

C. K. STOCKLAND.
GRADING MACHINE.
APPLICATION FILED DEC. 27, 1910.

1,012,109.

Patented Dec. 19, 1911.

3 SHEETS—SHEET 1.

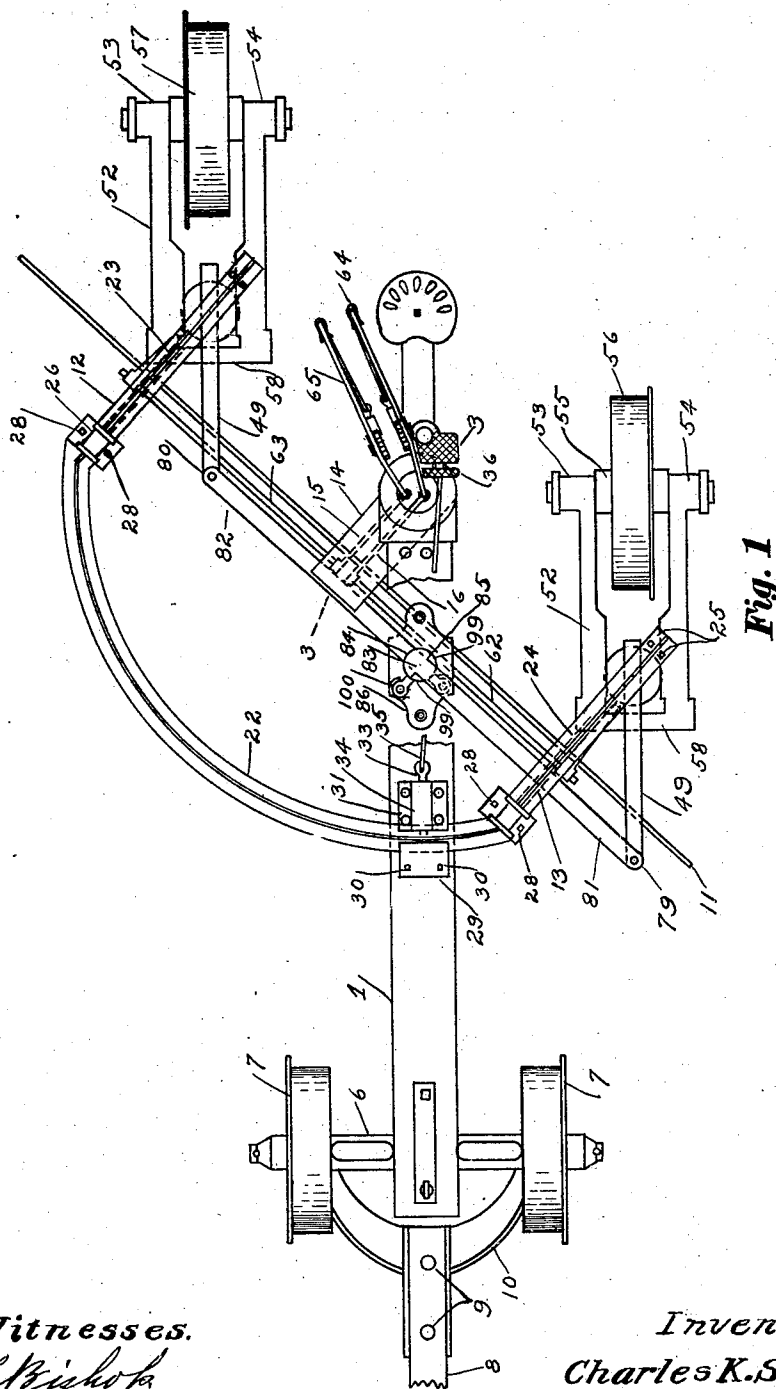


Fig. 1

Witnesses.
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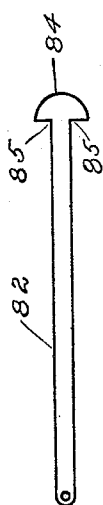


