Dec. 12, 1961 L. R. KRUEGER 3,012,345

SNOW PLOW

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Fig. 2.

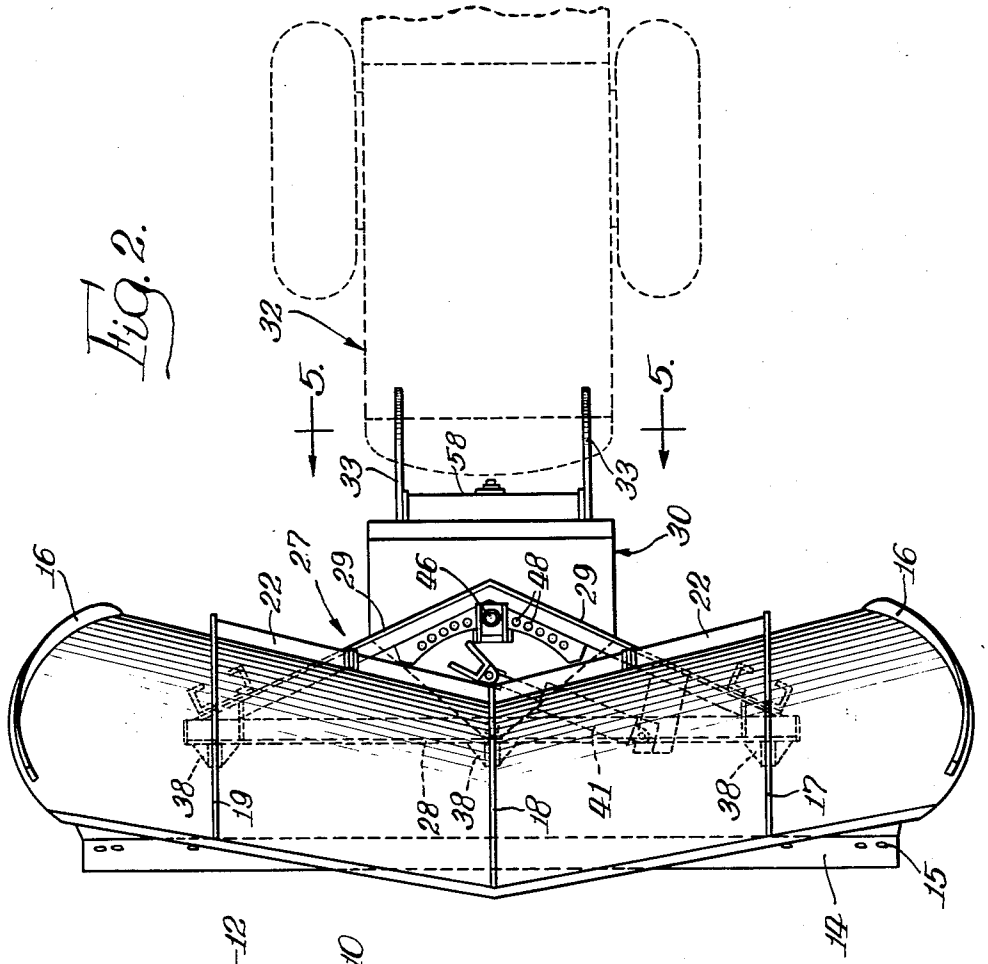
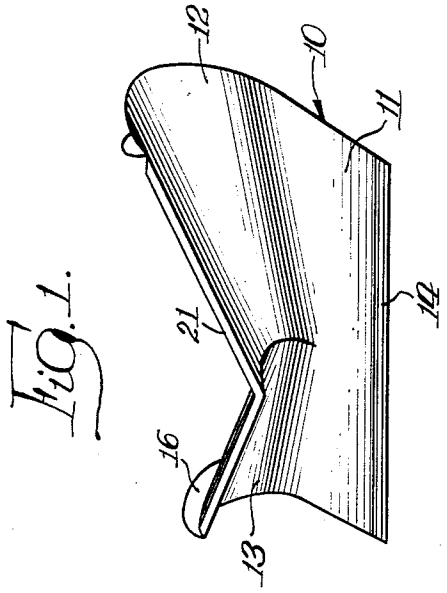


Fig. 1.



