Aug. 10, 1943. V. H. REISSER 2,326,561

ROAD WORKING MACHINE

Filed Feb. 17, 1941 4 Sheets-Sheet 1

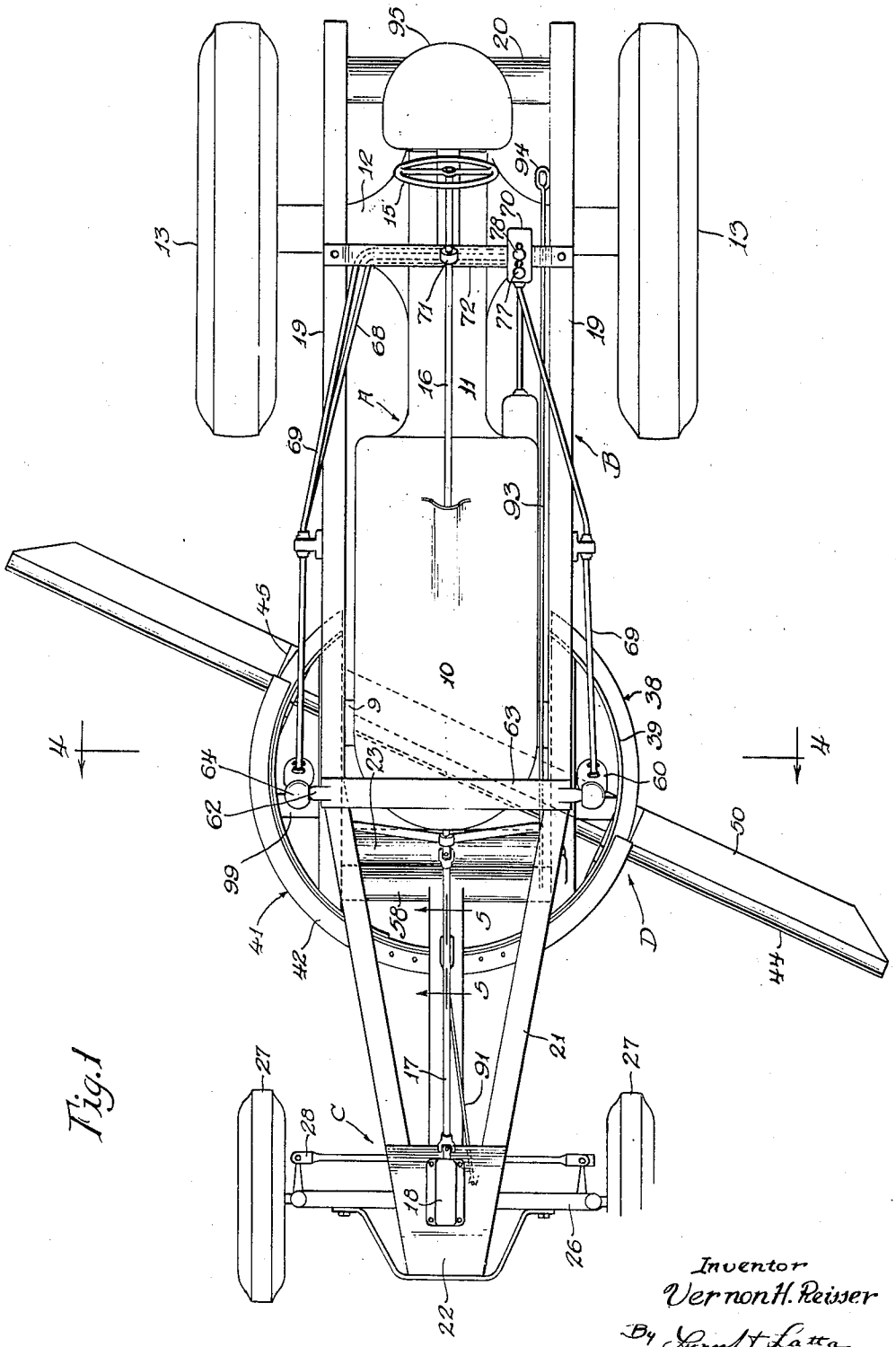