Fig. 9

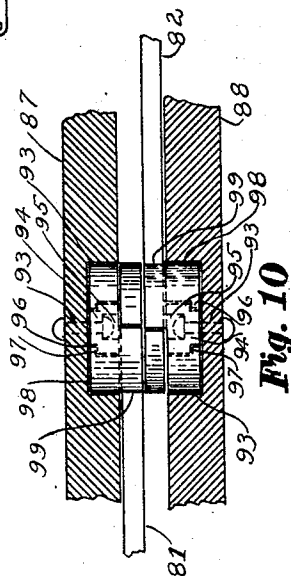


Fig. 10

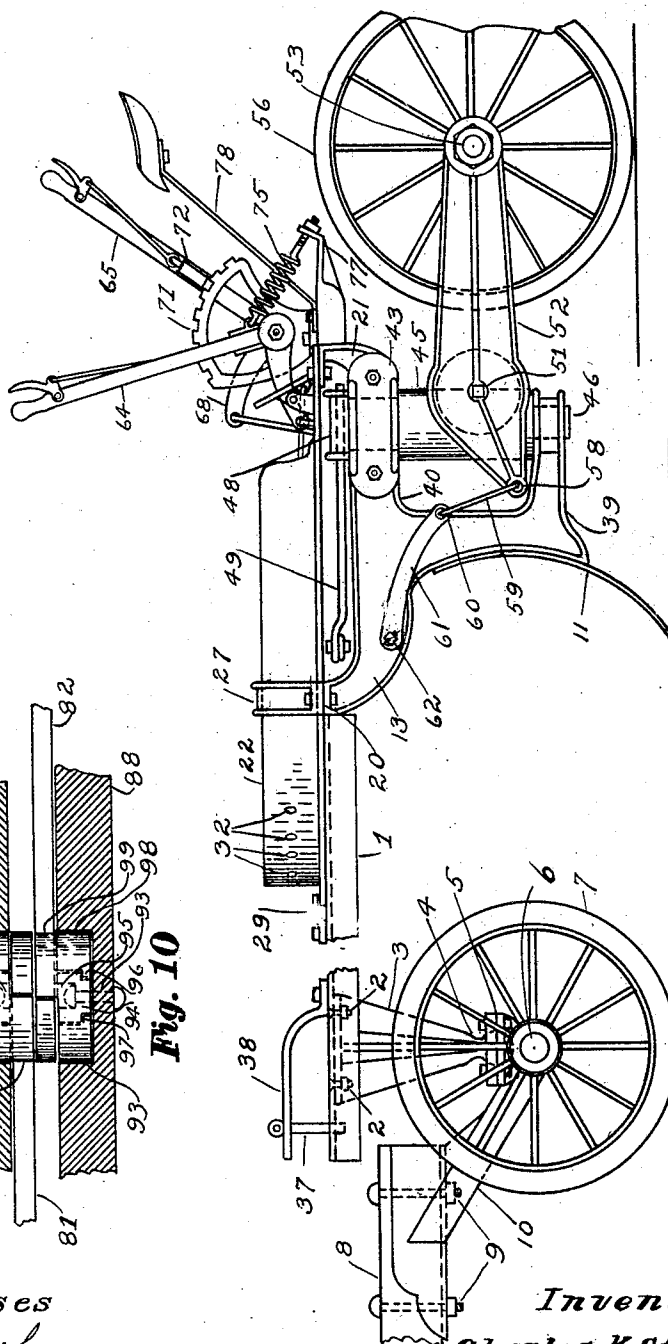


Fig. 2

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3 SHEETS—SHEET 3.