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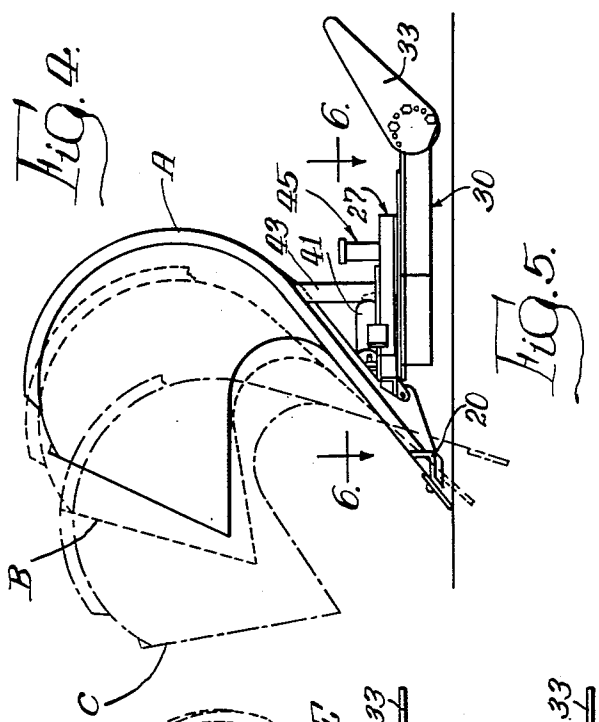


FIG. 4.

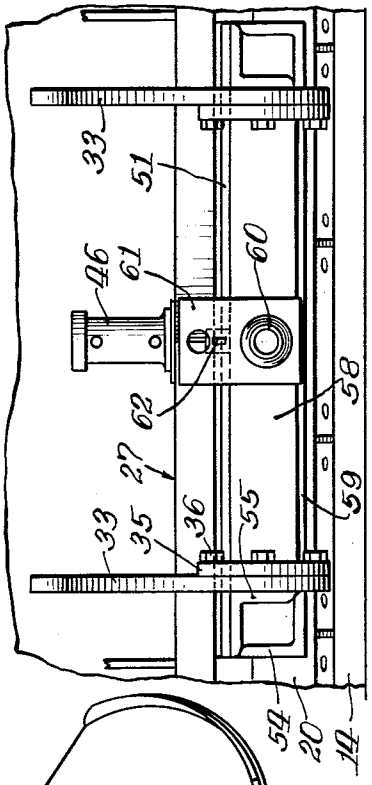


FIG. 5.

