

Jan. 15, 1929.

1,698,980

H. R. WILSON

ROAD GRADER

Filed Oct. 14, 1926

2 Sheets-Sheet 1

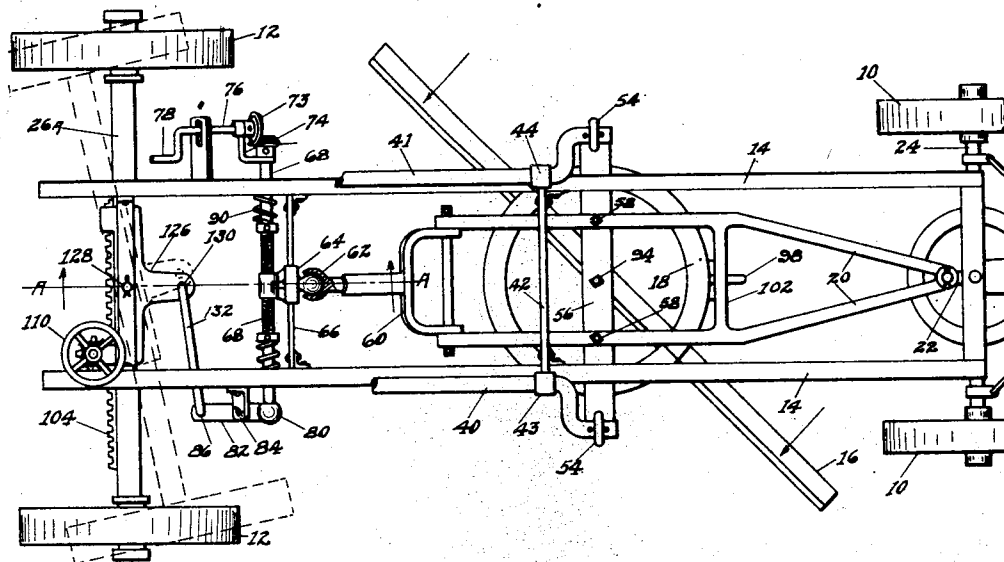


Fig. 1.

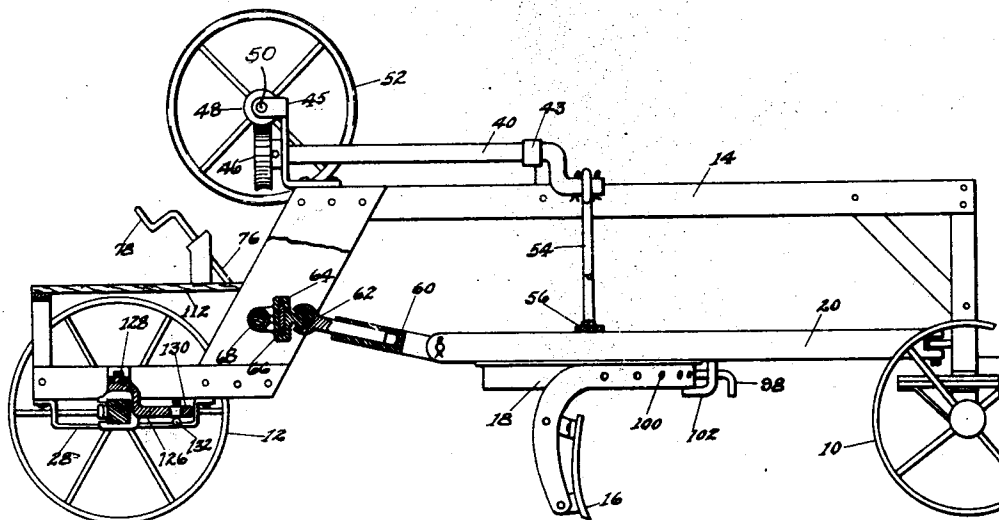


Fig. 2.

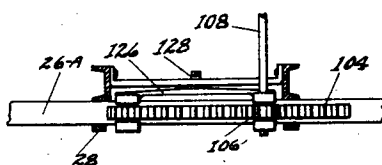


Fig. 3.

