July 21, 1964 C. H. EDDINS 3,141,250

LAND LEVELER

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FIG. 1

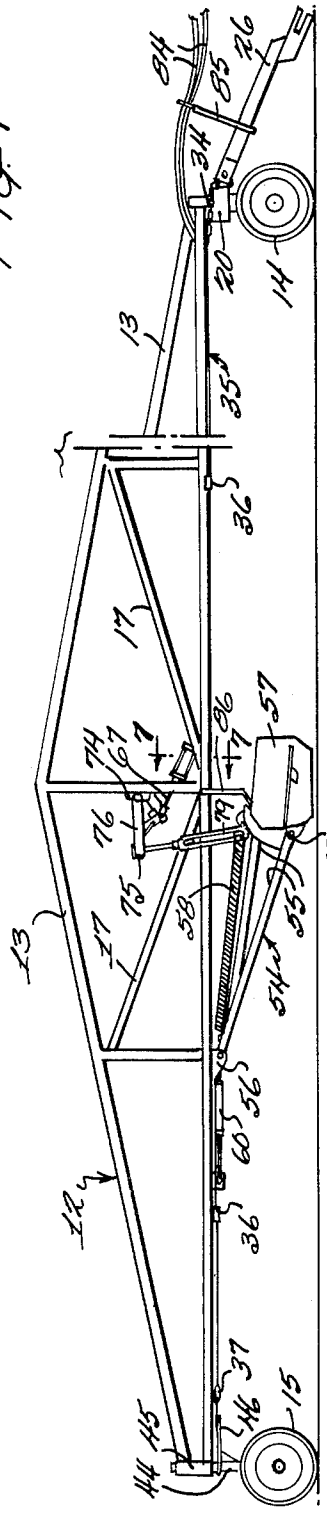
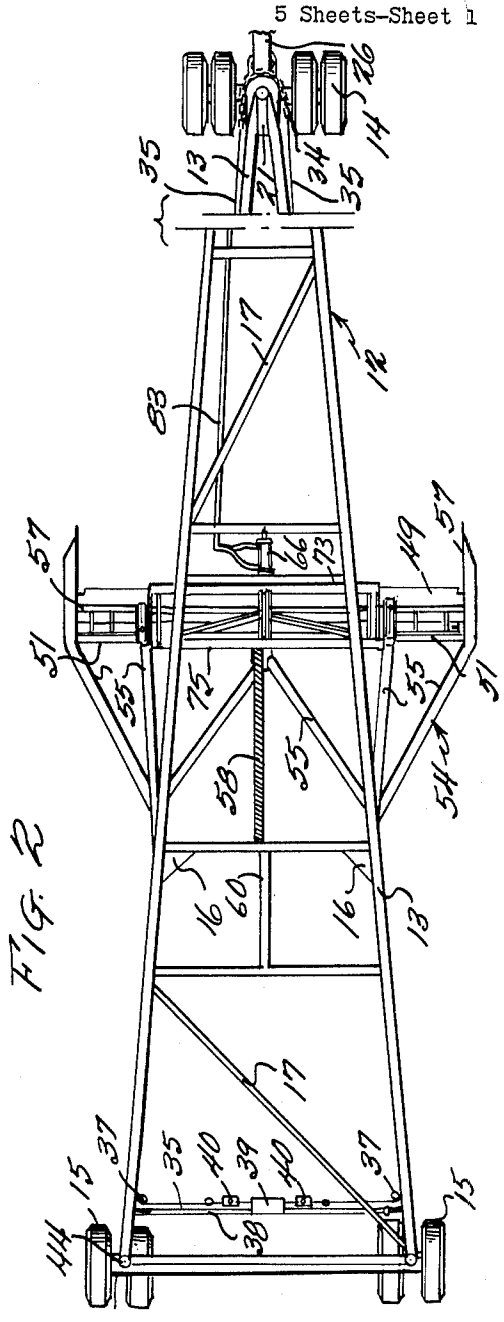