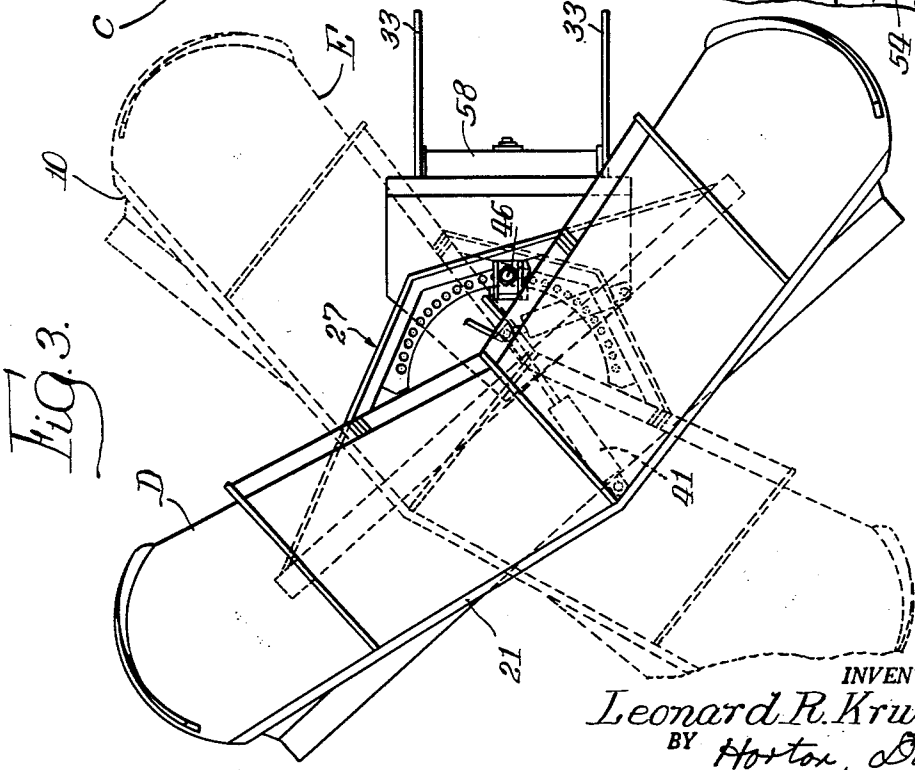


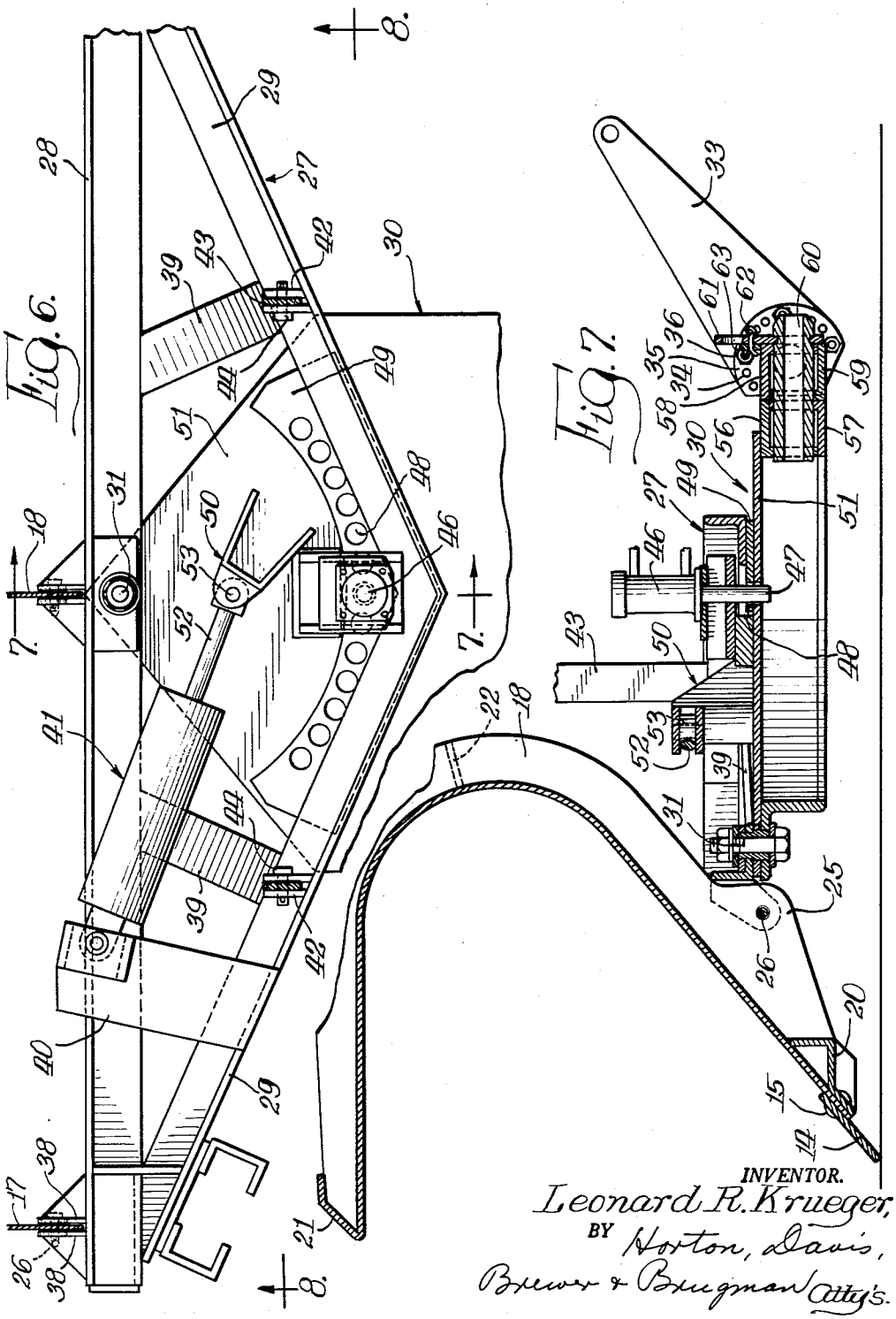
FIG. 3.