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2 Sheets-Sheet 2

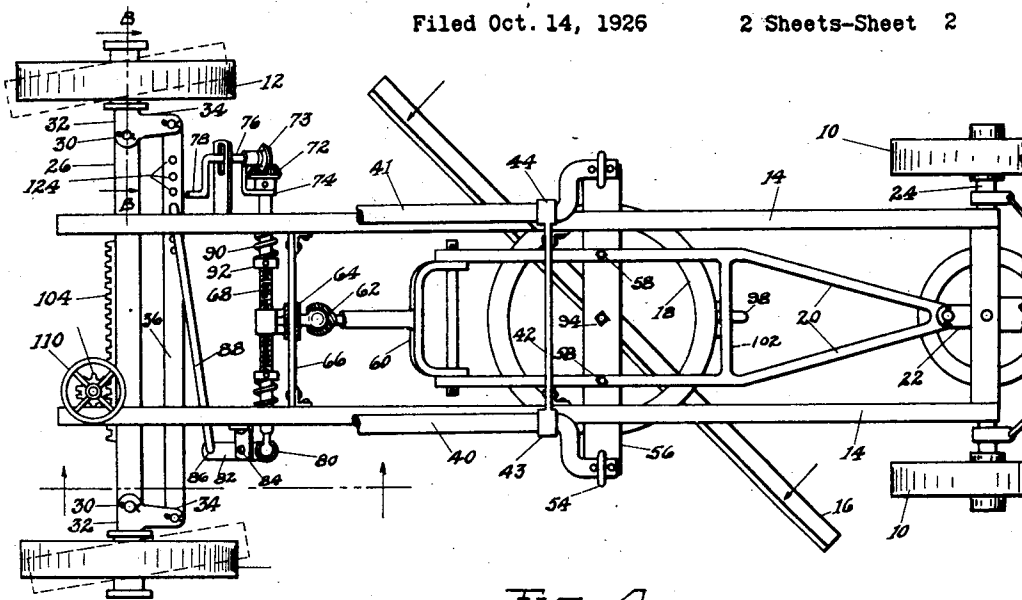


Fig. 4.

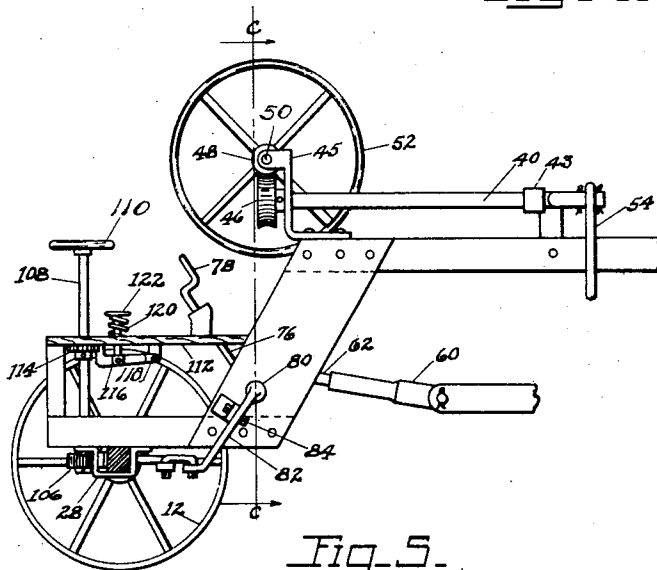


Fig. 5.

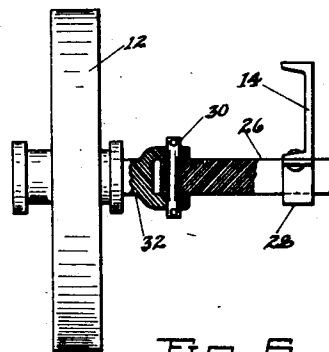


Fig. 6.

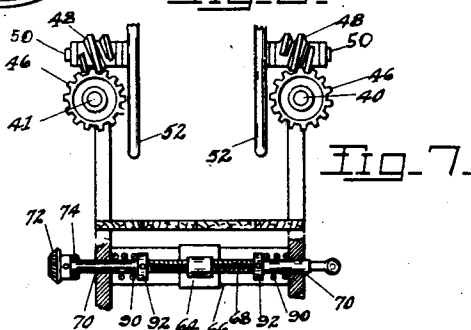


Fig. 7.

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ROAD GRADER.

Application filed October 14, 1926. Serial No. 141,653.

