

June 2, 1925.

1,540,161

L. B. CALLISON ET AL

GRADER ATTACHMENT FOR TRACTORS

Filed Nov. 3, 1921

3 Sheets-Sheet 1

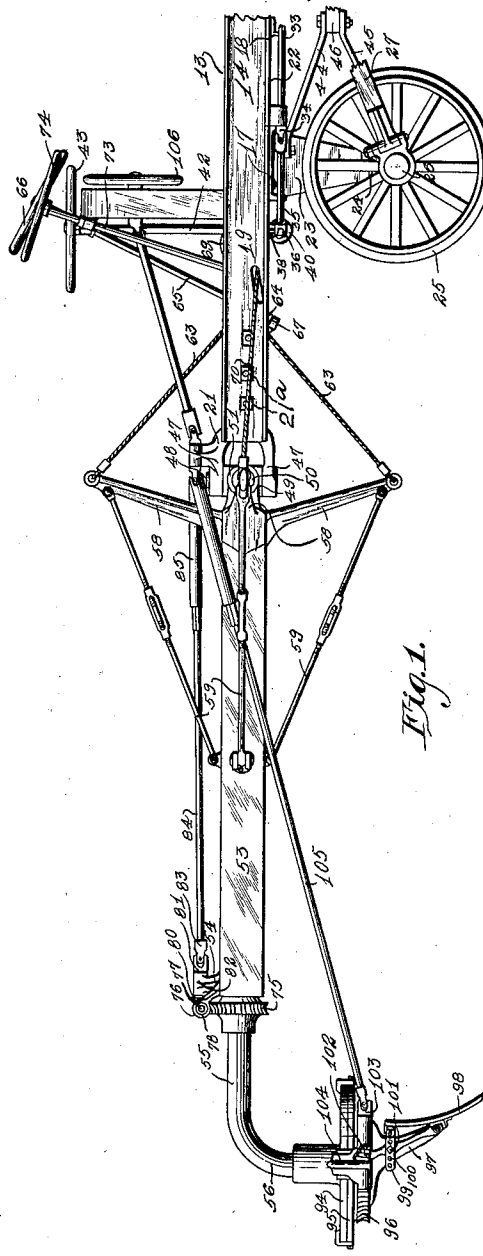


Fig. 1.