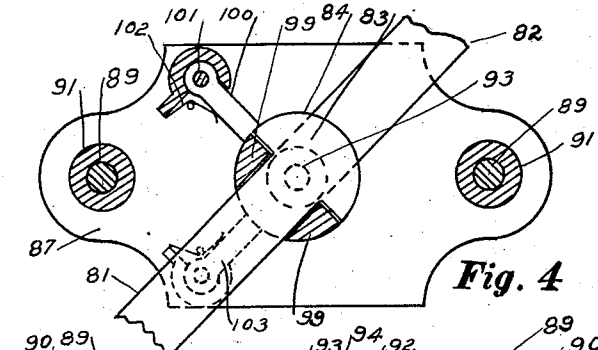


Fig. 4

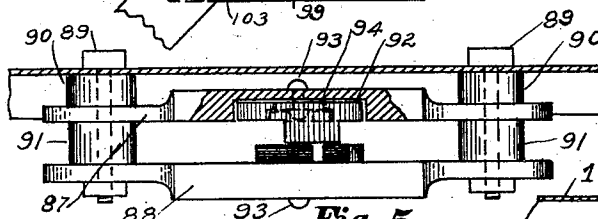


Fig. 5

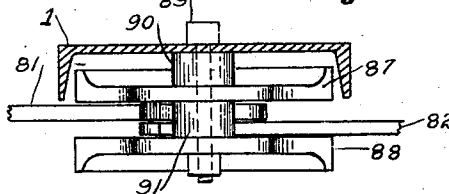


Fig. 6

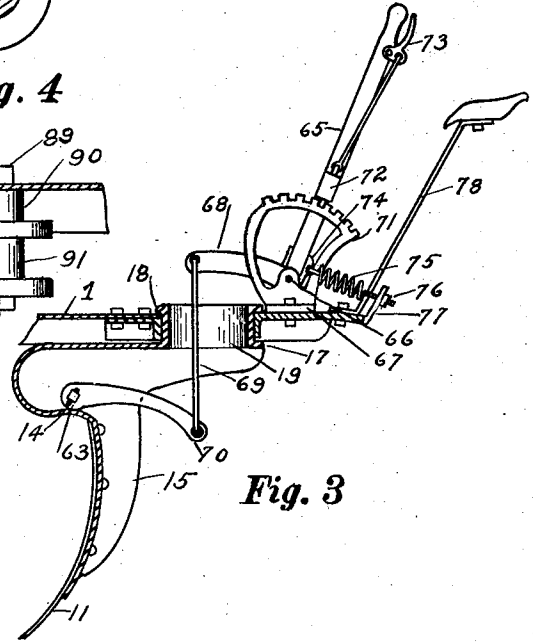


Fig. 3

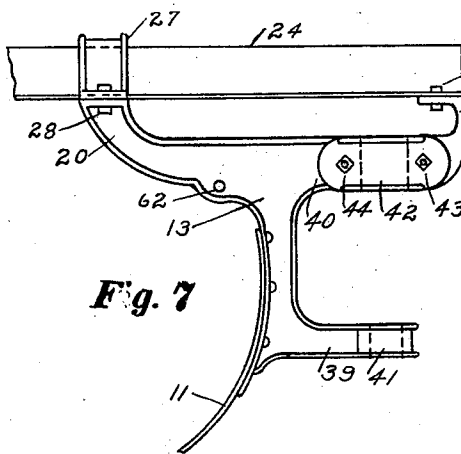


Fig. 7

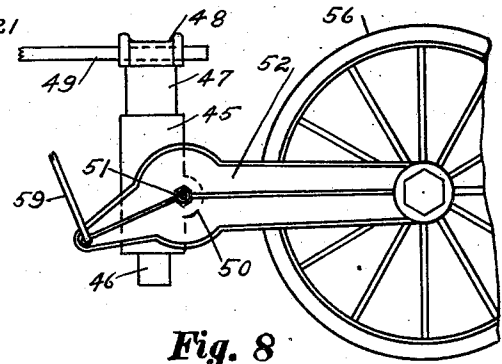


Fig. 8

Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES K. STOCKLAND, OF MINNEAPOLIS, MINNESOTA.

GRADING-MACHINE.

1,012,109.

Specification of Letters Patent.

Patented Dec. 19, 1911.

Application filed December 27, 1910. Serial No. 599,300.

To all whom it may concern:

Be it known that I, CHARLES K. STOCKLAND, a citizen of the United States, residing at Minneapolis, in the county of Hennepin, State of Minnesota, have invented certain new and useful Improvements in Grading-Machines, of which the following is a specification.

My invention relates to a machine to be used for grading purposes, more especially such a machine of light and simple construction, wherein the mold board or scraper blade is mounted for angular disposition, either to the right or left, with respect to the draw bar, and flange wheels are provided for receiving the lateral thrust, due to said angular disposition of the scraper blade, when the same is in operation, which wheels are normally held locked in parallel relation when the machine is in operation and being drawn directly ahead but which are so held in the machine as to permit the wheels to spread relatively when the machine is being operated on a curve or turned around.

The primary object of my invention is to provide a road-grader which, while being light of draft and easily operated, will, nevertheless, serve the purpose in operation of a general grading-machine. It also is so constructed and the parts are so arranged as to render them especially free from danger of breakage, and the adjusting and controlling levers are at all times within easy reach of the operator whatever may be the disposition of the mold board with respect to the draw-bar.

In the drawings which illustrate one form of my invention,—Figure 1 is a plan of my improved machine. Fig. 2 is a side elevation. Fig. 3 is a partial section and detail view on line 3—3 of Fig. 1. Fig. 4 is a plan, Fig. 5 is a side view, partially in section, with the draw-bars omitted, and Fig. 6 is an end elevation, showing the draw-bar in section, of the means of locking the flange wheels in parallel relation when the machine is in operation. Fig. 7 is a side elevation of one of the end castings for holding the mold board and the pivotal attachment for the wheel carrier. Fig. 8 is a detail view of said wheel carrier, shown in connection with its pivot. Fig. 9 is a detail view of one of the holding bars for the pivoted wheel members. Fig. 10 is an enlarged side elevation, partly

in section, of a portion of the locking device showing the locking bars in place.

1 is a draw-bar, having rigidly secured thereto by bolts 2 a supporting casting 3, of the form shown, which is provided at its lower end with a ball 4 registering in a socket 5 fast on the axle 6 providing mounting for the front wheels thereof. This arrangement of ball and socket joint at the axle, rather than above at the draw-bar, is of material advantage, inasmuch as with this arrangement, no matter what the draft, there can be no swinging of the axle and consequently lifting of the tongue, which is secured by bolts 9 to a yoke 10, which may be rigid with the axle 6 or may be pivoted thereto and held up between the horses by resilient means of common construction. The mold board 11 is bolted directly to end castings 12 and 13, respectively, and a center casting 14, one of the end castings being shown in detail in Fig. 7, and a section of the center casting 14 being shown in Fig. 3. The center casting 14 has two webs thereon 15 and 16, respectively, as shown in dotted lines in Fig. 1, one of said webs 15 being clearly shown in Fig. 3. Rising from the top of the casting 14 is a hollow cylindrical bearing member 17 having, about the upper edge thereof, a horizontal flange 18, and, upon this member 17, the draw-bar 1 is pivoted, the tubular opening 19 through the member 17 serving a purpose in my construction which will be later described. Each of the end castings 13 has a front upstanding member 20 and a rear upstanding member 21. An arc-shaped T-member 22 has on either end thereof parallel right line extensions 23 and 24, respectively, which are bolted to the rear upstanding members 21 by bolts 25 and are secured to the front upstanding member 20 by clevises 26 and 27, respectively, said clevises being secured to the upstanding member 20 by bolts 28, as clearly shown in Figs. 1, 2, and 7. The horizontal portion of the T-member 22 is adapted to ride upon the draw-bar 1 and is held in contact therewith by means of a clamp 29 secured to said draw-bar by bolts 30 and over-lapping one of the flanges of said horizontal portion, another clamp 31 being similarly bolted to the draw-bar 1 to overlie the inner horizontal flange of the member 22. The arc-shaped member 22 is thus held to the draw-bar 1 by the clamps 29 and 31,