This invention relates particularly to that class of wheeled road graders provided with a pivoted or as more commonly known, a skewable axle that in turn is supported by supporting wheels and provided with a moldboard or blade, which works in conjunction therewith for the general purpose of grading roads, making and cleaning ditches at the side thereof, etc. Also to that type equipped with dirigible rear wheels, the function of which is the same as the type referred to above.

In building a new road, recrowning an old one, or cleaning the ditches at the side thereof, it is always necessary, with the type of grader to which I refer, for the material of which the road is made to be taken from the side and deposited in the approximate center in order that proper drainage may result and this, of course, involves the movement of the material in a lateral direction relative to the travel of the machine.

This is accomplished, generally speaking, by adjusting the moldboard to an angle, suitable to the particular condition, with one end in advance of the other, the material, as loosened, being moved along the face and allowed to discharge off the rear end, at the same time being transferred toward the middle or crown of the road a distance in proportion to the angle and length of the blade and obviously the resistance and friction of the material against the blade is also in proportion to the angle and length of same taken in connection with the amount and condition of the material.

This uncertain and sometimes relatively great side thrust must, of course, be successfully resisted by the machine as a whole if a specified course is to be maintained and this is accomplished in the referred to type, either by pivoting or skewing the rear axle, thereby permitting for the time being, the rear axle with its supporting wheels to travel a path to one side of the front wheels or with a grader that has dirigible wheels, the wheels only are turned or guided toward the discharge end of the blade. In both cases the invention is to make the rear wheels while traveling crowd the rear of the grader toward the discharge end of the blade.

In other words, the rear supporting wheels, when skewed or turned to the left, take a course to the left of the forward wheels and do not follow directly behind them. When

the blade is lowered to an operative position and is moving dirt laterally, the rear wheels are pushing against the thrust set up by the dirt moving along the face of the blade. This thrust varies with the amount of dirt being moved and if the wheels are skewed or turned enough to successfully handle a heavy load, they in turn, are not correctly set for a lighter load, consequently when a lighter load is encountered the rear end of the grader swings farther to the left and in turn drops back when the heavy load is encountered. This condition not only leaves a very crooked furrow and ridge of dirt, but, also causes the wheels, at times, to partially drag along the ground due to their rotation in a plane out of parallel with the line of travel. Where the latter occurs it can readily be seen that it is not only detrimental to the wheels and will cause excessive breakage and wear, but it also consumes more power than it would if the rear wheels were running parallel with the front ones.

In pivoting or skewing the rear axle and wheels, it is customary to use manual power and for the operator to secure the maximum efficiency from the grader he must because of the very uneven nature of the work be continually changing the skew of the axle which does not permit him to give the proper amount of time to the operation of the blade and even though the operator endeavored to give all of his attention to the pivoting, it is a physical impossibility for him to change it as often and as quickly as the load changes, and unless he does, the inefficiency, wear, etc., which this invention eliminates is bound to develop.

I am acquainted with the fact that grading machines equipped with skewable wheels are old in the art and that the before-mentioned peculiarities of this type of machine are common knowledge to all those associated with them as is borne out by the fact that all graders with non-tiltable wheels are provided with means for adjusting the rear axle or wheels to cause them to resist the thrust of the blade and also adjustment for changing both the angle and lateral position of the blade, all of which adjustments, to the best of my knowledge, have always been made independently and manually.

It therefore appears that the desirability and usefulness of the objects of this invention will be readily apparent when it is

realized that the relative positions of the elements in question are now maintained by manual means and that it is a physical impossibility, to say nothing of the labor involved, to bring about a condition, as ideal for the working parts of the machine, so nearly maintaining the maximum efficiency thereof, or accomplishing as desirable results, with reference to the quality of work done, as with my machine.

The main object of this invention is the construction of a road grading machine wherein the side thrust of the material against the blade sets in operation mechanism automatically resisting such thrust.

An object of this invention is to produce a road grading machine wherein a combination of parts operate to produce simultaneous action of the blade, and rear wheels for the purpose of automatically aligning the two sets of wheels.

Another object is the production of a grader wherein the rear wheels operate to resist the side draft caused by the moldboard, when working at an acute angle relative to the line of draft, by an operative connection between the moldboard and wheels.

An object is to operatively connect the blade side shifting mechanism to an axle for the pivoting of said axle relative to the frame when the blade is shifted.

An object is to operatively connect the blade side shifting mechanism to the rear wheel spindles to cause a movement of said spindles relative to the axle when said blade is shifted.