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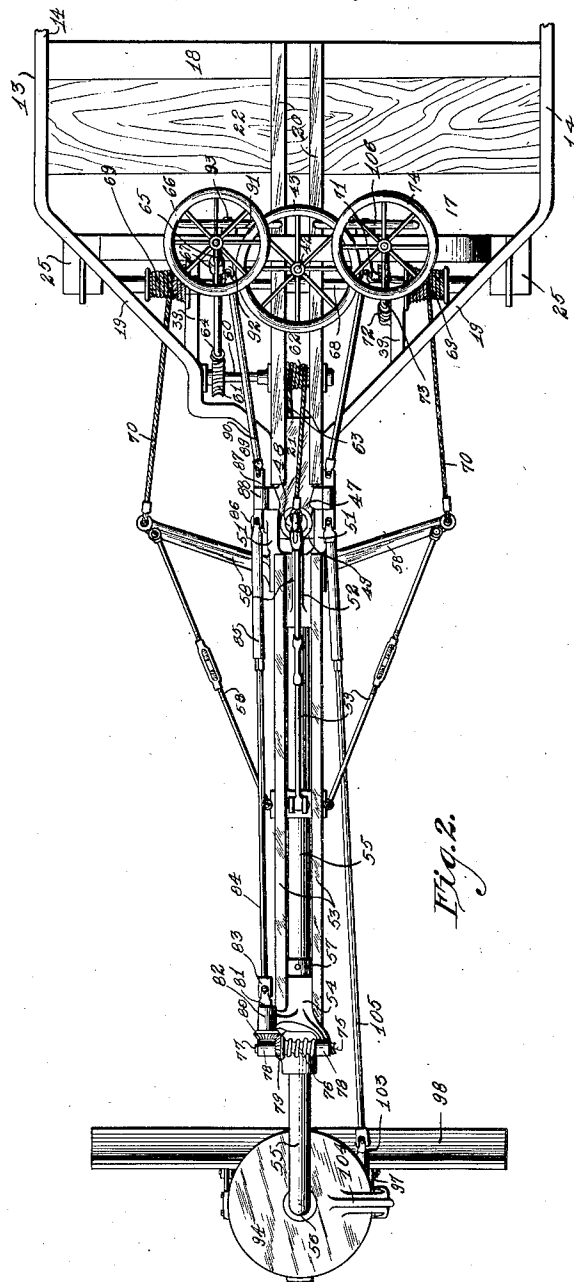
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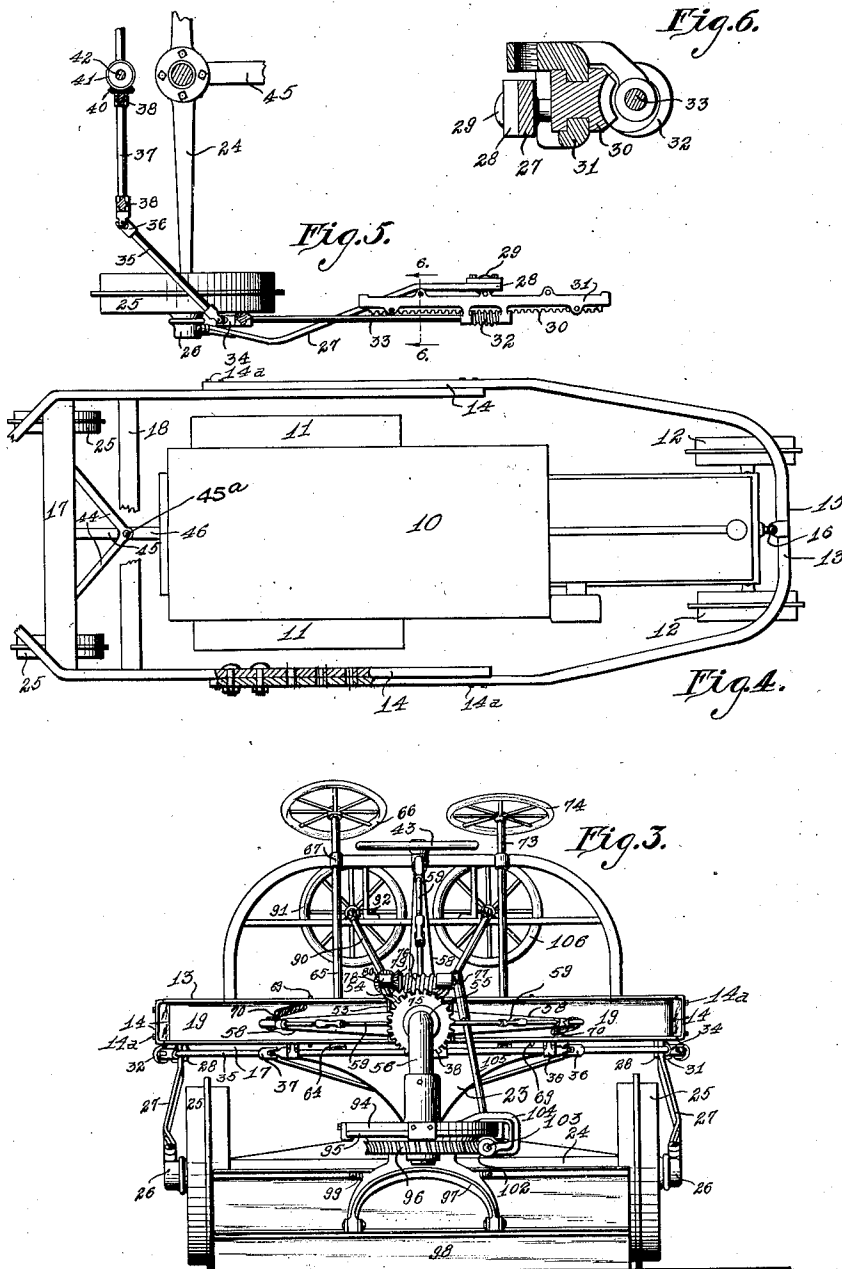
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

LILBERN B. CALLISON AND ELDER J. ERLANDSON, OF CHARITON, IOWA.

GRADER ATTACHMENT FOR TRACTORS.

Application filed November 3, 1921. Serial No. 512,675.

To all whom it may concern:

Be it known that we, LILBERN B. CALLISON and ELDER J. ERLANDSON, citizens of the United States, and residents of Chariton, in the county of Lucas and State of Iowa, have invented a certain new and useful Grader Attachment for Tractors, of which the following is a specification.

The object of our invention is to provide a road grader attachment which may be easily and quickly applied to the traction engine of the ordinary construction with a minimum amount of labor.