while permitting said draw-bar to swing along the arc of said member 22 about the member 17 to which it is pivoted to change the angular relation of the mold board 11, with respect to said draw-bar 1. For the purpose of locking the draw-bar in any given position along said arc-shaped member 22, said member is provided with holes 32 with which coöperates a pin 33 mounted in a cylindrical casing 34 carried by the clamping device 31 said casing being provided with a spring of ordinary construction coöperating with said pin 33 normally to force the same against the member 22 and through and into any selected hole 32. Connected to the pin by means of a link or cord 35 is a foot lever 36 by means of which the pin 33 is moved against the action of the spring for holding said pin in engagement with a selected hole 32, to withdraw said pin at any time it is desired to change the relative angularity of the mold board and draw-bar, this change being effected merely by withdrawing the locking pin and swinging the draw-bar 1 by the draft of the horses hitched to said draw-bar through the ordinary doubletree connected to the pin 37 held by the bracket 38 on said draw-bar.

Each of the end castings 12 and 13 is provided with rearward extensions 39 and 40, respectively, said extensions 39 and 40 being provided with alining vertical bearings 41 and 42 as shown by dotted lines in Fig. 7, the lower bearing 41 being a closed bearing while the upper bearing 42 may be open at one side and closed by a cap-piece 43 secured to the extension 40 by bolts 44, this arrangement being provided for conveniently assembling in said bearing pivot members 45, said pivot members being provided with a lower member 46 and an upper shoulder member 47 of larger diameter than said lower member 46 for seating in the bearings 41 and 42, the upper member 47 being also provided with cap 48 for rigidly holding a connecting link 49 whose purpose will be later described. Each of the pivot members 45 is provided with a transverse bearing 50 for a shaft 51 of a yoked wheel-carrier 52 having boxes 53 and 54, respectively, in each of the arms of said wheel-carrier, in which boxes are mounted to rotate between each pair of said arms the axles 55 of oppositely disposed flange wheels 56 and 57, respectively. The yoke members 52 are provided with arms extending forwardly from the pivot point 51, said arms being connected by a cross bar 58 to which is loosely connected a link 59, the other end of said link being loosely connected at 60 to an arm 61 fast on a rock-shaft 62 mounted in the castings 13 and 14, above and parallel with the scraper-blade 11, there being a similar rock-shaft 63 similarly mounted in the castings 12 and 14 and similarly con-

nected to the cross-bar 58 of the other yoke member.

Each of the rock-shafts 62 and 63 is connected for operation to levers 64 and 65, respectively, pivotally mounted at 66 upon a casting 67 bolted to the drawbar 1. The connection between each of the levers 64 and 65 and the rock-shafts 62 and 63, respectively, and the mode of operation thereof, being identical, the description of such connections and mode of operation with respect to lever 65 and rock shaft 63, as shown in Fig. 3, will answer for both. Extending outward from the lever 65 at the pivotal point 66 thereof, and fast with said lever 65 is an arm 68 which arm is loosely connected by a link 69 depending through the opening 19 in the member 17, said link 69 being loosely connected to an arm 70 fast on the end of the rock-shaft 63. The lever stand 67 has thereon a ratchet segment 71, with the notches of which a ratchet 72 operated by the ordinary hand-grip 73 is designed to coöperate. To a projecting eye member 74 on the lever 65, one end of a spring 75 is attached, the other end thereof being secured by means of a nut 76 to a bracket 77 fast on the draw-bar 1, a seat 78 also being secured to said bracket 77 in convenient proximity to the levers 64 and 65. By swinging the lever 64 or 65 about the pivot point 66, through the arm 68, connection 69 and arm 70 fast on the rock-shaft 63, or similar connections from the lever 64 to the rock-shaft 62, said rock shafts will be rocked in the castings 12-14 or 13-14, respectively, and by means of the arms 61 and links 59 connected with one or the other of the yoke members 58, will swing said yoke members about the pivot points 51, thereby operating to swing or oscillate the wheels 56 or 57, respectively, so as to raise or lower said wheels relative to their point of attachment to the pivot members 45, which will have the effect of raising or lowering the casting 12 and 13, respectively, together with the parts carried thereby. Since the link members 59 are loosely mounted on the cross-bar 58 and free to slide from end to end thereof, and the connecting links 69 between the arms 68 and 70, respectively, are also loosely mounted and extend through the opening 19 of the pivot member 17, it will be seen that however the draw-bar 1 may be rotated about said pivot member to change the angular relation of said draw-bar with respect to the mold board the operative connections between the levers 64, 65 and the rock-shafts 62 and 63, respectively, and also between said rock-shafts and the yoke members 52 will always be maintained. This is one of the chief advantages of my invention, since it permits the levers to be placed close to the seat of the driver where they will always be within easy reach, and at the same time provides a very

certain and easily operated control for raising and lowering the operative position of the mold board 11. It will be noted that the end castings 12 and 13 and the center casting 14 are rigidly secured together in lateral alinement by means of the mold-board 11, thus doing away with a separate framework for holding said mold board. The above noted three castings, together with the mold board itself, and the arc-shaped member 22 connecting the outside castings, comprise the entire supporting mechanism of my machine, so that the draw bar 1 is in effect pivoted directly to the mold board, the pivot point of said draw-bar and of the pivot members 45 in the end castings being in a line, for a purpose to be later described.