FIG. 2



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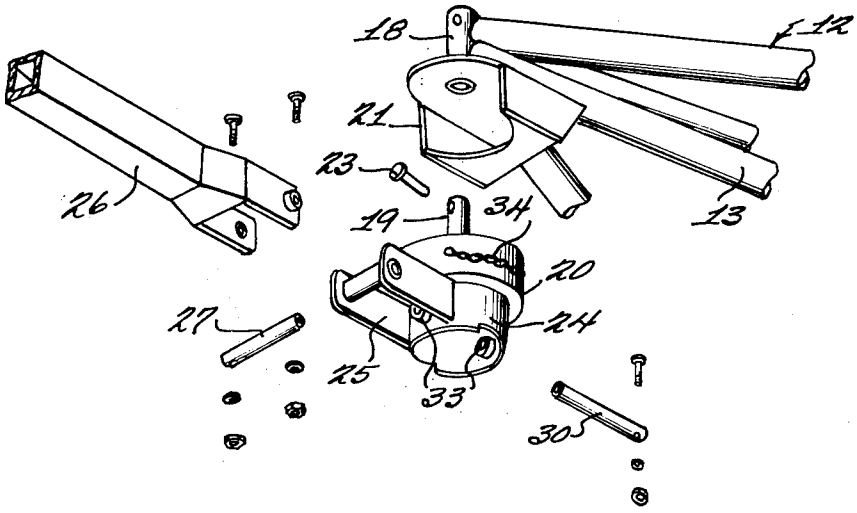
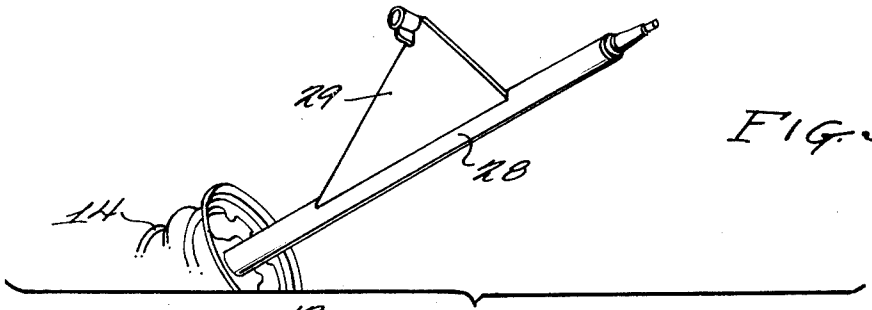