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SNOW PLOW

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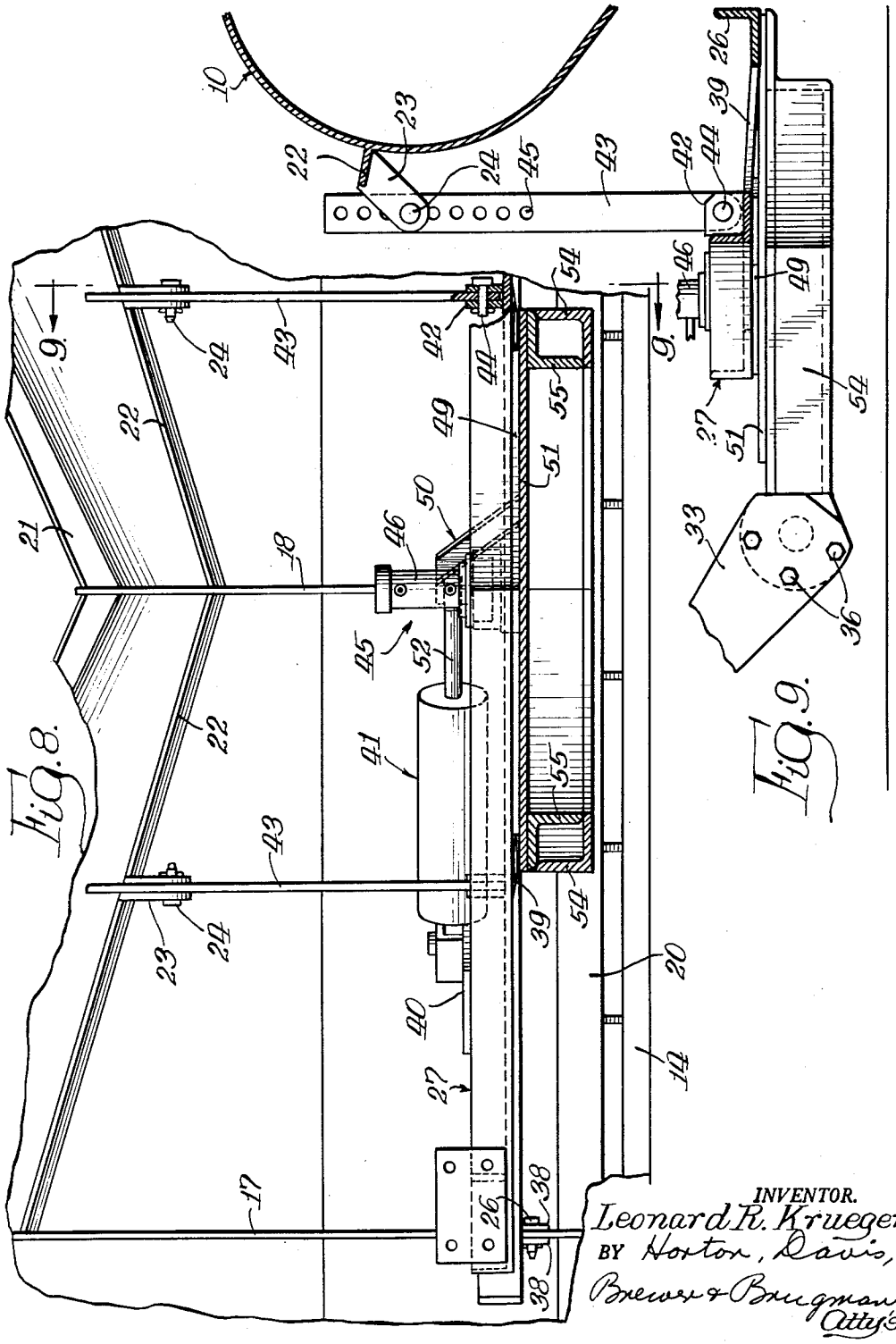


FIG. 8.

FIG. 9.

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SNOW PLOW

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Filed Apr. 29, 1960, Ser. No. 25,667
7 Claims. (Cl. 37—42)

This invention relates to snow removal equipment and more particularly to improvements in high speed snow plows productive of improved snow removal operation.

Snow plows, particularly for cleaning highways in association with wheeled vehicles or prime movers, generally traveling at relatively high speeds, desirably embody convenient features of adjustability to adapt their use to a wide variety of operating conditions and circumstances. A marked need for versatile and efficiently operating snow plows is particularly necessitated by the factors of ever increasing speed and traffic load on our highways which make the snow removal problem acute.

Present snow plows for this purpose fall generally into three major classes, namely, fixed straight blade plows, V-blade plows, and reversible plows. Each of these classes has certain advantages, depending on the weather and snow removal problems encountered, so that each is especially well suited for efficient operation under given weather conditions. Since by general practice it is quite normal for snow removal equipment to travel considerable road mileage per day, especially when high speed snow removal is contemplated, several varieties of snow load and weather conditions may be encountered in a designated territory covered by the equipment. For example, a snow fall may be light and powdery for some distance of the highway, heavily drifted in other areas, partially drifted elsewhere, and in still other places packed and iced over. It is essential to efficient clearing of the highway, therefore, that insofar as possible the snow removal equipment employed be capable of meeting and accommodating varying weather conditions. Such becomes especially important where a single piece of snow removal equipment is to cover a large territory or length of highway.

The present invention provides improved means for meeting the above-outlined problems of snow removal and in the main is characterized by a unique plow blade embodying the desirable features of fixed and reversible straight and V-blade plows, gaining from the combined features thereof added advantage and improvement by way of versatility, including a variable pitch moldboard which may be positioned for use as a scraper substantially transverse to the surface of the roadway or at lesser angles of contact therewith while affording maximum snow discharge through its V-plow action. For example, a regular straight blade plow tends to accumulate the snow in front of itself and roll the same to one side. The V-plow action tends to push and throw the snow to the side while the adjustable blade plows selectively cast the snow to selected sides with adjustment of the plow axis angularly with respect to the axis of its line of advance. V-plows of the order set out in my previous Patent No. 2,904,904 issued September 22, 1959, for Adjustable Snow Plow are further distinguished by overhanging deflectors at the upper end of the moldboards for preventing the plowed snow from flying upwardly to obstruct the operator's vision.