Fig. 1

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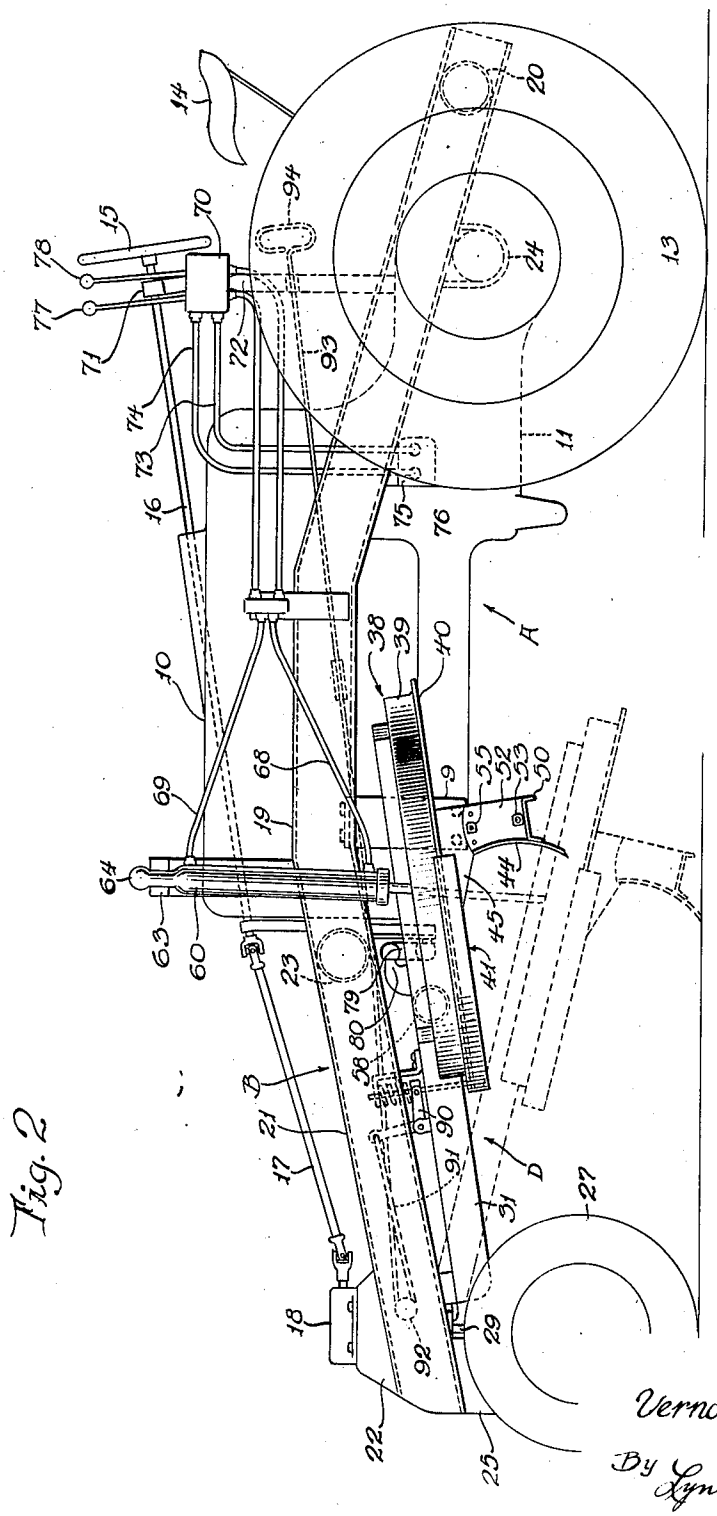