A further object is to provide a detachable road grader for traction engines so constructed and arranged that the grader member may be very flexibly handled so that it may be easily and quickly moved to a various number of working positions to accomplish all kinds of grading in connection with highway road beds.

A further object is to provide in a detachable grader for tractors, an open frame member designed to surround the tractor, one end of which is to be carried by the front end of the tractor while the rear end is to be carried by separate supporting wheels, the said supporting wheels being mounted to guide independently of the tractor, the said frame being designed to carry a universally pivoted grader supporting member in such a manner that the grader may be swung to a large number of working positions.

A still further object is to provide in a device as above described, improved steering mechanism.

These and other objects will be apparent to those skilled in the art.

Our invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in our claims, and illustrated in the accompanying drawings:

Figure 1 shows a side elevation of our improved grader mechanism as applied to the rear end of the detachable supporting frame.

Figure 2 is a plan view of the same.

Figure 3 is a rear elevation of our improved mechanism.

Figure 4 is a plan view of the supporting frame showing the manner in which it is applied to a tractor.

Figure 5 is a detail plan view of one-

half of the steering mechanism for the supporting frame.

Figure 6 is a detail sectional view taken on the line 6-6 of Figure 5.

The numeral 10 indicates a tractor of the ordinary construction having driving wheels 11 and front steering wheels 12.

For supporting and carrying our improved mechanism, we have provided a supporting frame 13 having side members 14 formed adjustable as to length by means of bolts 14^a, and a front end member 15. The said side members 14 and the member 15 are substantially a continuous frame member, the side members being spaced apart a distance so the tractor may be placed between them as clearly shown in Figure 4.

The front end member 15 is secured to the front of the tractor frame by means of a universal joint 16.

The members 14 should be spaced apart such a distance that the wheels 11 will be permitted a slight lateral movement relative to said members. The members 14 extend rearwardly beyond the back end of the tractor and are tied together by means of cross beams 17 and 18. The said end members are then provided with converging portions 19 and are designed to support parallel bars 20 and a stationary block 21 between them by means of bolts 21^a, as clearly shown in Figure 2.

The bars 20 extend forwardly, and are designed to carry a portion of the mechanism hereinafter to be described, and also the floor member 22.

Mounted beneath central portion of the cross beam 17 is a downwardly extending pivoted carrying member 23 best shown in Figure 3.

Mounted beneath the member 23 is an axle 24, each end of which is provided with a wheel 25. These wheels 25 form a support for the rear end of the supporting frame 13, and also for steering the grader operating mechanism.

This axle 24 is pivotally mounted beneath the member 23 in the usual manner so that the rear end of the supporting frame 13 may be steered independently of the tractor.

For steering the axle 24, we have provided the following mechanism:

Pivotally secured to each of the outer ends of said axle we have provided a cap 26. Each of the caps 26 is provided with a forwardly and upwardly extending link 27.

The upper ends of the links 27 are each provided with a ball socket 28 designed to be carried by a ball 29 rigidly secured to a rack bar 30 slidably mounted in a supporting frame 31, the said frame being rigidly secured to the under edge of the rear end of each of the members 14.

The frame 31 is provided with a worm 32 mounted on the front end of a rotatively mounted shaft 33. This shaft 33 is supported substantially parallel with the members 14, and is provided at its rear end with a universal joint 34.

The said joint 34 is provided with a shaft 35 having a universal joint 36 which is secured to each of the outer ends of a transversely and rotatively mounted shaft 37.

The shaft 37 is mounted in suitable bearings 38 secured to the lower edge of the frame members 39 and 20. The central portion of the shaft 37 is provided with a beveled gear 40 designated to mesh with a beveled gear 41 mounted on the lower end of a vertically arranged shaft 42, the said shaft 42 being rotatably mounted in suitable bearing secured to the supporting frame, and provided at its upper end with a hand wheel 43.

Thus it will be seen that by rotating the hand wheel 43, the shaft 37 may be rotated through the beveled gears 40 and 41. This will in turn rotate the shafts 35 and 33, which in turn will cause the worm 32 to be rotated and the rack bar 30 reciprocated due to the fact that the said worm 32 is in mesh with the said rack. This in turn will cause the link 27 to be reciprocated causing the axle 24 to be moved about its pivot.