According to the present invention a combined straight blade plow and V-plow is provided, including full features of adjustability not only as to the angularity of the plow blade with respect to the line of advance for the plow, but also as to upright attitude of the moldboard, thereby permitting variable pitch adjustment of the moldboard and right-hand and left-hand discharge, or both. Additionally, the combined blade features produce a remarkable ability to cast snow at high plowing speeds so

as to throw the snow into the air and away from the prime mover or plow-carrying vehicle while maintaining maximum operator visibility.

It is a principal object of this invention to provide a new and improved snow plow having a combined V-type and straight plow blade or moldboard productive of improved snow removal.

It is an additional object of this invention to provide a new and improved snow plow, as aforesaid, which includes means for varying the pitch of the moldboard relative to the roadbed.

A still further object of this invention is to provide a new and improved snow plow which combines certain features of the straight blade and V-blade plows, both fixed and adjustable, to produce a new and improved throwing action for discharging the snow from the plow.

A still additional object of the present invention is to provide an improved snow plow having a variable pitch moldboard and adjustable means for effecting both right and left and/or combined right and left hand snow discharge and for varying the effective width of the plow for accommodating variations in road dimensions.

The above and further objects, features and advantages of this invention will appear to those familiar with the art from the following description of a snow plow combining a preferred form of my invention, as illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of the improved snow plow blade embodied in the present invention;

FIG. 2 is a top plan view thereof showing the same mounted on a prime mover or wheeled vehicle;

FIG. 3 is another top plan view showing various positions of blade adjustment relative to the line of advance for the plow;

FIG. 4 is a side elevational view of the improved plow seen in FIG. 2, showing selected positions of variable pitch adjustment for the moldboard;

FIG. 5 is a partial enlarged view taken substantially from vantage line 5—5 of FIG. 2 and looking in the direction of the arrows thereon to demonstrate the means for mounting the moldboard to the prime mover;

FIG. 6 is a cross-sectional view taken substantially from vantage line 6—6 of FIG. 4 and looking in the direction of the arrows thereon to feature the means for supporting and adjusting the plow blade;

FIG. 7 is a cross-sectional view taken from line 7—7 of FIG. 6 and looking in the direction of the arrows thereon to demonstrate further details of the means for mounting and adjusting the plow blade;

FIG. 8 is another enlarged partial view in elevation with portions thereof in section, taken substantially from vantage line 8—8 of FIG. 6 and looking at the rearward side of the plow blade; and

FIG. 9 is an enlarged partial cross-sectional view taken from vantage line 9—9 of FIG. 8 and looking in the direction of the arrows thereon to further demonstrate the means for adjusting the pitch of the plow blade.

Turning now to the drawing, particularly FIG. 1, this invention comprises an improved plow blade indicated generally by numeral 10 having a lower near-ground engaging straight moldboard portion 11 and an overdisposed V-type plow portion comprising a left-hand discharge moldboard portion 12 and a right-hand discharge moldboard portion 13 suitably joined together in V fashion. These right- and left-hand moldboard portions 12 and 13 are also formed integrally with the straight blade moldboard portion 11 and are curvilinearly formed generally transverse to their longitudinal axes with re-entrantly curved flared deflector portions along their upper edges to discharge snow thrown upwardly by the straight mold-

board portion 11, laterally outwardly from the ends of the plow.

It will further be regarded that the two curved moldboard portions 12 and 13 intersect in a line located substantially midlength of the straight moldboard 11 and that the latter is equipped along its lower edge with a removable scraping member or plate 14 running the length thereof. Plate 14 is provided for the purpose of meeting the roadbed or surface to be scraped and is removably mounted to the straight moldboard 11 as by a plurality of bolts 15 for replacement purposes.

As previously stated, the upper edge or end of each curvilinear moldboard portion is flared upwardly and outwardly to provide deflectors so fashioned, as will be recognized from FIG. 2 for example, that at the line of intersection for the two curved moldboard portions the leading edges thereof project beyond the underlying forward or leading edge of the straight blade portion 11 and its attached scraper plate member 14. Additionally, each of the curvilinear moldboard portions 12 and 13 is reinforced by a curvilinear rib member disposed on the rearward face and near the outer end thereof, as indicated at 16. At least three additional vertical reinforcing or structural rib sections, indicated as at 17, 18 and 19 in FIG. 2, are also provided on the back or rearward face of the plow 10, such extending substantially from the upward leading edge of the related moldboard portions 12 and 13 to a lower bar 20 extending substantially the length of the straight moldboard portion 11 and comprising a channel section rigidly affixed to the rearward face of the plow blade substantially at the line of attachment between the scraper blade 14 and portion 11. Also the upper edges of the two curved moldboard portions 12 and 13 are folded over in continuous channel section, indicated at 21, for reinforcement purposes. Further reinforcement is given to the plow blade by means of a pair of angularly intersected structural members 22, 22 extending between the three ribs 17, 18 and 19 and substantially paralleling the leading edge channel portion 21.