Fig. 2

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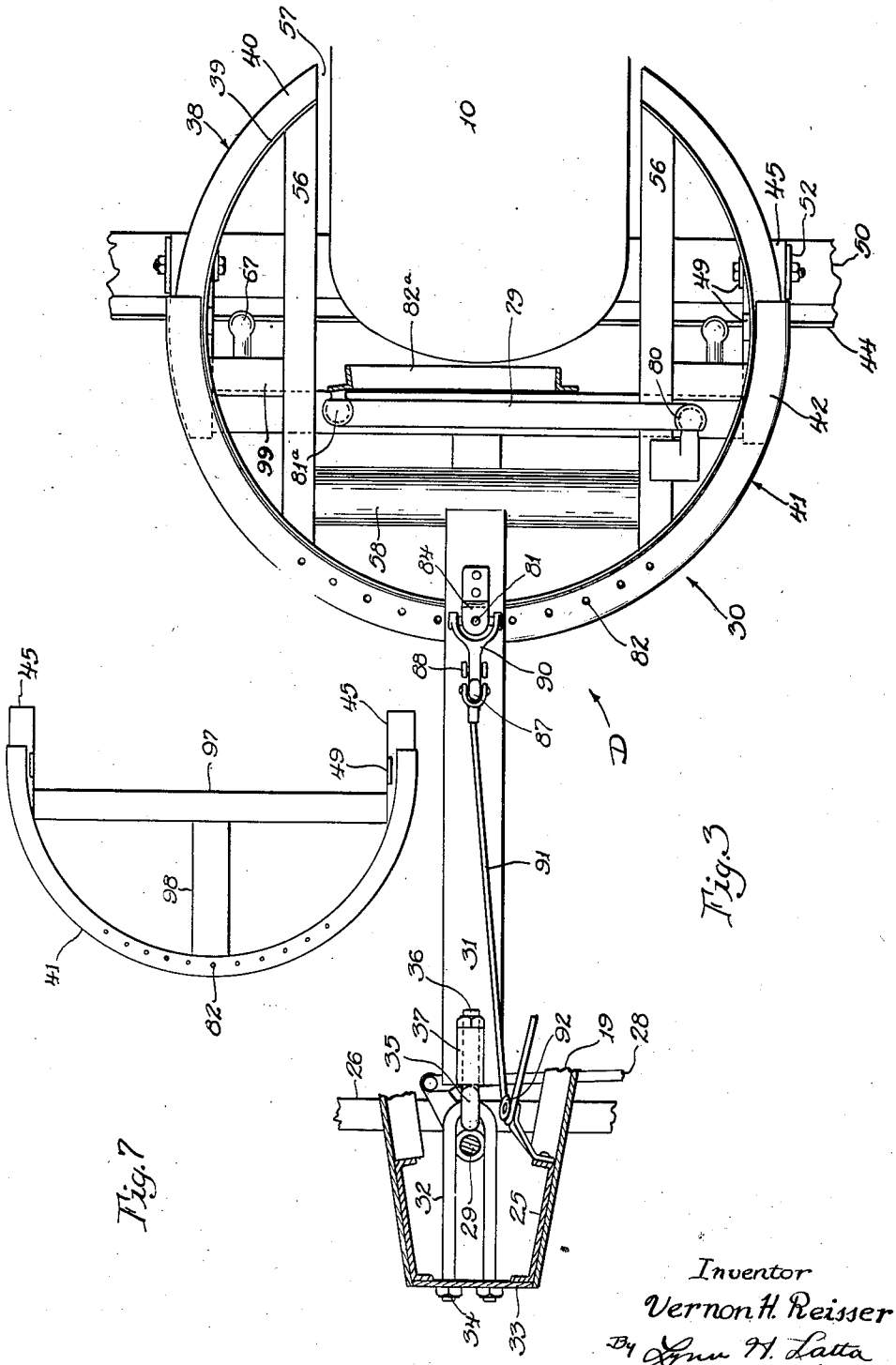


