half to John J. Beadle, Corydon, Iowa

Application May 10, 1937, Serial No. 141,781

17 Claims. (Cl. 37—42)

The object of my invention is to provide a snow plow of the type adapted to be mounted on the front of a self driven vehicle and having a number of features hereinafter more fully set forth.

One of the particular objects of the present invention is to provide a snow plow including a mouldboard so mounted that upon striking an obstruction in the road, its upper part will tilt forwardly, and there will be also effected a lifting of the mouldboard so that it may clear ordinary obstructions.

In this connection it is my purpose to provide a novel spring trip mechanism for holding the mouldboard in place and allowing it to tilt when it strikes an obstruction, and it is also my object to provide a novel lifting means.

Still another object of my invention is to provide what I might call a stabilizing device which tends to help hold the mouldboard in any position to which it may be adjusted, so far as end-to-end tilting is concerned, but which will permit end-to-end tilting of the mouldboard under certain conditions.

While there are a variety of features which will be later mentioned in detail, it may be said that my present device has three outstanding ones, namely: the spring trip which permits the tilting of the mouldboard, the mouldboard raising device, and the stabilizing device.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the snow plow, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a top or plan view of a snow plow embodying my invention installed on a truck.

Figure 2 is a side elevation of the same.

Figure 2*a* is a detail sectional view taken on the line 2*a*—2*a* of Figure 1.

Figure 3 is a detailed sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a side elevation of the snow plow illustrating the parts in their positions after the blade at the lower end of the mouldboard has struck an obstruction and the mouldboard has tilted forwardly.

Figure 5 is a front view of the mouldboard illustrating a position to which it may be tilted for use.

Figure 6 is a top view of a modified form of the mouldboard mounting.

Figure 7 is a side elevation illustrating a slightly modified form of raising device; and

Figure 8 is a detail sectional view taken on the line 8—8 of Figure 6.

On the accompanying drawings, the numeral 10 indicates the front portion of a self driven vehicle, such as a truck. Extending forwardly from the frame of the truck 10 are the laterally spaced brackets 11, which have at their forward ends the clamp members 12 and 13 (see Fig. 1).

The clamp members 12 and 13 receive a transverse pipe 14 to which a pair of laterally spaced upright frame members 15 are fastened by suitable means, e. g. U-bolts 16. The members 15 form part of the frame of the snow plow as distinguished from the truck.

Braces 17 may be inclined upwardly from the frame of the truck and bolted to the frame members 15. The braces 17 are preferably fastened by bolts at both ends so as to be readily detachable. The frame members 15 are connected at their lower ends by a cross bar 18, and at the top by a cross bar 19 (see Figs. 1 and 2).

A transverse bar 20 is pivoted in front of the cross bar 18, as shown in Fig. 2. At its opposite ends the bar 20 has the forwardly projecting ears 21. Pivoted to the ears 21 are frame members 22 which extend forwardly a short distance, as shown in Fig. 1, and then are inclined forwardly and toward each other as at *a*, their forward ends being connected with each other.

Thus the frame formed by the bar 20, the member 22 and the parts *a* may rock on the fore-and-aft pivot 23 of the bar 22, and the members 22 may also swing up and down on the horizontal transverse pivots 24.

Mouldboard mounting

I will now describe how the mouldboard 25 is mounted to the frame structure just described.

The mouldboard has the replaceable blade 26 at its lower edge. It has the transversely spaced braces 27 on its rear side. A transverse angle bar 28 is pivoted to these braces 27 near the lower part of the mouldboard.

An angle bar 29, bent in the form of a semicircle, has its ends connected to the angle bar 28 at 30 by welding or any other suitable means. The curved bar 29 forms part of a turntable which cooperates with the other parts. It lies just above the frame members 22, as shown in Fig. 1. An angle bar 31 is fastened to the frame members 22 and is curved to correspond with the curvature of the bar 29 and has one flange overlying the horizontal flange of the bar 29 to

serve as a guide and retaining member for the bar 29.

Thus the mouldboard 27 may have pivotal movement on the pivots 32 by which the mouldboard is connected to the bar 28.

The bar 28 is pivoted as at 33 to the forward ends of the parts *a* of the arms 22, as shown in Fig. 3. Thus the mouldboard, the bar 28 and the bar 29 may all swing around the axis of the pivot 33.