For purposes of mounting the blade 10 to a suitable supporting frame assembly, as will be presently described, each of the reinforcing structural members 22, 22 is equipped with bifurcated mounting ear portions indicated at 23 and comprising a set of separated parallel lobes having registering aligned openings for the reception of a pivot pin means 24. In like fashion, each of the vertical ribs 17, 18 and 19 has an enlarged area adjacent its lower end, as at portion 25 (see FIG. 7), to provide a mounting lobe through which an opening is formed for the reception of additional pivot pin means 26. By this system, then, the blade 10 is supported pivotally on and connected to a framework carried in a conventional manner by a truck or like mobile vehicle, with the immediate connection between the supporting frame behind the blade and the blade 10 being effected by five pivot pins, two pins 24, and three pins 26.

The blade supporting framework includes a first reversing frame 27, as best understood by examining FIGS. 2 and 6 in particular. This reversing frame is formed of three structural angle members, base 28, and legs 29, 29 rigidly welded together in triangular fashion and positioned immediately behind and aligned centrally of the blade means 10. Reversing frame 27 is in turn pivotally carried on an underlying A frame assembly 30 and connected thereto by a single vertical pivot comprising bolt means 31 (see FIGS. 6 and 7). The A frame assembly 30 in turn is suspended from the forward end of a prime mover or vehicle, such as the truck indicated at 32 in FIG. 2, by a pair of rearwardly extending parallel spaced arms 33, 33. Arms 33 are joined to the underframing of the truck or other prime mover in a conventional manner according to recognized practice and therefore will not be described in detail herein except to point out that junction between arms 33 and A frame assembly 30 includes means for adjusting their longitudinal axes at various inclines relative to the general plane of the A frame. This is accomplished by means of plural bolt openings 34, 34 formed in mounting plates 35 and plural connective bolts 36; the latter passing through the openings 34 and corresponding openings in the respective arms 33. This arrangement permits desired elevation or depression of the A frame to accommodate various plow blade attitudes as will appear more fully later herein.

In greater particular, the reversing frame assembly 27 which is supported pivotally on the A frame, as above described, includes the three aforementioned structural members 28 and 29, 29 arranged in triangular fashion with the base leg member 28 thereof paralleling the scraper member 14 on the plow blade and presenting three sets of projecting pad eyes 38, 38, one adjacent each end thereof and one centrally located. All pad eye sets 38 extend forwardly of member 28 and receive one of the mounting lobe portions 25 at the lower ends of the three vertical rib members 17, 18 and 19. Three pivot pins 26, 26 then pass through the three related pad eye sets and portions 25, in coaxial alignment, to define a single horizontal pivotal axis for movement of the plow blade relative to the reversing frame, the purpose of which will appear hereinafter. Further, the three triangle defining structural members 28 and 29, 29 are preferably rigidified by crosspiece members 39 and a mounting plate 40 for connection with one end of a reversing ram means 41.

Each of the structural leg members 29, 29 is further provided intermediate its ends with a pad eye bracket means 42 for pivotal connection with upwardly extending adjustment rods 43; each of the latter being joined to one of the pad eye brackets 42 by pivot means 44. The adjusting rods 43 in turn are formed with a plurality of adjustment openings or holes 45 adjacent their upper ends for effecting connection with the mounting ears 23 on the plow blade by pivot pins 24. This system permits regulating the upright attitude or pitch of the plow blade, as between the three positions indicated at A, B and C in FIG. 4, which indicate three of several positions of adjustment for the plow blade 10 about its horizontal pivotal axis defined by the several pivot pins 26. The adjustment of the pitch for the blade serves, of course, to vary the angle of the intersection between the scraper blade member 14 and the roadbed. When blade 10 is in its position C of FIG. 4, the same acts substantially as a scraper blade, while other positions of angularity or pitch adjustment, such as the intermediate position B or the full line position A, permit engaging the snow or other material to be moved at desired attack angles according to the particular conditions encountered. This then permits more efficient plow action and snow removal.

Selected variation of the moldboard pitch or upright attitude for the plow blade is brought about by selecting a desired set of holes in the upright adjusting rods 43 and placing the locking pivot pins 24 through the same and mounting ears 23. With the variation of the blade pitch as described, alteration of the altitude or vertical position of the A frame assembly 30 also may be necessary which, of course, is readily accomplished through adjustment of support arms 33, as above described.