Fig. 3

Fig. 7

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ROAD WORKING MACHINE

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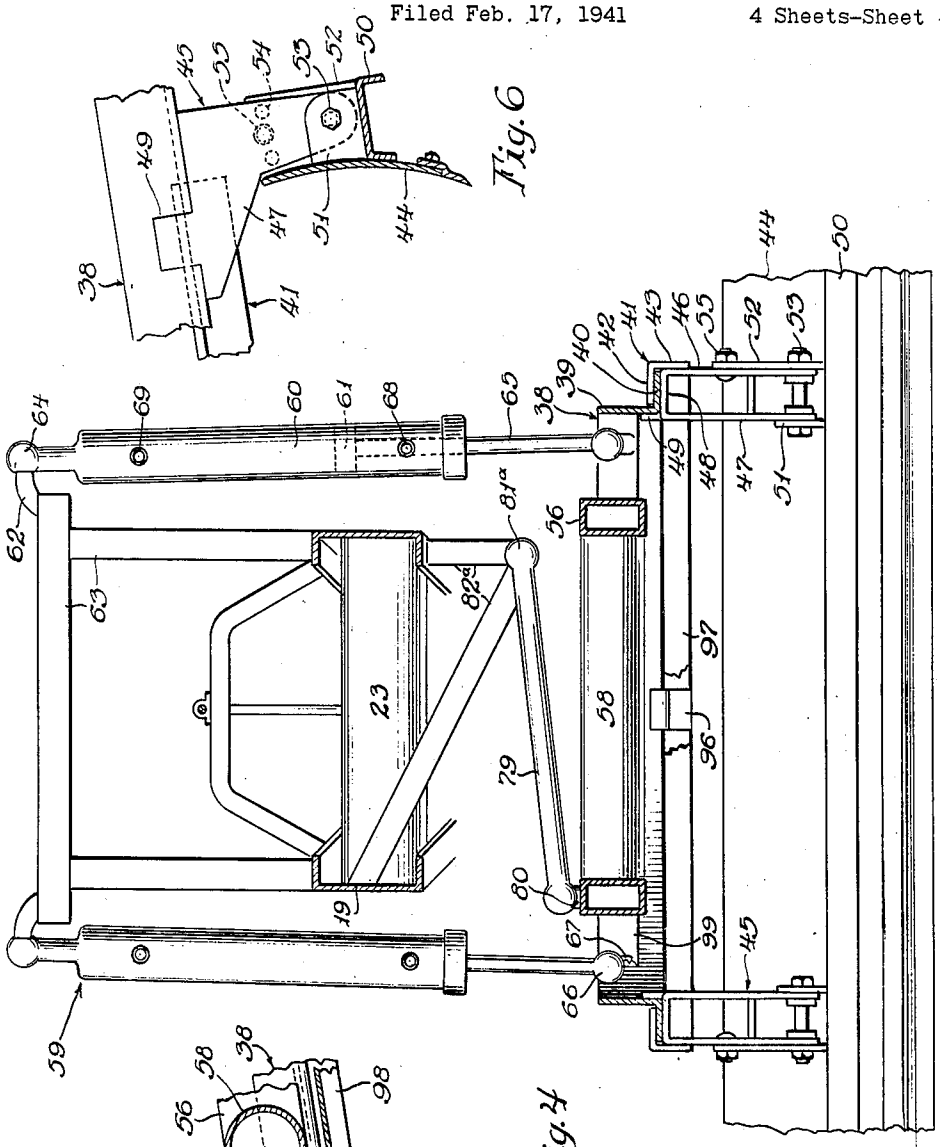


Fig. 4

Fig. 6

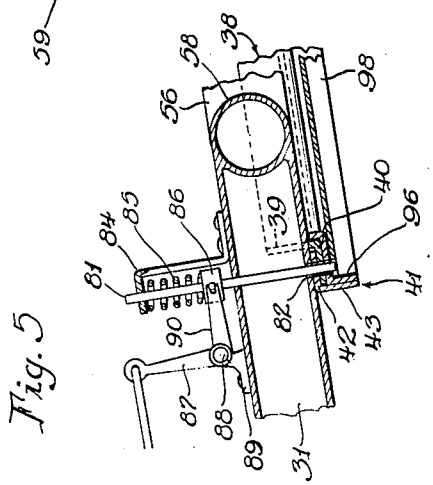


Fig. 5

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2,326,561

UNITED STATES PATENT OFFICE

2,326,561

ROAD WORKING MACHINE

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Application February 17, 1941, Serial No. 379,181

12 Claims. (Cl. 37—156)

This invention relates in general to road working machines, and particularly to road working machines of the type embodying a power plant and traction unit attached to or built into a vehicle which utilizes the traction wheels of such unit as the rear wheels thereof; is provided with steerable front wheels located well ahead of the front end of the power plant, and has means for adjustably mounting an implement, such as a scraper blade, in a position adjacent and preferably below the front end of the power plant.