FIG. 3



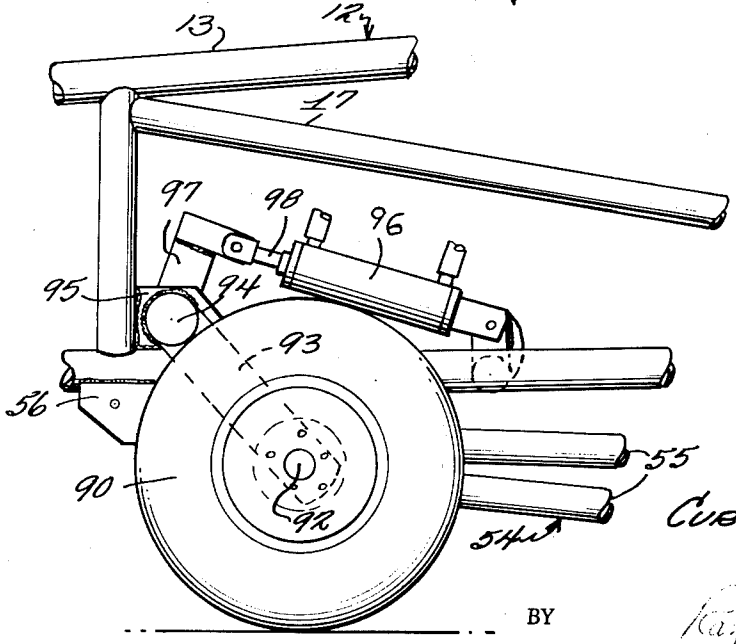


FIG. 9

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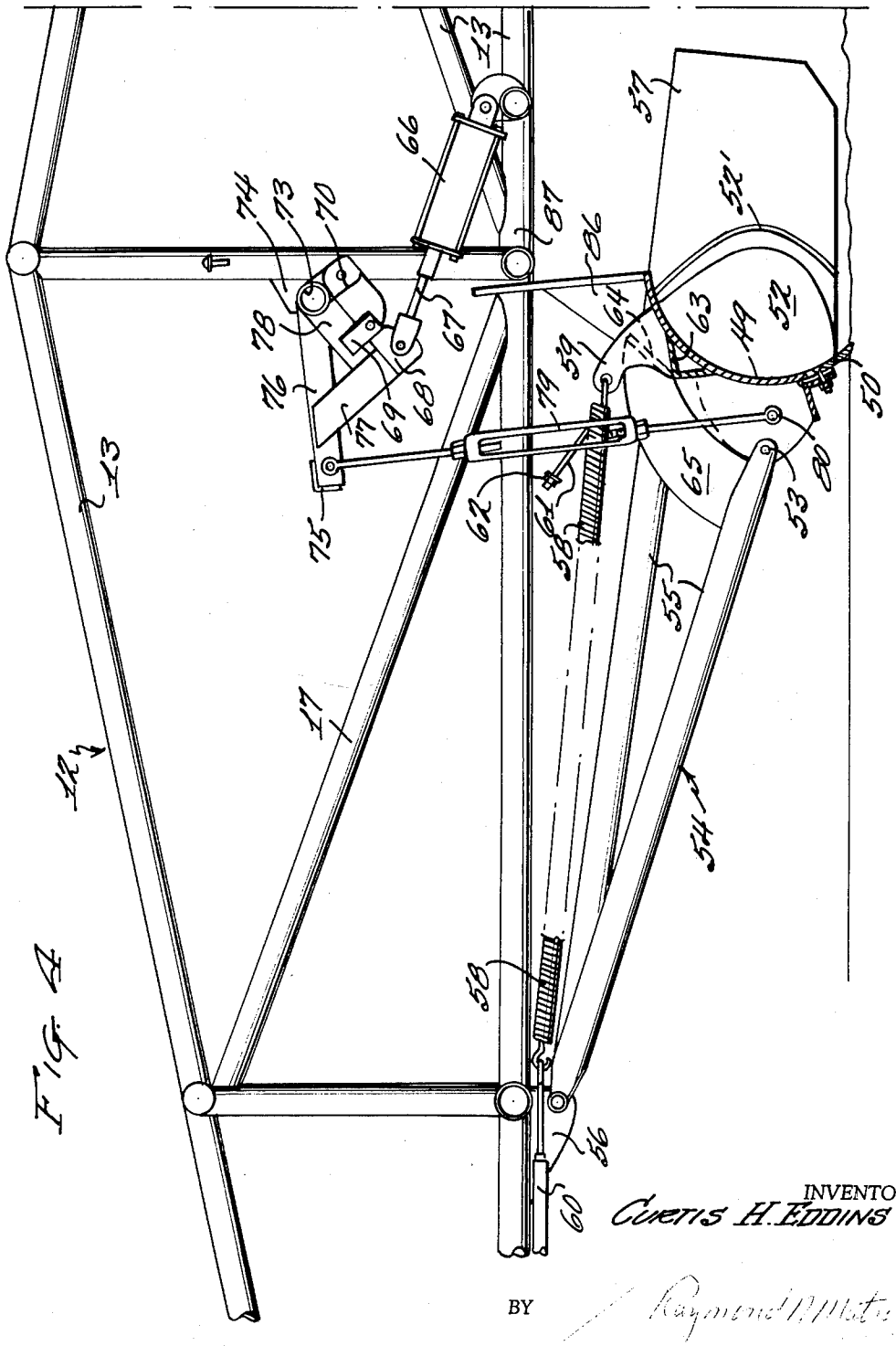