In addition to the structural aspects of the reversing frame assembly above set out, the same also includes a locking assembly having a hydraulic actuator 46 for vertically reciprocating, when desired, a cylindrical locking pin 47 which cooperates with plural openings 48, 48 formed in a locking sector plate 49 mounted on the A frame assembly beneath pin 47.

The locking assembly (as shown in FIGS. 2 and 6) is located at the apex of the triangularly formed reversing frame, or that is, at the point of intersection between the two structural leg frame members 29, 29. By selectively retracting the pin means 47 through operation of the actuator 46, the reversing frame assembly 25 may be

conveniently pivoted about bolt **31** relative to A frame assembly **30**, thereby to dispose the plow blade means **10** at various angular positions relative to its longitudinal axis of advance. This relationship is best illustrated in FIG. 3, as shown by extreme left-hand discharge position D in full lines and the extreme right-hand discharge position E in dotted lines therein. Movement of the plow blade to its various positions of angular adjustment about pivot **31** is conveniently accomplished by releasing pin **47** and actuating the reversing ram **41** by remote controls (not shown) but desirably located within the cab of the truck **32** for the convenience of the operator along with similar remote controls for reciprocating the locking pin **47**. Thus full extension of the reversing ram (as shown in FIG. 3) produces the extreme right-hand discharge plow position E, while full retraction thereof produces the extreme left-hand discharge plow position D. Intermediate positions of angularity are, of course available depending on the extension or retraction of the reversing ram accompanied by seating pin **47** in a selected position opening in the sector plate **49**.

Ram **41** while being pivotally connected at one end to bracket **40** on the reversing frame assembly **27** as previously described, has its opposite end connected to the A frame assembly **30**. More particularly, an upstanding mounting bracket means **50**, fixed to bedplate **51** of the A frame assembly, is pivotally joined to the one end of the ram piston rod **52** by pivot pin means **53**.

The bedplate **51** of the A frame assembly is supported by underlying structural members **54**, **54** and **55**, **55** fabricated in a rigid supporting framework which includes a base channel assembly fabricated with a pair of base frame members **56** and **57** cross-connecting the paired frame members **54** and **55**. The base frame members **56** and **57** are operatively positioned parallel to a supporting carriage frame comprising interjoined angles **58** and **59** which carry the two mounting plates **35** at their opposite ends. Connection between the angle members **58**, **59** and the A frame is by a single heavy duty pivot axle **60**, one end of is rigidly affixed to A frame members **56** and **57** so as to project centrally rearward therefrom for reception in suitable openings therefor in the supporting angles **58** and **59**. Axle **60** is removably locked to members **58** and **59** and held in place by a locking plate **61** anchored by a cotter key **62** and a locking ear **63**, as seen best in FIGS. 5 and 7.

From the foregoing it will be recognized that I have hereinabove described the structural aspects of an improved snow plow assembly embodying a novel form of plow blade including both a straight moldboard and a pair of V-related curvilinear moldboards entailing the better functional features of both V-plows and straight blade plows. Additionally, as shown in FIG. 3 for example, a simple expedient is provided for adjusting the lengthwise axis of the plow blade relative to its axis of advancement with the prime mover, thereby to effect left- and right-hand discharge for the plow, or, if desired, both left- and right-hand discharge thereof such as when the plow is positioned symmetrically of the longitudinal axes of advancement (illustrated in FIG. 2). This adjustment feature also accommodates the plow to differing highway widths and embodies the recognizably desired features of reversible blade plows previously known in the art. Additionally, provision of the adjustment rod means **43** and the single horizontal pivotal axes for the plow blade **10**, defined by the pivot pins **26**, permits the novel pitch adjustment feature, illustrated by plow positions A, B and C of FIG. 4. This latter departure over previously known plow devices, particularly produces increased versatility for more efficient plow action in snow removal. For instance, with the upright attitude for the blade, the ground-engaging scraper member **14** thereof acts similar to a squeegee or scraper while positions of reclining attitude from the vertical, such as retracted position A in FIG. 4, produces a more acute angle of attack between blade and snow, particularly desired for assisting the plow blade in throwing the snow, especially at high speed operation. With respect to snow discharge, the re-entrant upper end formation of the curvilinear moldboard portions prevents snow from flying upwardly to obscure the operator's vision while turning the upwardly flowing snow scraped up by the straight moldboard portion **11** into the V-related curved moldboard portions for lateral discharge. In practice the cooperation between straight and curvilinear moldboards, particularly at high speeds, produces a superior snow discharge and plow action.

While the foregoing and other features of this invention will be readily recognized by those familiar with the art, it is to be understood that the particular preferred embodiment shown and described is illustrative only of the novel features and concepts of this invention and that various changes, modifications and substitutions of equivalents may be made therein without necessarily departing from its spirit and scope. Further, it is not intended that this invention be limited to the particulars of the embodiment herein shown and described except as may appear in the following appended claims.