Another object is the production of a combination of elements causing simultaneous co-action between a shiftable blade and a pair of spindles on a shiftable rear axle.

Another object of this invention is the provision of means capable of steering the rear supporting wheels, relative to the axle, in one direction when the blade is shifted in the opposite direction.

Another object is the provision of means capable of skewing the rear axle in one direction relative to the frame when the blade is shifted in the opposite direction.

Another object is the construction of a blade shifting mechanism permitting both manual and automatic operation.

Still another object is the provision of means automatically straightening the rear wheels or the rear axle and wheels, when the blade is raised to either an in-operative position or when the load is sufficiently lightened to permit the unassisted weight of the grader to offset the side thrust of the blade.

Another object is the construction of a grader having a skewable axle or dirigible wheels and means for automatically skewing the axle or steering the wheels.

And still another object is the construc-

tion of a grader provided with an automatically skewable axle or dirigible wheels, in combination with a blade shifting device adapted for actuation by both manual and power operated means.

Another object is the construction of a grader that has either a skewable axle or dirigible wheels including means actuated automatically, thereby, permitting the rear axle, or wheels, to work in a parallel position relative to the front while resisting the side thrust caused by the movement of the dirt.

With the above and various other objects in view, the present invention consists in the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportion, and even method of obtaining these objects, without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Fig. 1 is a plan of a grader showing one form of my invention, the blade raising hand wheels being omitted to more plainly show the blade side shifting mechanism and its connection with the rear axle.

Fig. 2 is a side elevation of Figure 1 partly in cross-section taken on line A—A of Figure 1, and with the blade set square across.

Fig. 3 is a rear elevation of a rear axle showing a portion of the axle shifting mechanism and its slidable relation with the frame.

Fig. 4 is a plan of a grader employing dirigible wheels, and one method of connecting the blade thereto, the blade being adjusted to a plowing angle and the blade raising hand wheels omitted.

Fig. 5 is a side elevation of the rear part of Figure 4 with the axle in cross-section.

Fig. 6 is a rear elevation of the left wheel of Figure 4 partly in cross-section on line B—B.

Fig. 7 is a rear elevation of Figure 5 taken on line C—C, plainly showing the blade shifting shaft, springs, etc., hereinafter more fully described.

The drawings show a conventional form of grading machine, forward supporting wheels 10 and rear wheels 12, a main frame 14, and blade, or moldboard as it is sometimes called, 16, operatively attached to and pulled by the frame by means of the circle 18, gooseneck bars 20, and casting 22, which is universally pivoted to the forward end of the frame in any conventional manner permitting both lateral and vertical swinging of the blade and floating parts associated therewith.

The forward end of the frame 14 is pivoted to and carried on, the axle 24, and the

rear end is shiftably supported on the axles 26 and 26^A clearly shown in Figures 4 and 1 respectively, axle 26 being properly positioned by means of a pair of clamps 28, one to each frame side rail as shown in Figure 6 by any suitable means such as rivets. At the ends of the axle 26 are pivoted, by means of pins 30, the spindles 32 each having a forwardly extending arm 34 rigidly secured thereto and to the ends of which is pivotally connected the spacer bar 36, thereby always maintaining the wheels in parallel relation.

Rotatively mounted on the frame 14 are the lifting cranks 40 and 41, supported at their forward ends by the bar 42 and boxes 43 and 44 and at their rear ends by the brackets 45, one being securely attached to each side of the frame after the manner shown in Figures 2 and 5.

Keyed to the rear end of cranks 40 and 41 are worm gears 46 meshing with the worms 48 secured to the shafts 50, on the inner ends of which are keyed the blade shifting hand wheels, 52.

Pivoted on the crank end of the shafts 40 and 41 are the lifting rods 54, the lower ends of which are connected, also pivotally, to the crossbars 56, said bars being a rigid part of the gooseneck frame by virtue of the bolts 58 passing through the bars 20. It will, therefore, be understood that manipulation of the hand wheels 52 will either raise or lower the blade by raising and lowering the gooseneck frame to which it is connected and that because of the pivotal attachment of casting 22 to the frame 14 it is possible, by moving the wheels 52 separately to change the elevation of either end of the blade independent of the other.