In order to provide for angular adjustment of the blade with reference to the path of travel, it is customary in most road graders to suspend the blade on what is commonly known as a "circle," embodying a pair of rings, one carrying the blade or other implement and rotatably supported upon the other, which is in turn suspended from the vehicle frame for vertical adjustment, and has a draft connection to the frame which permits such adjustment. Such a circle and draft connection is sometimes referred to as the "sub-frame."

The present invention contemplates the use of such a sub-frame so arranged that the blade or other implement carried thereby may be positioned beneath the front end of the power plant, and has as its principal object to provide for a maximum amount of elevation of the blade. In all road machines of this general type which have been available for many years past, the elevation of the blade is limited by contact of the circle with the underside of the power plant or adjacent frame. My invention provides an arrangement wherein the circle does not contact the power plant and may, therefore, be elevated considerably above the bottom of the power plant, the elevation being limited only by contact of the blade with the bottom of the power plant. This is accomplished by forming the rear side of the circle with a gap adapted to receive the forward end of the power plant as the circle is elevated to a plane intersecting the power plant.

Other objects, the advantages and uses of the invention will become more apparent after reading the following specification and claims, and after consideration of the drawings forming a part of the specification, wherein:

Fig. 1 is a plan view of a road grader embodying the invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a plan view of the sub-frame and blade assembly;

Fig. 4 is a transverse sectional view of the grader, taken on the line 4—4 of Fig. 1;

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 1;

Fig. 6 is a detail cross-sectional view of the grader blade showing the blade supporting structure as viewed from the inside of the circle; and

Fig. 7 is a plan view of the rotatable member of the circle unit.

As an example of one form in which the invention may be embodied, I have shown in the drawings a grader comprising a standard tractor unit A, with the exception of the front wheel and axle assembly thereof; a main frame B the rear end of which is supported on the tractor unit A, the forward end of which is carried by a front wheel and steering unit C, and the intermediate region of which supports the forward end of the tractor unit A; and a sub-frame and blade assembly D carried beneath the intermediate region of the frame B and at least partially beneath the tractor unit A.

The tractor unit A comprises a power plant 10, a transmission housing 11 extending rearwardly therefrom and terminating in a rear axle and differential housing 12, and rear traction wheels 13 mounted on a rear axle and differential assembly which is encased in the housing 12. An operator's seat 14 is mounted on the housing 12, and a steering wheel 15 is mounted on a steering shaft 16 extending forwardly through the upper region of the power plant 10 and connected by an articulated shaft section 17 to a steering worm unit 18. The rear end of the steering shaft 16 is journalled in a bracket 71 on an arch 72 mounted on the frame B.

The frame B comprises a pair of sills 19, preferably of channel iron construction, the rear ends of which are connected by a cross member 20 and the forward regions of which are converged as at 21 and connected at their forward ends by a bow cap 22 on which the steering worm unit 18 is mounted. A cross member 23 connects the sills 19 just ahead of the front end of the power plant 10.

The rear region of the frame B is supported upon the rear axle housing 12 and secured thereto as indicated at 24 in Fig. 2. The power plant 10 is suspended from the sills 19 by brackets 9. The forward end of the frame is provided with a downwardly projecting leg 25 (Figs. 2 and 3) to the lower end of which the front axle 26 is attached.

The front wheel unit C comprises the axle 26, a pair of wheels 27 steerably connected to the axle 26, and conventional steering linkage 28, which is connected to a steering shaft 29 ex-

tending downwardly from the worm unit 18 and through the leg 25 (see Fig. 3).

The sub-frame D comprises a circle unit, indicated generally at 30 in Fig. 3, and a draw-bar 31 extending forwardly therefrom and hitched at its forward end to the leg 25. The hitch comprises a U-bolt 32, the legs of which extend through the forward wall 33 of the leg 25, and are secured by nuts 34. An eye bolt 35 is linked to the U-bolt 32 and has a shank 36 anchored in a socket 37, which is secured to the forward end of the draw-bar 31. The legs of the U-bolt 32 straddle the steering shaft 29.