I claim:

1. A snow plow comprising, unitary blade means having a straight planar moldboard portion and a pair of curvilinear moldboard portions formed integrally therewith and emerging from the upper boundary thereof; the curvature of formation for each of said curvilinear moldboard portions being re-entrant and generally transverse to the longitudinal axis thereof, and said curvilinear moldboard portions intersecting in V-relation centrally over said straight moldboard portion to overhang the latter and extend forwardly of the leading edge thereof in the normal operating positions of the blade means.

2. A snow plow comprising, blade means having a straight planar moldboard portion, elongated ground-engaging scraper means attached to the leading edge of said straight moldboard portion, and a pair of curvilinear moldboard portions formed integrally with and emerging from the trailing edge of said straight moldboard portion; each said curvilinear moldboard portion having a re-entrant curvature of formation generally throughout its length with the said curvilinear moldboard portions intersecting in V-relation and generally overhanging the leading edge of said straight moldboard portion in the normal operating positions of the blade means.

3. A snow plow comprising, blade means having a straight planar moldboard portion, a pair of curvilinear moldboard portions formed integrally therewith and extending outwardly from the plane thereof, each said curvilinear moldboard portion having a re-entrant curvature of formation generally transverse to its longitudinal axis with the said curvilinear moldboard portions intersecting in V-relation centrally above said straight moldboard portion and diverging rearwardly and upwardly therefrom in the normal operating positions of the blade means, pivotal means for supporting said blade means on a prime mover and providing movement thereof about vertical and horizontal axes, and means for adjustably positioning the blade means on said axes thereby to selectively vary the pitch of the straight moldboard portion relative to a surface to be plowed and its angularity across the snow plow's line of advance.

4. A snow plow comprising, a unitary blade means having a straight planar moldboard portion and a pair of curvilinear moldboard portions formed integrally therewith and extending outwardly of the plane thereof, each of said curvilinear moldboard portions having a re-entrant curvature of formation generally transverse to its longitudinal axis with said curvilinear moldboard portions intersecting in V-relation and overhanging substantially the entire said straight moldboard portion, support means associated with a prime mover for carrying said blade means, means mounting said blade means on said support means for pivotal movement thereof about

a horizontal axis, and means for adjustably positioning said blade means at selected pivotal positions of angularity with respect to the vertical, thereby to regulate the pitch of the said straight moldboard portion.

5. A snow plow comprising a unitary blade having a lower straight planar moldboard portion terminating at its upper limits in overhanging right- and left-hand curvilinear moldboard portions formed integrally therewith, each said curvilinear moldboard portion having a re-entrant curvature of formation generally transverse to its longitudinal axis with the said curvilinear moldboard portions being related in V-fashion coverging to a line of intersection overhanging the leading edge of said straight moldboard portion, support means associated with a prime mover for carrying said blade means, means pivotally mounting said blade means on said support means for movement about a single vertical axis, and means for adjustably moving the said blade means about said vertical axis to selected positions of angularity with respect to its axis of advance along a surface to be plowed, thereby to effect right-hand discharge, left-hand discharge, and combined right- and left-hand discharge for the plow as selected.

6. The combination as set forth in claim 5 including additional means pivotally connecting said blade means to said support means for movement about a single horizontal axis, means for pivotally moving and positioning said blade means about said horizontal axis thereby to regulate the angularity of said blade means with respect to the surface to be plowed, power means including remotely operated controls for moving said blade means about its said vertical axis of connection with said support means, and locking means for locking said blade means in its said selected positions of angularity relative to its axis of advance.

7. A unitary blade for a snow plow adapted to be positioned generally upright in operation comprising, a lower ground-engaging straight moldboard portion, and merging with the upper edge of and extending generally outwardly of the plane of said straight moldboard portion, an overhanging V-blade portion comprising left-hand and right-hand curvilinear discharge moldboard portions intersecting centrally over said straight moldboard portion and diverging rearwardly from their line of intersection; the upper edge portions of said discharge moldboard portions comprising re-entrantly curved deflectors overhanging said straight moldboard portion, each such deflector being formed to receive materials cast upwardly by said straight and discharge moldboard portions and adapted to deflect the same laterally and rearwardly across the outer end of its related discharge moldboard portion; and means for mounting said blade on a mobile carrier including means for tiltably adjusting the blade about its longitudinal axis to regulate the pitch of the said straight moldboard portion with respect to a surface to be plowed, and including additional means for positioning the blade at various angles across its line of advance whereby to discharge material from said right-hand moldboard portion, said left-hand moldboard portion, and simultaneously from said left-hand and right-hand moldboard portions as selected.

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