The arms 49, extending from the tops 48 of the pivot members 45 are pivotally connected at 79 and 80 to two reversely positioned holding bars 81 and 82, respectively. One of these bars is shown in detail in Fig. 9 of the drawings. It will be noted that each of these bars is provided with a T-shaped head member 83 having a circular end 84, thus providing shoulders 85 on each side of the bars 81 and 82 in front of the said curved head. These locking bars pass into a specially constructed locking device 86, shown in detail in Figs. 4, 5, 6, and 10, the bars lying one above the other and being held in such position that the line of the shoulders 85 on the two sides of the bars is always positioned one above the other, so that the outline of the two semi-circular heads 83 will form a complete circle.

The locking device 86 is composed primarily of an upper plate 87 and a lower plate 88. These plates are similar in form and symmetrically disposed, that is, like faces of each plate are opposed to one another. The plates are secured to the underside of the draw-bar 1 by means of bolts 89, the upper plate being held spaced from said draw-bar by washers 90 while the two plates are similarly held spaced apart by washers 91. Each of the plates 88 and 89 is provided with a cavity 92, as clearly shown in Fig. 5. Rotatably secured within each of the cavities 92 by means of pivot bolts 93 is a roller 94, said roller being provided with a central depression 95 for receiving the head of the pivot bolt 93 and a peripheral cut-away portion 96. Seated within the cut-away portion 96 is a flange ring 97 of a circular locking member 98, said locking members thus being rotatably held within the seats 92 in the plates 88 and 89, respectively. The plates 88 and 89 are spaced apart sufficiently to permit the bars 81 and 82, when placed one upon the other, to move freely in a longitudinal direction between said plates whenever said bars are not locked from said movement by the locking device. Between each of the locking members 98 is

a pair of lugs 99, each of said pairs of lugs extending out from the seats 92 in the bars 88 and 89 a little less than one half the distance between said bars, said lugs being rectangular on the inside and circular on the outside, and of exactly the size and shape, and so spaced apart, that the shank of one of the locking bars will lie between said lugs and when the shoulders 85 of said locking bar are drawn forward against the lugs the peripheral outline of the lugs 99 will coincide with the peripheral outline 84 of the head 83 to form a continuation of the circumference of a circle whose center will coincide with the center of the pivot bolts 93, as clearly shown in Fig. 4. It will thus be seen that the bars 81 and 82 are locked from longitudinal movement in a direction past the lugs 99 but are free to move in the opposite direction unless prevented by other means, although always so held as to rotate with the locking members about the pivot bolts 93.

In turning around curves with a grading machine, or in turning the machine around, when the blade is angularly disposed with respect to the draw-bar, it is necessary to turn in a direction corresponding to that in which the said scraper blade faces, and since in this type of machine, under such circumstances, the wheels for supporting the scraper blade and connecting parts do not run abreast but one much ahead of the other, the machine will pivot about the rear wheel dragging the forward wheel laterally over the ground and subjecting it to serious strain which frequently causes breakage. If, however, the forward wheel may itself swing independently of the rear wheel it will naturally follow the arc of a circle centered at the pivoting rear wheel and be released from such strain. This is precisely what my locking device accomplishes, for the locking bar 81 of the forward wheel is free to slide longitudinally between the lugs 99 in a direction to permit such independent pivoting movement of the front wheel 56 outward while being held from movement in the opposite direction and parallel with the rear wheel 57 by the coöperation of said lugs with the shoulders 85. The rear wheel 57, however, should not be permitted to move in either direction because when the machine is turned around, said wheel should be positively positioned as the pivot about which the machine is turned. To lock the rear wheel against movement in either direction while permitting the front wheel to oscillate outwardly from parallel relation with said rear wheel, I provide on the plate 87 a locking member 100, the end of which comes close to the peripheral circumference formed by the head 83 and lugs 99 and is at right angles to the position of the scraper blade when the same is angularly disposed for op-

eration to the right, as shown in Fig. 1, this arrangement leaving the locking bar 81 free for longitudinal movement to permit the forward wheel 56 to swing outwardly as above indicated. Member 100 is pivoted at 101 to the plate 87 and is held in its normal or operative position by means of a spring 102, so that in case said lock should be caught in any way while the draw-bar is being rotated on the pivot 17 to change the angular position of the scraper blade with respect to said draw-bar, the lock may give and prevent breakage. A similar locking member 103 (shown in dotted lines in Fig. 4) is provided on the plate 88 which will thus occupy a position relative to the lock 100 at right angles thereto and, as shown in the figure, will cooperate with the head 84 of the bar 82 to lock the same against movement away from the lugs 99 of the lower locking member 98, said lock or catch 103 being spring-held to the plate 88 in the same manner that lock 100 is held to the plate 87. This arrangement, while permitting the forward wheel carrier to swing outwardly when it is possible for it to do so, has the effect of locking the wheel carriers in parallel relation under normal operating conditions of the machine. The reason for this will be apparent when it is noted that the force exerted upon the mold board by the earth which is being scraped up and thrown to one side has a resultant at right angles to the direction of travel of the machine which is exerted directly against the outside of the flange of the forward wheel, thus constantly pressing said wheel inwardly so as to rock the wheel carrier and bring the head 83 of the locking bar 81 into engagement with the seat 92, which will have the effect of holding the forward wheel locked in parallel relation with the rear wheel during normal operation of the machine.