But one of the rack bars 30 has been shown in Figure 5, one of these being applied to the outer end of each of the members 14 and the worms so arranged that if one of the rack bars is moved rearwardly, the opposite rack bar will be moved forwardly or vice versa. This provides means whereby the axle 24 may be effectively moved to steer the rear end of the supporting frame 13, the worms 32 being of such pitch that longitudinal movement of the rack 30 will be prevented except when the said worms are being rotated. This will rigidly hold the axle 28 against the limited oscillating movement which is common in devices having a pivoted axle as the machine is advanced over rough surfaces.

The frame member 17 is provided with diagonally arranged bars 44 and a forwardly extending bar 45 the intersecting portion of which is provided with a pivot 45^a to receive a draw bar 46 of the tractor 10. This provides means whereby the supporting frame will be advanced forwardly by the usual tractor hitching so that the draft of the tractor may be applied in the usual manner thereto.

The stationary block 21 terminates in two rearwardly extending end members 47 designed to receive a vertically arranged pin 48. This pin carries a pivotally mounted block 49. The said block 49 is provided with laterally extending pins 50 on which is pivotally mounted forwardly extending portions 51 of a block 52.

The block 52 is secured between the forward ends of parallel beams 53, the rear ends of which carry between them a block 54. The blocks 54 and 52 are designed to rotatively receive a shaft 55, the rear end of which extends rearwardly beyond the block 54 and is provided with a downwardly extending portion 56.

A collar 57 is secured to the shaft 55 ahead of the block 54 to prevent rearward movement of said shaft by engaging the front end of said lug 54.

The blocks 52 and 54 and the members 53 form what we shall term a boom of our improved grader. This boom is designed to be operated in substantially a horizontal position and is supported and operated by means of lateral extending arms 58 secured to the forward end of said boom.

There are four of these arms 58, two of which are mounted in substantially a vertical plane, and two of which are mounted in a horizontal plane and extend in opposite directions to each other so that the rear end of the boom may be swung horizontally or vertically by means of the said arms 58.

The outer ends of the arms 58 rest substantially in a plane extending through the pivotal center of the universal pivoting member. Each of the arms 58 is held against forward movement by means of a truss rod 59 anchored to the central portion of the boom, as clearly shown in Figure 2.

For operating the arms 58, we have provided the following mechanism:

Rotatively mounted transversely to the beams 20, and one of the members 19, we have provided a shaft 60 having a worm gear 61 on one end and a rope drum 62 on the other end, said drum being mounted between the members 20.

The drum 62 is designed to receive ropes 63 wound in opposite directions, the free end of each being secured to a corresponding arm 58 in such a manner that as the drum 62 is rotated, one of the radial members 58 will be moved forwardly, while the opposite member is permitted to move rearwardly. This will cause the rear end of the boom to be elevated.

A reverse movement of the drum 62 will cause the rear end of the boom to be lowered.

In mesh with the worm gear 60, we have provided a worm 64 carried on the lower end of a rotatively mounted shaft 65, the

upper end of which is provided with a hand wheel 66, the said shaft 65 being mounted in suitable bearings 67.

• Rotatively mounted transversely in the supporting frame, we have provided a shaft 68, each end of which is provided with a drum 69. Each of these drums has the form of a truncated cone, and is designed to carry a rope or cable 70, the free end of each is connected to a corresponding one of the horizontal members 58.

The cables 70 are wound in opposite directions in such a manner that as the shaft 68 is rotated, one of the members 58 will be moved forwardly while the opposite one is moved rearwardly, and the rear end of the boom moved in a horizontal plane.

Secured to the shaft 68, we have provided a worm gear 71 in mesh with a worm 72 mounted on the lower end of an upwardly extending shaft 73. The shaft 73 is rotatively mounted in suitable bearings secured to the supporting frame and provided at its upper end with a hand wheel 74.

Thus it will be seen that as the hand wheel 74 is rotated, the shaft 68 will be rotated and consequently the drums 69, thereby causing the rear end of the boom to be moved horizontally in either direction.

It will be noted that as the arms 58 are swung either forwardly or rearwardly, the ropes 70 will have a tendency to tighten or loosen, due to the angularity of said arms relative to the longitudinal center of the machine.

We have overcome this difficulty by providing the conical drums 69 which are so arranged that this slack will be automatically taken up or let out as they are operated.

Thus it will be seen that we have provided for lateral movement of the rear end of the boom in all directions by operating the hand wheels 66 and 74 either simultaneously or independently, the said wheels being so mounted that both of them may be grasped at the same time and operated in unison if so desired.