To lock the parts in any position of this last swinging movement, to which they may be moved, I have provided the following means:

In the horizontal flange of the bar 29 I provide a series of holes 34 (Fig. 1). A bolt 35 (Fig. 2) is mounted in the horizontal flange of the angle bar 31 and is selectively extended through any one of the holes 34, depending on the position to which the bar 29 is adjusted.

Spring trip

I shall now describe the spring trip device which is the means by which the mouldboard 27 is normally held in position for operation, and yet is permitted to tilt forwardly at the top in case the blade 26 should strike a bad obstruction.

Projecting rearwardly from the upper portion of the mouldboard, and laterally spaced, are brackets 36 to which are pivoted short links 37 which, when the mouldboard is in its normal operating position, incline upwardly and slightly forwardly as shown in Figure 2.

A shaft 37*a* extends through the spaced brackets 36 and the links 37, and is rotatable in the brackets 36 and is fixed to the links 37.

Pivoted to the curved bar 29 as at 38 are the laterally spaced longer links 39. The links 39 may have a series of holes 40 to selectively receive the pivot bolt for making desired adjustments.

As a detail of construction, short bars 41 are fastened to the upper ends of each link 39 to form an extension of the link. The link 37 is received between the forward upper ends of the bars 41. Short shafts 42 connect the bars 41 and the links 37. The construction, of course, is the same at the upper ends of both of the links 39.

A pulley 43 is fixed on the shaft 37*a*. Fixed to the pulley 43, is a cable 44 connected in turn to a coil spring 46 which is also secured to a bracket 46' on the back of the mouldboard 25.

Referring to Figs. 2 and 3 it may be seen that the parts just described tend to normally hold the mouldboard 27 in its position as there shown, which is its position for operation.

Referring to Figures 1 and 2*a*, it will be noted that on the shaft 37*a* is mounted an arm in which is a set screw 47 which engages the mouldboard to limit its swinging movement in one direction, to-wit: rearward swinging movement of the upper part. By means of the set screw 47 a rather fine adjustment can be had.

By the arrangement thus described, the mouldboard will be held rigidly in place for ordinary operations. However, if the blade 26 should strike an obstruction which might otherwise break the machine, the mouldboard can swing forwardly at its upper end to permit its lower end to slide over the obstruction. The load that will be required to cause the forward swinging movement of the mouldboard may be determined largely by regulating the position of the set screw 47, and thus permitting the link 37 to more or less approach a straight line position between the pivot 42 and the pivot 38.

When the mouldboard is tilted forwardly at its top, as shown in Figure 4 for example, and the links 37 and 39 swing from their positions in Figure 2 to their positions shown in Fig. 4, the fact that the pulley 43 is fixed to the shaft 37*a* will cause the cable 44 to be wound around the pulley 43 for thus increasing the tension on the spring 46, so that as soon as the obstruction is cleared, the springs 46 will restore the mouldboard to its normal working position.

In Figs. 6 and 8 I have shown a slightly modified and considerably simplified form of my invention. In this form of the device the turntable structure is done away with and substantially parallel arms 110 and 111 are pivoted to the ears 21 and inclined forwardly and are fastened to the angle bar 28 similar to that already described to which the mouldboard 25, similar to that already described, is pivoted.

In this form, ears 112' project from the back of the mouldboard 25. Pivoted to the ears 112' is the link 113' in the outer end of which is fixed the short shaft 112. The shaft 112 is journalled in arms 113 which receive between them, and are rigidly fastened to, the link 114. The link 114 is pivoted to the ear 110' on the frame arm 110. On extreme ends of the shaft 112 are fixed the pulleys 118. Cables 117 are fastened to and wind on the pulleys 118. Springs 115 connect the cables 117 with a cross bar 116 on the link 114.

These parts are so arranged that the springs 115 normally tend to hold the mouldboard in its upright position, with the link 113' inclined upwardly and forwardly in the same way as are the links 37 in Fig. 2.

A set screw 114' is threadedly mounted in the link 114, to cooperate with the link 113' to adjustably limit the rearward movement of the mouldboard.