The reason why it is necessary for the locks 100 and 103 to be spring-held will be apparent when it is noted that, when the draw-bar 1 is rotated about the pivot 17, the locking bars 81 or 82, whichever is free to move longitudinally, may be so moved to some extent so that the lock 100 or 103 might be brought back of the shoulder 85, which, of course, would cause breakage if said lock were not free to move. It will also be noted that the center of the pivot members 45 for the wheels and the center of the pivot member 17 for the draw-bar lie in the same straight line so that as the draw-bar is swung about its center the wheel carriers and members 49 attached thereto will be correspondingly swung about their centers so as always to keep the locking bars 81 and 82 in substantially the same straight line although the position of said bars, with respect to the scraper blade, will thereby be varied. The swinging of the wheel carriers, when

the draw-bar is swung relatively to the mold board, is, of course, effected by the action of the locking bars 81 and 82 upon the arms 49 fast on the vertical pivot members 45 of the wheel carriers. In the position shown in Fig. 2, the locking bar 81 will be actuated through the lugs 99 cooperating with the shoulders 85, while the locking bar 82 will be actuated through lock or catch 103 cooperating with the curved end 84 of the head 83. This is one of the chief functions of the catches 100 and 103, which, while so actuating one or the other of said locking bars to cause them to swing the wheel carriers on their vertical pivots, nevertheless, by reason of the coinciding circular contour of the ends 84 and lugs 99 with which said catches cooperate, will permit said bars and locking members to rotate about the pivot bolts 93. By arranging said pivots 93 and the pivoted connections of the locking bars 81 and 82 with the arms 49 in a line parallel with the line of centers of the pivots for the draw-bar and the wheel carriers, that is so that the distances between the pivoted center of each of the members 45 and the corresponding pivoted connections of the arm 49 on said member with its locking bar shall be equal, and equal to the distance between the center of the drawbar pivot and the pivot bolts 93, when the drawbar is swung on its pivot the wheel carriers will be correspondingly swung on their pivots, thus maintaining said wheel carriers and drawbar in parallel relation.

The operation of my improved device has been fully given in connection with the detailed description of the parts thereof, and will be readily understood therefrom.

I claim:

1. A grading machine having a drawbar, a mold board or scraper pivotally connected with said drawbar, yoke members pivotally connected to said scraper, wheels mounted in said yoke members for sustaining said scraper, and means mounted on the drawbar and connections therefrom for independently rocking said yoke members on their pivots to raise and lower the scraper.

2. A grading machine having a drawbar, a mold board or scraper pivotally connected with said drawbar, means to lock said scraper in different angular positions with respect to said drawbar, yoke members pivotally connected to said scraper, wheels mounted in said yoke members for sustaining said scraper, and means mounted on the drawbar and connections therefrom for independently rocking said yoke members on their pivots to raise and lower the scraper, said means being arranged to operate when the scraper is locked in any operative angular position with respect to the drawbar.

3. A grading machine having a drawbar, a mold board or scraper pivotally connected

with said drawbar, means to lock said scraper in different angular positions with respect to said drawbar, yoke members pivotally connected to said scraper, wheels 5 mounted in said yoke members for sustaining said scraper, a pair of levers fixedly mounted on the drawbar in close proximity to the seat of the operator, and connections from said levers to said yoke members 10 whereby the same may be rocked on their pivots to raise and lower the scraper.

4. In a grading machine, end castings having a mold board or scraper blade attached to said castings and being provided 15 with vertical bearings, wheel carriers mounted to oscillate in said vertical bearings and also to oscillate about horizontal pivots, and means connected with said wheel carriers at a point forwardly of the vertical bearings 20 for rocking the wheel carriers about their horizontal pivots.

5. In a grading machine, end castings having a mold board or scraper blade rigidly attached thereto, wheel carriers in said 25 end castings provided with vertical and horizontal pivots, a drawbar connected with said scraper blade, means for locking said scraper blade in different angular positions relative to said drawbar, and means connected 30 with said wheel carriers at a point forwardly of the vertical pivots and adapted to rock the wheel carriers about their horizontal pivots when the scraper blade occupies any angular position relative to the 35 drawbar.

6. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly 40 holding them in lateral alinement, yoke members pivoted to the end castings, wheels mounted in the yoke members, a drawbar pivotally connected to the center casting, means for locking the mold board in different angular positions relatively to the 45 drawbar, and means mounted on the drawbar and connections therefrom for independently rocking said yoke members on their pivots to raise and lower the mold board.

7. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly 50 holding them in lateral alinement, yoke members pivoted to the end castings, wheels mounted in the yoke members, a drawbar 55 pivotally connected to the center casting, means for locking the mold board in different angular positions relatively to the drawbar, a crossbar connecting the arms of each 60 yoke member on the opposite side of the pivot from the wheel, and means on the drawbar connected with said crossbar, so that said means will operate to rock said yoke members on their pivots to raise and 65 lower the mold board when the mold board

is locked in any operative angular position relative to said drawbar.

8. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly 70 holding them in lateral alinement, a drawbar pivotally connected to the center casting, an arc-shaped member rigidly connecting the end castings, said member having a horizontal base portion positioned upon the top 75 of the drawbar, clamps on said drawbar overlapping said base member to connect the same adjustably with the drawbar thereby to distribute the draft thereof to all of said castings, and a catch mounted in one of said 80 clamps under the control of the operator to cooperate with said arc-shaped member and lock said clamps in any desired position on said arc-shaped member.

9. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly 85 holding them in lateral alinement, yoke members pivoted to the end castings, wheels mounted in the yoke members, a drawbar 90 pivotally connected to the center casting, means for locking the mold board in different angular positions relatively to the drawbar, a crossbar connecting the arms of each yoke member on the opposite side of the 95 pivot from the wheel, a separate rock-shaft mounted in each end casting and the center casting, an arm fast on each end of each of said rock-shafts, a link connected to each of the outer arms and loosely embracing the 100 cross-bars so as to slide freely from end to end thereof, a pair of levers mounted on the drawbars, and loosely attached connections between each of said levers and the inner 105 arms of each rock-shaft, respectively, said connections passing through a central opening in the pivoted connection of the central casting, so that the levers will operate to rock the yoke members on their pivots to 110 raise and lower the mold board when the drawbar is locked in any operative angular position relative to the mold board.

10. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and 115 rigidly holding them in lateral alinement, means for holding wheels mounted on said end castings so as to swing about both vertical and horizontal pivots, means for locking said wheel-holding means from move- 120 ment about the horizontal pivots, and means for locking said wheel-holding means from movement about the vertical pivots.

11. In a grading machine, end castings and a center casting, a mold board or 125 scraper blade attached to said castings and rigidly holding them in lateral alinement, means for holding wheels mounted on said end castings so as to swing about both vertical and horizontal pivots, means under the 130

control of the operator for locking said wheel-holding means from movement about the horizontal pivots, and means for automatically locking said wheel-holding means from movement above the vertical pivots.

12. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly holding them in lateral alinement, a drawbar pivotally attached to said center casting, means for locking the mold board in different angular positions relatively to the drawbar, wheel carriers mounted in said end castings to swing about vertical pivots, wheels in said carriers, and means for locking said wheel carriers against movement about the vertical pivots.

13. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly holding them in lateral alinement, a drawbar pivotally attached to said center casting, means for locking the mold board in different angular positions relatively to the drawbar, wheel carriers mounted in said end castings to swing about vertical pivots, wheels in said carriers, and means for locking said wheel carriers against movement about the vertical pivots, normally to hold said wheels in parallel relation, said locking means being adapted to permit the forward wheel only to swing outwardly on said pivot when the mold board is held locked in operative angular relation to the drawbar.

14. In a grading machine, end castings and a center casting, a mold board or scraper blade attached to said castings and rigidly holding them in lateral alinement, a drawbar connected by a vertical pivot to said center casting, wheel carriers connected by vertical pivots to the end castings, all of said vertical pivots centering in the same straight line, and means connecting said wheel carriers with the drawbar normally to hold the wheel carriers in parallel relation, and when the drawbar is swung on its pivot to cause each of the wheel carriers to be correspondingly swung on its pivot.

15. A grading machine having a mold board, independent wheel carriers connected to the mold board by vertical pivots, and locking means having connections to said wheel carriers, normal operation of the machine causing said locking means to hold the wheel carriers in parallel relation, while one of said wheel carriers is free to swing outwardly when the grading machine is being turned around.

16. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, and means pivotally connecting said wheel carriers with the drawbar such that normal

operation of the machine will cause said means to hold the wheel carriers in parallel relation, while one of said wheel carriers is free to swing outwardly when the grading machine is being turned around.

17. A grading machine having a mold board or scraper, independent wheel carriers connected to the mold board by vertical pivots, wheels in said carriers adapted to run abreast or one in advance of the other, and locking means connected with said wheel carriers to hold the same locked in parallel relation when the wheels run abreast but permitting the forward wheel carrier to swing outwardly when either wheel is positioned to run in advance of the other.

18. A grading machine having a mold board or scraper, independent wheel carriers connected to the mold board by vertical pivots, wheels in said carriers adapted to run abreast or one in advance of the other, a drawbar, and locking means connecting said wheel carriers with the drawbar to hold the wheel carriers locked in parallel relation when the wheels run abreast but permitting the forward wheel carrier to swing outwardly when either wheel is positioned to run in advance of the other.

19. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, wheels in said carriers adapted to run abreast or one in advance of the other, independent locking bars pivotally connected with the wheel carriers, and a device on the drawbar for cooperating with both of said locking bars to hold the wheel carriers locked in parallel relation when the wheels run abreast but permitting the forward wheel carrier to swing outwardly when either wheel is positioned to run in advance of the other.

20. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, independent locking bars pivotally connected with the wheel carriers, and a device on the drawbar for cooperating with both of said locking bars, normal operation of the machine causing said cooperating device and bars to hold the wheel carriers in parallel relation, while one of said wheel carriers is free to swing outwardly when the grading machine is being turned around.

21. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, independent locking bars pivotally connected with the wheel carriers, each of said locking bars comprising a shank and a semicircular head forming shoulders outstanding from

the shank, and a device on the drawbar within which said heads are seated in overlapping relation, normal operation of the machine causing said device and said locking bars to cooperate to hold the wheel carriers in parallel relation, while one of said wheel carriers is free to swing outwardly when the grading machine is being turned around.

22. A grading machine having a drawbar, a mold board or scraper connected to said drawbar by a vertical pivot, bars pivotally connected with the wheel carriers, and pivotal means on the drawbar separate from but cooperating with said bars so that when the drawbar is swung on its pivot said pivotal means will permit the bars to swing correspondingly thereon and will cause the bars to swing the wheel carriers correspondingly on their vertical pivots.

23. A grading machine having a drawbar, a mold board or scraper connected to said drawbar by a vertical pivot, independent wheel carriers connected to the scraper by vertical pivots, means to lock said drawbar in different angular positions relatively to said mold board, and means on said drawbar, and connections to the wheel carriers cooperating therewith, whereby normal operation of the machine will cause said means to hold the wheel carriers in parallel relation, while one of said wheel carriers is free to swing outwardly when the grading machine is being turned around.

24. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, wheels in said carriers adapted to run abreast or one in advance of the other, means to lock said drawbar in different angular positions relatively to said mold board thereby correspondingly changing the position of said wheels, pivotal means on the drawbar and cooperating connections to the wheel carriers such that when the drawbar is swung on its pivot to change its angular relation with said mold board said wheel carriers will be correspondingly swung on their pivots to maintain them parallel with the drawbar although when either wheel carrier occupies its advanced position it will be free to swing outwardly.

25. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, independent locking bars pivotally connected with the wheel carriers, each of said locking bars comprising a shank and a semi-circular head forming shoulders outstanding from the shank, a pair of oppositely disposed plates attached to the drawbar between which said heads are seated in overlapping relation, circular locking members rotatably

mounted in each of said plates and having lugs engaging said shoulders, thus holding said locking bars from movement in one direction while permitting them to slide freely in the opposite direction.

26. A grading machine having a drawbar, a mold board or scraper connected to said drawbar, independent wheel carriers connected to the scraper by vertical pivots, independent locking bars pivotally connected with the wheel carriers, each of said locking bars comprising a shank, and a semi-circular head forming shoulders outstanding from the shank, a pair of oppositely disposed plates attached to the drawbar between which said heads are seated in overlapping relation, circular locking members rotatably mounted in each of said plates and having lugs engaging said shoulders, said lugs forming with said semi-circular head the continuation of the circumference of a circle having the same center as the circular locking members, and a lock on each of the plates disposed at right angles to one another and cooperating with the peripheries of said heads and lugs, so that when the mold board is in one operative position one of said locking bars will be locked against the lugs of its locking member while the other locking bar is free to slide away from said lugs, and when the mold board is in reverse operative position the bar that was locked to its lugs will be free to slide and the other bar be locked to its lugs.

27. In a grading machine, end castings having a mold board or scraper blade rigidly attached thereto, wheel carriers vertically pivoted in said end castings, each of said wheel carriers comprising a yoke member horizontally pivoted for vertical oscillation having arms each extending to both sides of the center of vertical connection to the end casting, means for swinging the wheel carrier about its horizontal pivot, wheels mounted between the arms rearwardly of said vertical connection, and means connecting said arms forwardly of said vertical connection and adapted to cooperate in different angular positions relative to the scraper blade with the means for swinging the wheel carrier about the horizontal pivots.

28. In a grading machine, a scraper blade having a wheel carrier connected thereto, said wheel carrier comprising a vertical pivot member and a two-armed member horizontally pivoted at a point between the ends of said arms to the vertical pivot member, a wheel mounted between said arms rearwardly of said horizontal pivot, and a bar connecting said arms forwardly of said horizontal pivot, and means connected with said bar for swinging the wheel carrier about its horizontal pivot.

29. In a grading machine, a scraper blade having a wheel carrier connected thereto,

said wheel carrier comprising a vertical pivot member and a two-armed member horizontally pivoted at a point between the ends of said arms to the vertical pivot member, a wheel mounted between said arms rearwardly of said horizontal pivot, and a bar connecting said arms forwardly of said horizontal pivot, means connected with said bar for swinging the wheel carrier about its horizontal pivot, a bar rigidly connected with the vertical pivot member, and means connected with said bar for swinging the wheel carrier about its vertical pivot.

30. In a grading machine, end castings having a scraper blade connected thereto, each of said castings being provided with a plurality of spaced vertical bearings, wheel carriers each comprising a vertical pivot member mounted in said bearings and wheel-carrying arms, a bar rigidly connected with the vertical pivot member and extending therefrom in a direction away from said wheels, and means connected with said bar

for swinging the wheel carrier about its vertical pivot.

31. A grading machine comprising castings and a scraper secured thereto, wheel carriers vertically and horizontally pivoted in said castings, each wheel carrier comprising a pair of arms having a wheel mounted therebetween at the rear of the vertical pivot, a bar connecting said arms forwardly of said vertical pivot, and manually controlled means for swinging the wheel carriers about the horizontal pivots, including a link loosely connected with said bar and free to slide from end to end thereof to maintain the operative connection with said manually-controlled means when the wheel carriers occupy different relative angular positions with respect to the scraper.

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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."