The circle unit 30 comprises a non-rotatable ring section 38 attached to the rear end of the hitch 31 and suspended from the frame B, and a rotatable ring section 41, which carries the grader blade 44. The ring section 38 is formed of angle iron providing a vertical flange 39 and a horizontal flange 40.

The rotatable ring section 41 is U-shaped and of substantially 180° circumferential extent. The ring section 41 is also of angle iron, having a horizontal flange 42 overlying the flange 40 and in oscillatable bearing engagement therewith, and a depending flange 43.

The grader blade 44 is supported by the ring section 41 through the medium of brackets 45. Each bracket 45 is U-shaped in rear elevation (Fig. 4) and includes an outer arm 46 which is welded to the flange 43, an inner arm 47, and a web 48 which is in bearing engagement with the underside of the flange 40. Such bearing engagement is utilized for imposing the weight of the tractor on the blade to any extent that may be necessary. The bearing engagement of the flange 42 on the flange 40 is utilized for supporting or partially supporting the weight of the blade while the blade is being carried in a raised position, or is being angularly adjusted about the axis of the circle.

The arms 47 have extensions 49 in bearing engagement with the inner surface of the flange 39, for the purpose of resisting thrust on the blade longitudinally thereof, which might otherwise tend to spring the sides of the ring sections 39 and 41 apart.

The blade 44 is backed with a beam 50 of channel iron, the forward flange of which is welded to the blade. Welded to the upper side of the beam 50 and the rear side of the blade 44 are a plurality of brackets 51 and 52, to which the lower ends of the arms 46 and 47 are pivoted by means of bolts 53. Each bracket 52 is formed at its upper end with a series of openings 54, disposed on an arc concentric with a bolt 53, and adapted to receive a locking bolt 55 extended through a registering opening in the adjacent arm 46. The several openings 54 provide a selective range of tiltable adjustment of the blade 44 about the axis of the bolts 53.

The ring 38 is formed with chordal struts 56 which define the side extremities of a gap 57, adapted to receive the forward end of the power plant 10 when the subframe is elevated. The ring section 41 extends through a much smaller circumferential arc than the ring section 38 to permit the desired amount of angular adjustment of the blade without projecting a bracket 45 into the gap 57. The ends of the struts 56 are secured, as by welding, to the inner surface of the flange 39. A cross member 58 is secured at its ends to the inner sides of the struts 56. The rear end of the draw-bar 31 is anchored to this cross-piece. Where the draw-bar crosses the ring 38 the flange 39 is notched to receive it, and the two are welded together in the area of contact. The cross-piece 58 cooperates with the struts 56 to give inherent rigidity to the ring 38 across the gap 57. This inherent rigidity is assisted in resisting thrust longitudinally of the blade 44, by a strut 97 the ends of which bear against and are secured to the brackets 45, thus tying together the sides of the ring section 41. The sides of the ring section 39 are confined between the flange 43 and the extensions 49 so that the strut 97 in effect provides a bridging connection across the gap 57, adapted to transmit loads in both directions. The strut 97 is bracled to the central region of the ring section 41 by a brace 98.

The sub-frame and blade assembly D is suspended from the main frame B by a pair of hydraulic motors 59 each comprising a cylinder 60 and a piston 61 operating therein. The cylinders 60 are suspended from brackets 62 on the corners of an arch 63 mounted on the sills 19, being attached to the brackets 62 by pivotal connections 64. The piston 61 are attached to piston rods 65 the lower ends of which are pivoted at 66 to studs 67 secured to cross-pieces 99, which in turn are secured between the flange 39 and the struts 56. Operating fluid, such as oil from the crank case of the tractor, is admitted to the cylinders 60 below the pistons 61 through tubes 68, moving the pistons upwardly so as to elevate the sub-frame, or above the pistons 61 through tubes 69, moving the pistons downwardly so as to force the blade 44 into the earth. The fluid is delivered to the tubes 68 and 69 from a valve unit 70 supported on the arch 72. The fluid is supplied under pressure to the valve unit 70 through delivery and return lines 73 and 74, from a pump 75 on the crank case 76 of the power plant 10. The valve unit 70 is adapted to control the flow of fluid from the delivery tube 73 to two sets of the tubes 68 and 69, one for each of the hydraulic motors 59, and to selectively deliver fluid to either the tubes 68, for elevating the sub-frame, or to the tubes 69, for depressing the sub-frame. Valve levers 77 and 78 control the flow of fluid to the respective hydraulic units.