Raising device

While it is important that the snow plow should be so arranged that the mouldboard can tilt as described upon striking an obstruction, it is also desirable that it should be raised upon striking such an obstruction.

I have provided means for accomplishing this raising of the mouldboard. On the shaft 37*a* is fixed a pulley 50, shown for instance in Fig. 1. Fastened to this pulley is a cable 52 (Fig. 2). The cable is threaded from the pulley 50 downwardly around a pulley 53 (Figs. 2 and 3) journalled in brackets 54 on the bar 28, and around the pulley 55.

The pulley 55 is supported from a plate 56, shown in Figs. 1, 2 and 4, which is supported on the cross frame member 19 by suitable braces 57.

A hydraulic cylinder 58 is hung from the plate 56, and on its piston stem 59, which extends downwardly, is a pulley 60. The cable 52 extends around the pulley 60 and thence upwardly again to the cross frame member 19 to which it is anchored at 61.

The connections for the hydraulic cylinder 58 are not shown. This cylinder is used for raising and lowering the plow for transportation from place to place, and is not of particular importance here. It is connected with the automatic lifting device in such a way as to save manufacturing costs.

In case the mouldboard should strike an obstruction and then swing from its normal position shown in Fig. 2 to its tilted position shown

in Fig. 4, it will be seen that since the pivot **53** is substantially rearwardly from the pivot line **32**, the forward swinging movement of the upper part of the mouldboard will cause the lifting of the entire mouldboard and the forward part of the turntable mechanism.

This lifting action is accentuated by the fact that when the parts are moved from the position of Fig. 2 to the position of Fig. 4, the links **37** rotate the shaft **37a**, thus winding the cable **52** on the pulley **50**. There is thus provided a rather simple structure for accomplishing the lifting of the mouldboard when any such tilting action occurs.

Stabilizing device

In addition to being able to raise and lower the mouldboard in ordinary operation, and in addition to being able to swing around the axis of the pivot **33**, it is desirable to be able to tilt it from end to end. The tilting is made possible by the arrangement of the pivot **23**.

I have provided mechanism by which the tilting can be accomplished and I have interposed in such mechanism the safety stabilizing device.

A bar **62** is pivoted as at **63** to the forward end of the plate **56**. It is actuated at its rear end by means of a hydraulic device **64** which need not further be described. It might be actuated by any other suitable mechanism.

Vertically slidable in the forward end of the bar **62** is an upright rod **65** having at the top a head **66**, which supports at its lower end a substantially triangular plate **67** (see Fig. 3). Pivoted to the upper end of the plate **67**, on opposite sides of the upright rod **65**, are the upper ends of downwardly opening channel shaped links **68** which, in their lower positions of movement, receive the edges of the plate **67**, but these links **68** do not extend to the lower edge of the plate **67**.

Pivoted to the lower ends of the links **68** are links **69** which extend downwardly in diverging relation, and are pivoted at their lower ends to short channels **70** on substantially horizontal fore-and-aft pivots **71**. The short channels **70** are pivoted by pintles **72**, which are parallel with the bar **28**, to suitable ears **73** on the bar **28**. The lower ends of the respective links **68** are connected by suitable coil springs **74** which tend to hold the links **68** and **69** in their positions shown in Fig. 3.

By swinging the rear end of the bar **62** laterally, the upright rod **65** is swung laterally, and on account of the arrangement of the other parts, such lateral swinging movement tends to tilt the mouldboard **27** from end to end.

The stabilizer when once adjusted holds the mouldboard in its then assumed position. If it be lifted, both ends will be lifted the same distance. For example, if the edge of the mouldboard is set level, the stabilizer will hold it level even though the mouldboard is raised or lowered. The reasons for adjusting the mouldboard to different tilted positions are several. By way of illustration, the mouldboard may be tilted in order to throw the greater weight to the low end on the road, to assist in cutting loose packed ice or snow.

In case, however, one end of the mouldboard should drop into a loose space, or should strike a high spot, so that there should be unusual strain imposed upon the mouldboard tending to shift it from its then position, any tendency to tilt the mouldboard from end to end strong enough to overcome the springs **74** will affect a limited tilting movement. This stabilizing device affords another safety factor in the operation of the plow.