For rotating the shaft 55, we have provided a worm gear 75 rigidly secured to said shaft adjacent to the back end of the block 54. This gear also serves the purpose of a collar to prevent the shaft 55 from being moved forwardly.

This worm gear 75 is designed to mesh with a worm 76 mounted on a transversely arranged shaft 77 in suitable bearings 78. One end of the shaft 77 is provided with a beveled gear 79 in mesh with a beveled gear 80 secured to the rear end of a shaft 81. The shaft 81 is mounted in a suitable bearing 82 secured to the block 54.

The forward end of the shaft 81 is provided with a universal joint 83 designed to carry a forwardly extending shaft 84, the

forward end of which is telescopically received in a tubular shaft 85.

The forward end of the shaft 85 is provided with a universal joint 86 mounted on the rear end of a shaft 87 mounted in suitable bearings 88 secured to the block 21.

The forward end of the shaft 87 is provided with a universal joint 89 secured to the rear end of a shaft 90, the forward end of which is operatively connected with a hand wheel 91. Through a universal joint 92, the shaft 93 is mounted in suitable bearings in the frame.

Thus it will be seen that as the wheel 91 is rotated, the beveled gears 79 and 80 will be rotated through the flexible shaft just described, which in turn will cause the worm 76 to be rotated and the shaft 55 through the worm gear 75. This provides means for tilting the grader as will hereinafter be described.

Secured to the downwardly extending portion 56 of the shaft 55, we have provided a stationary plate or disc 94 which serves as a support for a disc 95 adjacent to and beneath the said disc 94.

The disc 95 is provided with upwardly extending flanges or guide members designed to surround the projection edge of the disc 94.

Adjacent to the lower face of the disc 95, we have provided a worm gear 96, the lower face of which is provided with downwardly and forwardly extending arms 97. The forward and lower ends of each of the arms 97 is pivotally connected to the central portion of a grader blade 98 in such a manner that the face of the said blade may be tilted to assume substantially a vertical position or an inclined position, the tilting movement of which is accomplished by means of a strap 99 being pivotally secured to the back and upper edge of the said blade and provided with openings 100 to receive a bolt 101.

This bolt 101 is detachably secured to the arms 97 in such a manner that they may be placed in either of the openings 100, the tilting of the blade is thereby accomplished. After the blade has once been tilted, it will be rigidly held against movement by the said members 99.

For swinging the blade 98 in a horizontal plane so that its cutting edge may assume any desired angle with the line of advance of the machine, we have provided the following mechanism:

In mesh with the worm gear 96, we have provided a worm 102 mounted on a shaft 103 and carried by an overhanging bracket 104, the said bracket being secured to the upper surface of the disc 94.

The shaft 103 is rotatively operated by means of a flexible and telescopically arranged shaft 105 similar to the telescopic

shaft used to operate the beveled gears 79 and 80, the said shaft 105 being provided at its forward end with a hand wheel 106 similar to the hand wheel 91.

5 In the practical operation of our mechanism assuming that the supporting frame has been mounted to the tractor frame, as before described, and that the grader blade 98 is in the position as illustrated in the
10 various figures, and it is desired to operate the device for leveling a road bed or any other surface. This may be accomplished by advancing the tractor, which will cause the blade 98 to be advanced and which will
15 act as a road drag merely to knock off the high places and fill the ruts and hollow places.

The blade 98 may be moved out of engagement with the ground surface by operating the hand wheel 66.

25 Assuming that it is desired to use the device as a grader for drawing the dirt toward the center of the road from the outer edges of the road bed, the hand wheel 106 may be operated, which will cause the worm 102 and the gear 96 to be operated. This will cause the blade 98 to assume an angle relative to the boom.

30 If the grade is a crowned one in which the center is higher than the outer edges, the cutting edge of the blade 98 may be tilted so that its inner end may be elevated by operating the hand wheel 91.

35 If the outer edges of the road bed should be soft so that the tractor could not be operated to one side thereof, the back end of the boom could be swung laterally by operating the hand wheel 74 until the grader blade 98 will operate at a point to one side of the
40 central line of draft. This work would have a tendency to produce a lateral movement of the rear end of the supporting frame 13. This lateral swinging movement can be counteracted by operating the hand
45 wheel 43 and steering the supporting wheels 25, which will be rigidly locked into any desired position, and may be steered independently of the steering of the tractor.

50 By the construction described, it will be seen that a large variety of movements may be imparted to the rear end of the boom and also to the cutting blade 98, as the blade can be set at any desired angle and can be operated at any desired position by the
55 proper manipulation of the various hand wheels.