Hinged for vertical movement to the rear ends of the bars 20 is a yoke 60, slidably mounted on the socket member 62, (see Figures 1 and 2) to the rear end of which is universally pivoted the blade adjusting bracket 64 slidably mounted on the bar 66, said bar being securely fastened to the frame 14 in any suitable manner.

Threaded in the adjusting bracket 64 is the rod 68, slidably and rotatively mounted in the frame as shown in Figure 7 at 70 and on one end of which is suitably mounted means to cause its rotation, as a pair of gears 72 and 73 carried in the bracket 74 and provided with a rotatable shaft 76, having a crank 78 or other suitable means of rotation, said shaft (76) being adapted, or mounted, to permit a limited amount of lateral movement of the rod 68 without impairment of function.

At the opposite end of the rod 68 is a swivel 80 to which is attached an end of the lever 82 fulcrumed at 84 to the frame 14, the other end of the lever being pivoted at 86 to the connecting link 88 which link is pivoted, at its other end, to the spacer bar 36, thus

connecting the blade shifting mechanism with the wheels 12 through the medium of the spindle casting 32.

Referring to Figure 7, loosely mounted on the rod 68, are contractible springs 90 each having an end abutting some stationary part of the grader as for instance, the bearing at 70, and each its free end abutting a shoulder, or collar, on the rod 68 as at 92, 92 being either a part of, or a collar secured to the shaft. Obviously, it is not necessary that 92 be mounted to surround 68 as any method of attachment causing a counterbalancing action tending to return the shaft to a predetermined position I consider part of my invention.

It will be understood from the foregoing, that the blade 16 is movable vertically, at either end or both, by the manipulation of the hand wheels 52 and that by the rotation of the shaft 76 by means of the handle 78 the threaded rod 68, by virtue of the internally threaded bracket 64, will when turned, cause 62 together with 60, to move in either direction across the frame carrying with it the rear ends of the bars 20 to which is attached, operatively, the blade 16.

The blade 16 is mounted for rotation about the pivot 94 being retained in any selected position by the pin 98, being placed in one of the holes 100, the pin being held in the proper relation to the bars 20 by the cross member 102.

It will also be understood that any lateral movement of the blade, because of its connection through the bars 20, the yoke 60, the socket castings 62, and the bracket 64, will cause a similar lateral movement, in fact a greater movement of the shaft 68 (to the limit of the springs 90) carrying with it one end of the bar 82, which pivoting around the pin 84 moves 88, 36 and consequently the wheels, in the opposite direction.

Attached to the rear of either type of axle, 26 or 26^A, is a gear rack 104 in mesh with a pinion 106 secured to the shaft 108 having at its upper end means for turning such as the wheel 110. Intermediate the ends, preferably just below the operator's platform 112, and secured to the shaft 108 is a ratchet wheel 114 retained from rotation by the foot-latch 116 also pivoted to the platform (at 118) and provided with an extension on which is the spring 120 and the foot-pad 122, the spring holding 116 in normal engagement with the wheel 114 because its lower end is resting upon the platform.

By first depressing the foot-pad 122 causing disengagement of 116 from the wheel 114 the rotation of wheel 110 turns the pinion 106 which moves the rack 104 and therefore, the entire axle in a lateral direction relative to the frame, it being understood that the connecting rod 88 is first disconnected from the spacer bar 36 and later adjusted to any

of the holes 124 (Figure 4) suitable to the changed position.

There are two ways of controlling the lateral position of the rear end of a grader relative to the line of travel, viz., a one piece axle mounted to pivot on the frame and a non-pivotable axle provided with dirigible wheels such as shown in Figure 4 the latter type being particularly adaptable to the larger and heavier machines because it is more easily controlled and the former type axle being generally used on the smaller and cheaper machines in which, because of their light weight, leverage is not such an important feature, it being more within the limit of manual power to manipulate them as in both types said manipulation has always, heretofore, been manually controlled.

Referring to Figure 1, the adaption of my invention to a pivoted axle grader involves a T shaped frame 126 preferably located between the side rails of the main frame 14, to which is slidably mounted (for side shifting) the axle 26^A, said frame 126 being pivoted to a stationary part of the grader frame on or about the intersection of the center lines of the main frame and axle as at 128, and to the forwardly extending arm 130 to which is hingedly connected the link 132 connecting it with an end of a bar 82.