From the foregoing it will be seen that changes may be readily made in the details of construction and arrangement of my improved plow, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within the scope of my invention.

For example, it would be very easy to apply the raising device herein described to a wing type mouldboard swung out to the side of the vehicle, instead of applying it to one mounted in front of the vehicle as here shown.

One modification of my invention I have shown in Figure 7. Instead of the particular raising device already described, a cable **75**, connected at its upper rear end in the same way as is the cable **52** or in any other suitable way, might be connected to two links **76** and **77** pivoted together, and then pivoted respectively as at **78** and **79** to the bar **28** and to one of the braces **27** of the mouldboard, as shown in the drawings.

I claim:

1. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, and means for connecting the upper part of the mouldboard with said second frame at points substantially rearwardly from the mouldboard, said means comprising short links pivoted to the mouldboard and longer links pivoted to the short links and to the second frame.

2. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, means for connecting the upper part of the mouldboard with said second frame at points substantially rearwardly from the mouldboard, said means comprising short links pivoted to the mouldboard and longer links pivoted to the short links and to the second frame, and spring means tending to swing the links to a relative position that their forward ends are above and forward with relation to the pivot axes of the first links with the mouldboard.

3. In a structure of the kind described, a support, a frame pivoted thereto, a mouldboard pivoted to said frame, means for normally holding the mouldboard in snow plowing position, adapted, when the lower part of the mouldboard meets sufficient resistance in operation, to permit the upper part of the mouldboard to swing forwardly, and means connected with the mouldboard above its pivot and operatively connected with the upper part of the frame and connected with the support above the frame, for positively mechanically raising the mouldboard when its upper part thus swings forwardly.

4. In a structure of the kind described, a support, a frame pivoted thereto, a mouldboard pivoted to said frame, means for normally holding

the mouldboard in snow plowing position, adapted, when the lower part of the mouldboard meets sufficient resistance in operation, to permit the upper part of the mouldboard to swing forwardly, and means for raising the mouldboard when its upper part thus swings forwardly, said means including a flexible member secured to the rear part of the mouldboard above its pivotal connection to said frame, guide means on the frame, said flexible member being extended around said guide means, thence extended upwardly and rearwardly, and means for anchoring the upper rear end of the flexible means.

5. In a structure of the kind described, a support, a frame pivoted thereto, a mouldboard pivoted to said frame, means for normally holding the mouldboard in snow plowing position adapted, when the lower part of the mouldboard meets sufficient resistance in operation, to permit the upper part of the mouldboard to swing forwardly, means for raising the mouldboard when its upper part thus swings forwardly, said means including a flexible member secured to the rear part of the mouldboard above its pivotal connection to said frame, guide means on the frame, said flexible member being extended around said guide means, thence extended upwardly and rearwardly, means for anchoring the upper rear end of the flexible means, and means for shortening the effective length of said flexible device when the upper part of the mouldboard is swung forwardly.

6. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, means for connecting the upper part of the mouldboard with said second frame at points substantially rearwardly from the mouldboard, said means comprising short links pivoted to the mouldboard and longer links pivoted to the short links and to the second frame, spring means tending to swing the links to a relative position that their forward ends are above and forward with relation to the pivot axes of the first links with the mouldboard, means for raising the mouldboard when its upper part is swung forwardly comprising a guide on said pivot frame, a flexible member secured to the mouldboard above and forwardly from said guide and extended thence around the guide and upwardly and rearwardly to a relatively fixed point, and means actuated by the forward pivotal movement of the mouldboard for shortening the effective length of said flexible device.

7. In a device for the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, a bar mounted to swing on a vertical axis above and rearwardly with relation to said mouldboard and projecting forwardly from its pivot, an upright rod slidably mounted in said bar, a pair of links pivotally associated with the upright rod at its lower part by horizontal fore-and-aft pivots, a pair of links pivoted to the lower end of said first links and extending downwardly to said pivot frame and pivoted thereto, means for limiting the relative movement of the links in one direction, and springs for resisting their movement in the other direction.

8. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, a single central means for tilting the mouldboard from end to end and holding it in its tilted position, said last means being adapted to become temporarily inoperative for holding the mouldboard against tilting in case one end of the mouldboard should either drop or be raised on account of the contour of the road.

9. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a mouldboard mounted on said frame for swinging movement on a substantially horizontal axis, a single central means for tilting the mouldboard from end to end and holding it in its tilted position, said last means being adapted to become temporarily inoperative for holding the mouldboard against tilting in case one end of the mouldboard should either drop or be raised on account of the contour of the road.

10. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, means for tilting the mouldboard from end to end and holding it in its tilted position, said last means being adapted to become temporarily inoperative for holding the mouldboard against tilting in case one end of the mouldboard should either drop or be raised on account of the contour of the road, said last means including a bar mounted to swing on a vertical axis above and rearwardly from the mouldboard, means for locking the bar in various adjusted positions, an upright rod slidably mounted in the bar, and diverging members extending from the rod and secured to the lower part of the mouldboard.

11. In a device of the kind described, a frame, means for mounting the frame on a vehicle to have pivotal movement on a horizontal fore-and-aft axis and a horizontal transverse axis at the rear part of the frame, a second frame mounted on the front part of the first frame for swinging movement on a substantially vertical axis, a mouldboard mounted on said second frame for swinging movement on a substantially horizontal axis, means for tilting the mouldboard from end to end and holding it in its tilted position, said last means being adapted to become temporarily inoperative for holding the mouldboard against tilting in case one end of the mouldboard should either drop or be raised on account of the contour of the road, said last means including a bar mounted to swing on a vertical axis above

and rearwardly from the mouldboard, means for locking the bar in various adjusted positions, an upright rod slidably mounted in the bar, and diverging members extending from the rod and secured to the lower part of the mouldboard, said members being adapted to yield when the mouldboard is subjected to exceptional strain tending to tilt it from end to end.

12. In a structure of the kind described, a support, a frame pivoted thereto, a mouldboard pivoted to said frame, means for holding the mouldboard in snow plowing position adapted when the lower part of the mouldboard meets sufficient resistance in operation to permit the upper part of the mouldboard to swing forwardly and mechanical means associated with the mouldboard and connected with the support above the frame, for raising the forward end of said frame when the upper end of the mouldboard swings forwardly.

13. In a structure of the kind described, a frame, a mouldboard pivoted to the forward part of said frame, and additional means for connecting the mouldboard with the frame comprising a link pivoted to the mouldboard above its pivotal connection to the frame and a link pivoted to said first link and pivoted to said frame rearwardly of the first pivot connection, the parts being so arranged that when the mouldboard is in operative position the links form an acute angle and extend in substantially aligned position when the mouldboard is tilted.

14. In a structure of the kind described, a support, a frame pivoted thereto, a mouldboard horizontally pivoted to said frame, means for holding the mouldboard in snow plowing position adapted when the lower part of the mould board meets sufficient resistance in operation to permit the upper part of the mouldboard to swing forwardly, means for raising the mouldboard when its upper part swings forwardly, said means including a flexible member anchored to the mouldboard above its pivot axis and at a spaced point, and means for shortening the effective length of said flexible device when the upper part of the mouldboard swings forwardly.

15. In a device of the class described, supporting means, a mouldboard pivoted thereto on a horizontal axis above its lower edge and below its horizontal median line, means for holding the mouldboard at a certain position of rearward movement of its upper part, said means including a coil spring connected with the mouldboard and at a point spaced therefrom and means for increasing the tension on the spring, over and above that due to the mere separating movement of its points of attachment, when the upper part of the mouldboard is swung forwardly on such axis.

16. In a structure of the kind described, a frame, a second frame pivoted to the first frame on a horizontal axis, a mouldboard pivoted to said second frame, a single means for tilting the mouldboard from end to end without raising or lowering the center of the mouldboard and for simultaneously tilting the second frame correspondingly and for causing the mouldboard to stay at any tilted position while being raised or lowered by movement of the second frame.

17. In a device of the class described, a support, a frame mounted thereon for swinging movement on a fore and aft horizontal axis and on a transverse horizontal axis, a mouldboard pivotally connected with the frame on a horizontal axis, a member adapted to be moved transversely for tilting the mouldboard from end to end, links pivoted to the member and engageable therewith for limiting their movement in one direction, spring means for holding the links at such limits of their movement and links pivoted respectively to the first links and to transversely spaced parts of the mouldboard.

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