FIG. 4

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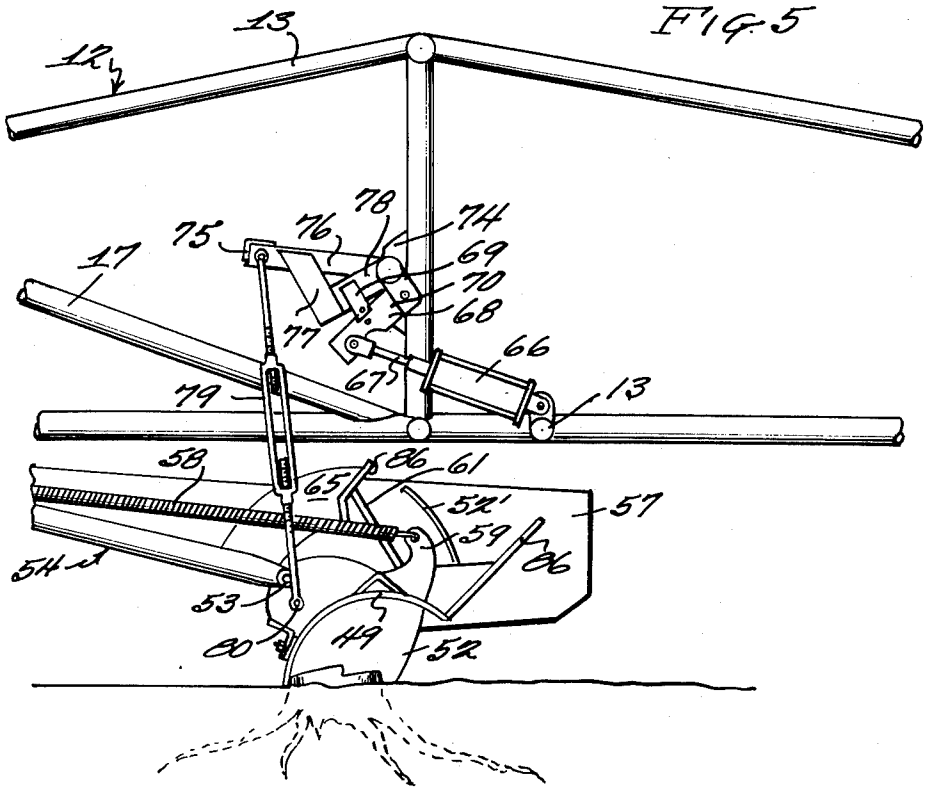
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LAND LEVELER

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FIG. 5



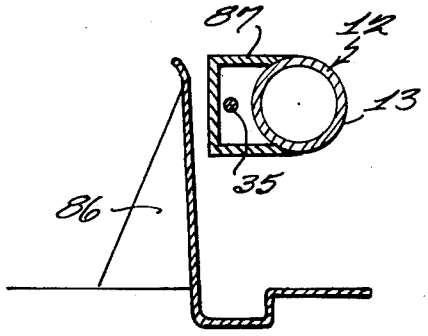
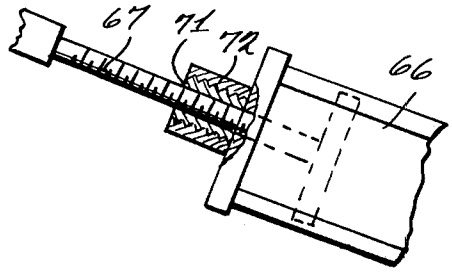