It is believed that it is clearly shown in Figure 1, how side thrust on the blade in the direction of the arrows, causes a proportional thrust in the same direction on an end of the bar 82 which because of the fulcrum 84 reverses the direction of said thrust against the arm 130 and, consequently, guides the wheels in the opposite direction and obviously, that when no thrust exists, as when the blade is raised, one or the other of the springs 90 will guide said wheels back to, and retain them in, their normal path and that it is clearly possible by means of the crank 78, to selectively position the bracket 64 in either direction across the frame for the purpose of adjusting the blade and that in any of these positions the rod 68 responds and is subject to, the urging caused either by the blade or hand crank, said urging in one case being automatically applied in proportion to the load of dirt on the blade.

Since the side draft against the blade is the result of the draft of the tractor or other propelling means it follows that in this sense, the blade is shiftable by power and also automatic in its action, inasmuch as the heavier the load the more it shifts (within certain limits) without attention from the operator and that in both types of machines the springs 90 tend to return to their normal positions both the blade and wheels.

For the reasons and in the sense stated above, I am claiming wheels automatically skewable by power means. It is of course

apparent that in so far as the lateral hand adjustment is concerned my machine has all the capabilities found in either type and understood, too, that a portion of the shifting means, as for instance, 64 and 68, are shiftable by power in any position selected by the actuation of the hand operated means 76 and 78 and it is with these facts in mind that certain of the following claims are drawn to claim, "shifting means adapted to be actuated by both power and hand operated means."

While I have shown and described in considerable detail two specific embodiments of my invention, I am aware that there may be other ways of accomplishing the result I claim, but, it is to be understood that I do not limit myself to the details of construction shown, except in so far as I have included such limitations within the terms of the following claims in which it is my intention to claim all novelty inherent in it as broadly as is possible in view of the prior art.

What I claim as new and desire to secure by Letters Patent is:

1. A road grader in combination, a main frame, and a shiftable moldboard, wheels for supporting the frame and means connecting the moldboard and said wheels for the purpose of changing their line of travel independent of the main frame.
2. A road grader in combination, a main frame, a laterally shiftable moldboard, and a pair of wheels, and mechanism operatively connected to the moldboard for automatically changing the course of said wheels when the blade is in operation.
3. A road grader in combination, a moldboard provided with independent lateral and diagonal adjusting means, a main frame supporting the moldboard and pivoted on an axle, and movable means connecting the moldboard and axle causing simultaneous co-action thereof.
4. A road grader in combination, a moldboard provided with independent lateral and diagonal adjusting means, a main frame supporting the moldboard and pivoted on a pair of axles and movable means connecting the moldboard and one of said axles causing simultaneous co-action thereof.
5. A road grader in combination, a main frame, a moldboard carried by said frame and provided with cushioned shifting means, wheels supporting the frame and moldboard; and mechanism connecting the shifting means and wheels controlling the course of said wheels for the purpose set forth.
6. A road grader in combination, a main frame, a laterally shiftable moldboard and cushioned shifting means, a pair of supporting wheels and mechanism operatively connecting the shifting means and wheels controlling the course of the latter, for the purpose set forth.

7. A road grader in combination, a moldboard, cushioned shifting means controlling the moldboard, a main frame supported on a pivoted axle and movable mechanism connecting the moldboard shifting means and said axle.

8. A road grader in combination, a moldboard, cushioned shifting means controlling the moldboard, a main frame supported on a pair of pivoted axles and movable mechanism connecting the shifting means with one of said axles and causing simultaneous movement thereof.

9. Means adapted to cause a supporting wheel of a road grader to operate in a skewed position relative to the line of draft when the machine is in operation, comprising in combination, a frame, a pivoted axle, a supporting wheel on the axle and a moldboard having controlling mechanism operating to rock the axle around the pivot substantially as shown.

10. In a road grader, the combination of a main frame, a moldboard and lateral shifting means therefor, a supporting axle normally, substantially crosswise of the main frame and pivoted thereto, cushioned mechanism connected to the shifting means for rocking the axle around its pivot and adapted to assist in retaining said axle in its normal position.

11. In combination, a road grader comprising a diagonally disposed, laterally shiftable blade, skewable wheels supporting and controlling said blade and devices, secured to interposed framework, adapted to permit both manual and automatic shifting of the blade for the purpose set forth.