End thrust against the blade is resisted by a stabilizer bar 79, one end of which is pivoted at 80 to one of the struts 56 and the other end of which is pivoted at 81a to a bracket 82a, depending from the frame B. The stabilizer bar 79 maintains the sub-frame and blade assembly centered laterally of the vehicle while permitting elevation and lowering thereof.

The position of angular adjustment of the blade about the axis of the circle is fixed by a latch bolt 81 extending through registering openings 82 in the flanges 42 and 40, respectively. There are a number of the openings 82 in the flange 42 corresponding to the desired range of blade adjustment. An angle member 96 secured to the flange 43 and having an opening into which the bolt 81 extends, provides purchase for the lower end of the bolt when loads are being transmitted between the flanges 40 and 42 through the bolt. One end of the brace 98 bears against the angle member 96, holding the latter securely in place. At its upper end the bolt 81 extends through a bracket 84 fixed to the draw-bar 31. A spring 85, acting between the bracket 84 and a collar 86 on the bolt, urges the bolt toward latching position. A bell crank lever 87, pivoted at 88 to a bracket 89 on the draw-bar 31, has a fork 90 which is connected to the collar 86 in

such a manner as to transmit lever movement thereto. Attached to the upper end of the lever is an operating cable 91, which extends around a pulley 92 at the forward end of the frame B, and thence rearwardly to an operating rod 93 to which it is attached. The rod 93 has a handle 94 positioned within reach of the operator when seated on the seat 14 of the tractor unit.

During normal grading operations, the primary blade load is transmitted through the ring section 41 to the ring section 33, thence through the draw-bar 31 to the frame B. In backing, the load is taken on the latch bolt 81. The lateral component of the primary load, developed by the angularity of the blade in the form of longitudinal thrust in the blade, is transferred through the brackets 45 to the ring section 41, thence to the ring section 33 and through the stabilizer bar 79 to the frame B. The strut 97 transfers this thrust across the gap 57.

Since the hydraulic units may be operated individually, one end of the blade may be elevated while the other end remains in contact with the earth. By moving the vehicle forwardly or rearwardly while the blade is in this position (the latch bolt 81 having been previously lifted) the angularity of the blade may be changed while the operator remains seated at the controls.

The chief advantage of the invention resides in the greatly increased range of vertical adjustment of the blade that is made possible by the gap 57 in the ring 33.

The blade elevation achieved by my invention is adequate to bring the lower edge of the blade to the height of the front axle. If the circle were continuous, only about a third as much elevation could be obtained.

I claim:

1. In a road machine, a power plant, a frame in the intermediate region of which said power plant is supported, means on which said frame is mounted for transportation over a road, a road working implement, a sub-frame the forward end of which is hitched to the forward region of said frame and the rear region of which comprises a circle on which said implement is supported for pivotal adjustment, means supporting said circle for vertical swinging adjustment around the hitch axis of said sub-frame to a plane above the bottom of said power plant, said circle having in its rear region a gap in which the forward end of said power plant is received when the circle is in said plane.

2. In a road machine, a power plant, a frame in the intermediate region of which said power plant is supported, means on which said frame is mounted for transportation over a road, a road working implement, a sub-frame including a draw-bar the forward end of which is hitched to the forward region of said frame and the rear region of which comprises a circle including a ring section fixed to the rear end of said draw-bar, a ring section oscillatably supported on said fixed ring section, an implement carried by said oscillatable ring section, and means supporting said fixed ring section for vertical swinging adjustment around the hitch axis of said sub-frame to a plane above the bottom of said power plant, said fixed ring section having in its rear region a gap in which the forward end of said power plant is received when the circle is in said plane.