60 In fact, the cutting edge of the blade 98 can be made to assume a vertical position instead of a horizontal position for trimming vertical banks.

It will also be seen that the frame 13 may be adjusted as to length by means of the bolts 14^a so that it may be adapted to fit
65 tractors of different lengths.

Thus it will be seen that we have provided

an improved grading machine which is in the nature of an attachment, and which may be easily and quickly applied to the ordinary tractor when so desired, and which, when in use, will not in any way incum-
70 ber the tractor. When detached, it may be used for other purposes.

We claim as our invention:

1. A supporting frame, means for steering and advancing said supporting frame, a
75 boom extending beyond the rear end of said supporting frame having its forward end universally pivoted to the rear end of said supporting frame, means carried by said supporting frame for imparting universal
80 movement to the free end of said boom, a grader blade attached to the free end of said boom capable of universal adjustment, and means carried by said supporting frame for accomplishing the said universal adjust-
85 ment of said grader blade.

2. A supporting frame, means for steering and advancing said supporting frame, a boom having one end universally pivoted to the rear end of said supporting frame,
90 means carried by said supporting frame for imparting universal movement to the free end of said boom, a shaft rotatively mounted longitudinally in said boom, said shaft being provided with a downwardly extend-
95 ing portion, means carried by said supporting frame for imparting rotary movement to said shaft when the boom is in any of its positions of movement, a grader blade
100 pivotally mounted to the downwardly extending portion of said shaft to swing about the downwardly extending portion of said shaft as an axis, means carried by said supporting frame for imparting the pivotal
105 movement to said grader blade when the boom is in any of its positions of movement.

3. A supporting frame, means for steering and advancing said supporting frame, a boom having one end universally pivoted to
110 the rear end of said supporting frame, means carried by said supporting frame for imparting universal movement to the free end of said boom, a shaft rotatively mounted longitudinally in said boom, said shaft
115 being provided with a downwardly extending portion, means carried by said supporting frame for imparting rotary movement to said shaft when the boom is in any of its positions of movement, a grader blade
120 pivotally mounted to the downwardly extending portion of said shaft to swing about a downwardly extending portion of said shaft as an axis, means carried by said supporting frame for imparting the pivotal
125 movement to said grader blade when the boom is in any of its positions of movement, means for adjusting the angle of the face of said blade relative to the downwardly extending portion of said shaft. 130

4. A supporting frame, a boom extending beyond the rear end of said supporting frame having its forward end universally pivoted to the rear end of said frame, means for imparting universal movement to the outer end of said boom comprising sets of oppositely and laterally extending arms, a cable for each of said arms, a drum carried by said frame for carrying each set of cables, said cables being wound in opposite directions, and means for operating each of said drums.

5. A supporting frame, means for steering and advancing said supporting frame, a boom having one end universally pivoted to the rear end of said supporting frame, means carried by said supporting frame for imparting universal movement to the free end of said boom, a shaft rotatively mounted longitudinally in said boom, said shaft being provided with a downwardly extending portion, means carried by said supporting frame for imparting rotary movement to said shaft when the boom is in any of its positions of movement, and a grader blade mounted on the downwardly extending portion of said shaft.

6. A supporting frame, a boom extending beyond the rear end of said supporting frame, having its forward end universally pivoted to the rear end of said frame, the rear end of said boom being provided with a downwardly extending portion, means carried by said frame for imparting universal movement to said boom, a grader blade

pivotaly mounted on the downwardly extending portion of said boom, and means carried by said frame for imparting pivotal movement to said grader blade when the boom is in any of its positions of movement.

7. A supporting frame, a boom extending beyond the rear end of said supporting frame, having its forward end universally pivoted to the rear end of said frame, the rear end of said boom being provided with a downwardly extending portion, means carried by said frame for imparting universal movement to said boom, a grader blade pivotaly mounted on the downwardly extending portion of said boom, means carried by said frame for imparting pivotal movement to said grader blade when the boom is in any of its positions of movement, and means for adjusting the angle of the faces of the blade relative to the downwardly extending portion of said boom.

8. A supporting frame, means for steering and advancing said supporting frame, a boom extending beyond the rear end of said supporting frame, having its forward end universally pivoted to the rear end of said supporting frame, means carried by said supporting frame for imparting universal movement to the free end of said boom, and a grader blade attached to the free end of said boom.

Des Moines, Iowa, October 17, 1921.

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