12. A road grader in combination, a main frame mounted on skewable supporting wheels, an earth moving element for the lateral movement of material beneath the frame and mechanism connecting said element with some of the wheels adapted to automatically position the wheels at an angle to the draft line to resist the thrust caused by the movement of material against the blade, for the purpose set forth.

13. A road grader in combination, a main frame, an earth moving element connected to and supported by said frame and adapted to move material laterally, skewable wheels supporting the frame, means, movably attached to the frame, controlling the positions both of the said element with reference to its crosswise adjustment and of the wheels with reference to the line of draft, said means co-operating to cause a reverse movement of one relative to the other.

14. In combination, a road grader comprising a laterally shiftable moldboard adapted to automatically shift its position in proportion to the side thrust thereon, spring devices adapted to resist said shifting and skewable wheels supporting the

moldboard and controlled by said spring devices.

15. In combination, a road grader comprising a main frame, a moldboard and automatically skewable supporting wheels and spring devices interposed between some of said wheels and the main frame to resist the skewing thereof, substantially as shown and for the purpose set forth.

16. In combination, a road grader comprising a main frame, a moldboard, automatically shiftable in a lateral direction, skewable supporting wheels and spring cushion devices adapted to resist and control the shifting of said moldboard, substantially as shown.

17. In combination, a road grader comprising a main frame, a vertically adjustable ground engaging element adapted to be moved laterally a predetermined distance when in a lowered and operative position, a skewable pair of wheels in the rear of said element, means for simultaneously skewing said wheels with the lateral movement of said element and means for returning said wheels and element to their original position, for the purpose set forth.

18. In combination a road grader comprising a main frame, a vertically adjustable ground engaging element adapted to be moved laterally a predetermined distance when in a lowered and operative position by the side thrust thereon, a skewable pair of wheels in the rear of said element, means for simultaneously skewing said wheels with the lateral movement of said element and automatically acting means for returning said wheels and element to their original positions for the purpose set forth.

19. In combination, a road grader comprising a main frame, skewable supporting wheels, a moldboard and moldboard shifting means adapted to be actuated by the side thrust on the moldboard and also by hand manipulated means, substantially as shown and described.

20. In combination a road grader, comprising a main frame, skewable supporting wheels therefor, a laterally shiftable moldboard, and moldboard shifting means, comprising a crossbar, a shaft adjacent said crossbar, screw mechanism on said shaft and connected to control the moldboard and cushion devices also on the shaft adapted to cushion the shifting of the moldboard through said mechanism.

21. In combination a road grader comprising a main frame, skewable supporting wheels therefor, a laterally shiftable moldboard, moldboard shifting means, shiftable a predetermined distance relative to the main frame and mechanism operatively connecting the shifting means with some of the supporting wheels for the purpose set forth,

22. In combination a road grader, comprising a main frame, skewable supporting wheels, a laterally shiftable moldboard, and a shifting member controlling said moldboard, adapted to be actuated by the side thrust on the moldboard or hand operated means, independently, and mechanism operatively connecting said actuating means with some of said wheels for the purpose set forth.

23. In combination, a road grader comprising a main frame, a pair of forward supporting wheels and a pair of skewable rear supporting wheels, a laterally shiftable moldboard, a shifting member controlling the moldboard, adapted to be actuated by the moldboard or manipulated by hand means, independently, and mechanism operatively connecting said actuating means with some of the supporting wheels substantially as shown and described.

24. In a road grader, in combination a main frame, a moldboard vertically and laterally movable relative to the frame, front and rear supporting wheels, some of which are skewable, and shiftable moldboard shifting means in the rear of the moldboard,

adapted to be actuated by hand means, when the blade is in one position and by side thrust when it is in another position and operatively connected to skew some of said wheels for the purpose set forth.

25. In combination, a road grader comprising a main frame, a pair of skewable wheels, a moldboard, automatically shiftable in a lateral direction, laterally shiftable and horizontally rockable devices adapted to control and resist the skewing of said wheels and lateral movement of the moldboard for the purpose set forth.

26. In a road grader in combination, supporting wheels skewable relative to the line of draft, a main frame, a moldboard and moldboard actuated means for automatically skewing said wheels, substantially as shown and described.

27. In a road grader in combination supporting wheels, skewable relative to the line of draft and laterally shiftable, a main frame, a moldboard adapted to receive side thrust and connected to automatically skew said wheels substantially as shown and for the purpose set forth.

HORACE R. WILSON.