3. In a road machine, a power plant, a frame comprising a pair of rails closely embracing and supporting said power plant, means supporting the forward and rear extremities of said frame for transportation over a road, the forward region of said power plant depending below the intermediate region of said frame, a road working implement, and a sub-frame the forward region of which is hitched to the forward region of said frame and the rear region of which comprises a circle on which said implement is mounted for pivotal adjustment, means supporting said circle for vertical swinging adjustment around the hitch axis to a plane above the bottom of the power plant, said circle having in its rear region a gap in which the depending portion of said power plant is received when the circle is in said plane.

4. A road machine as defined in claim 2, wherein said fixed ring section has a chordal cross strut defining the forward extremity of said gap, the ends of said strut being secured to the ring, the forward region of said sub-frame comprising a draw-bar secured at its rear end to said strut and at its intermediate region to said fixed ring section.

5. A road machine as defined in claim 2, wherein said fixed ring section has a pair of parallel longitudinal struts defining the side extremities of said gap, said struts being secured at their ends to said fixed ring section in chordal relation thereto.

6. A road machine as defined in claim 2, wherein said fixed ring section has a pair of parallel longitudinal struts defining the side extremities of said gap, said struts being secured at their ends to said fixed ring section in chordal relation thereto, and wherein said fixed ring section has a chordal cross strut defining the forward extremity of said gap, the ends of said strut being secured to the ring, the forward region of said sub-frame comprising a draw-bar secured at its rear end to said strut and at its intermediate region to said fixed ring section.

7. In a road machine, a circle structure comprising a rotatably fixed ring section having a vertical flange and an outwardly extending flange at the lower extremity thereof, a substantially semi-circular oscillatable ring section having a horizontal flange supported on said outwardly extending flange and a flange depending from the outer extremity thereof, a pair of depending implement supporting brackets secured to the sides of said depending flange, said brackets being of inverted U-shape in rear elevation, including outer side arms welded to said depending flange, horizontal web portions in bearing engagement with the under surface of said outwardly extending flange, and inner side arms formed with upwardly projecting extensions in bearing association with the inner surface of said vertical flange.

8. In a road grader, a frame, a sub-frame including a circle section having a pair of parallel spaced struts secured in chordal relation to side regions thereof, cross pieces joining intermediate regions of said struts and side regions and terminating at said struts so as to leave an unobstructed space between said struts, hoisting mechanism universally pivoted to said cross pieces and means for transmitting thrust to said circle from the frame.

9. In a road machine, a frame, forward and rear wheels on which said frame is mounted for transportation over a road, a power plant supported in said frame and having a forward region depending below the frame and disposed forwardly of the rear wheels, a road working im-

plement, a circle on which said implement is mounted for pivotal adjustment, said circle having a gap receiving the said depending forward region of the power plant means whereby said circle is supported for vertical adjustment to a plane above the bottom of said power plant, and means for transmitting to said circle the travelling thrust developed by said power plant and rear wheels.

10. A road machine as defined in claim 9, wherein the side regions of said circle which define said gap are in close embracing relationship to the sides of said power plant.

11. In a road machine, supporting traction means, a frame projecting forwardly therefrom, a power plant supported in said frame and having a forward region depending below the frame and disposed forwardly of said traction means, a road working implement, a circle on which said implement is mounted for pivotal adjustment, said circle having a gap receiving said depending forward region of the power plant, the side regions of the circle which define said gap being accommodated in the spaces lying forwardly of said traction means, beneath said frame, and on either side of said power plant and means on which said circle is mounted for vertical adjustment to a plane above the bottom of said power plant.

12. In a road machine, supporting traction means, a frame projecting forwardly therefrom, a power plant supported in said frame and having a forward region depending below the frame and disposed forwardly of said traction means, a road working implement, and a circle on which said implement is mounted for pivotal adjustment, said circle having a gap adapted to receive said depending forward region of the power plant, the side regions of the circle which define said gap being accommodated in the spaces lying forwardly of said traction means, beneath said frame, and on either side of said power plant, including means on which said circle is mounted for vertical adjustment relative to said frame, from a plane below to a plane above the bottom of said power plant.

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