FIG. 7

FIG. 8



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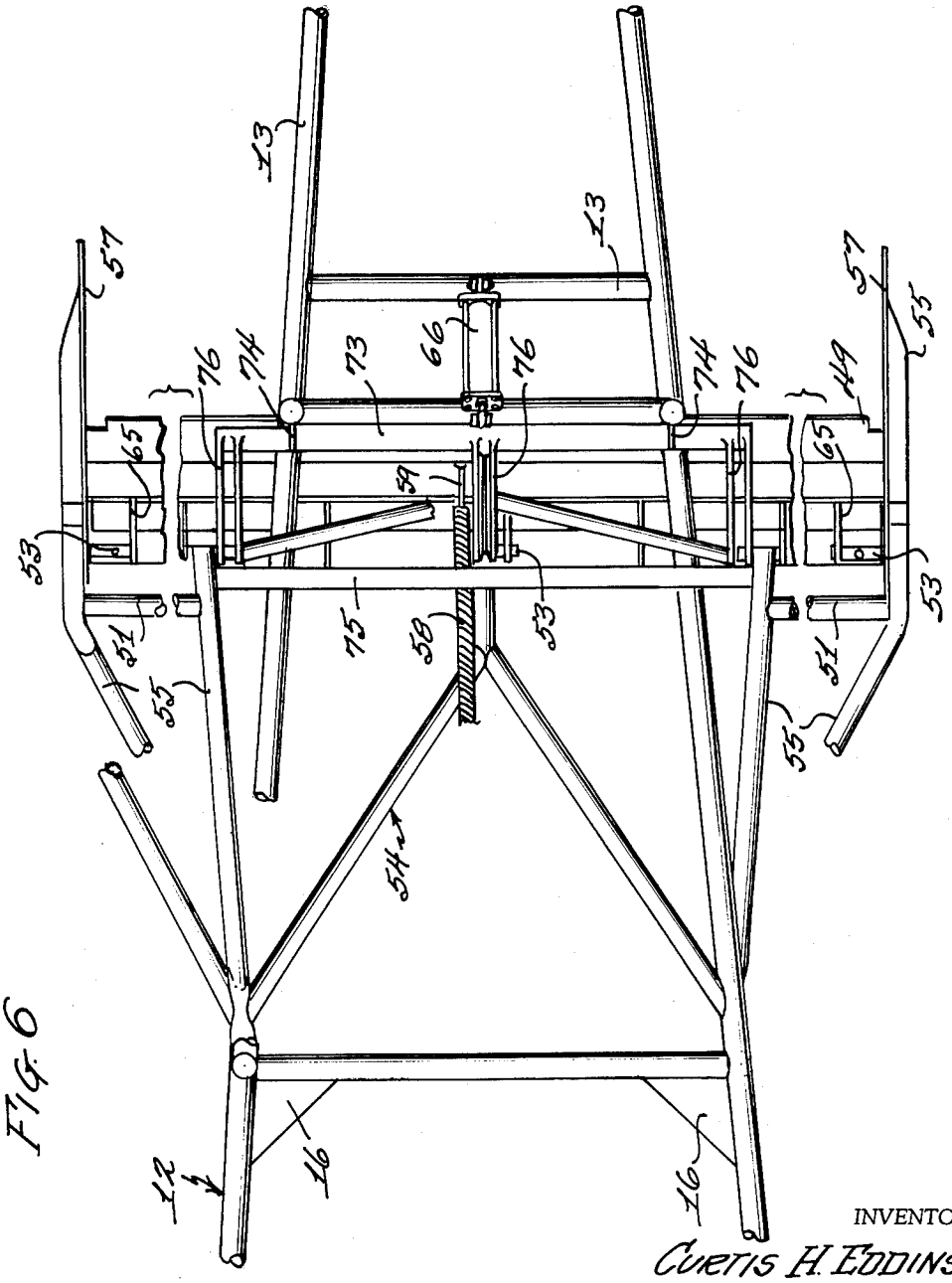


FIG. 6

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United States Patent Office 3,141,250 Patented July 21, 1964

3,141,250

LAND LEVELER

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Filed Oct. 10, 1962, Ser. No. 229,760
14 Claims. (Cl. 37—180)

This invention relates generally to earth working apparatus and more particularly to an improved land leveler for use in land and road grading, etc.

Devices of this general type are known in the art but are usually characterized by one or more objectionable features. Among these are: a short span between the supporting wheels resulting in a corduroy rather than a leveling effect; an inability to make sharp enough turns where the span is adequate; a likelihood of damage to the device or injury to the operator upon the encountering of an obstruction such as a rock or stump by the scraping blade; and a poor design rendering the device difficult of operation and inflexible and impractical in use.

Accordingly, the main object of the present invention is to provide an improved land leveler which will obviate the above and other objectionable features characterizing known devices.

An important object of the present invention is to provide an improved land leveler having a blade which automatically tilts upon engagement with an obstruction so as to avoid damage thereto and eliminate the need for stopping or backing up the device.

A further important object of the present invention is to provide an improved land leveler wherein a spring and hydraulic means cooperate to maintain the leveling blade at a predetermined depth of cut so that the blade will not jump out of the land under heavy load, and are so connected and arranged as to enable the tilting of the blade when a predetermined load has been exceeded such as by encountering an obstruction without the placing of strain upon the hydraulic means or other parts of the device.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown one embodiment of the invention. In this showing:

FIGURE 1 is a side elevational view of the land leveler comprising the present invention;

FIGURE 2 is a top plan view thereof;

FIGURE 3 is an exploded view to an enlarged scale of the front end wheel supporting assembly showing the steering and rocking bolster elements;

FIGURE 4 is a fragmentary vertical longitudinal sectional view to an enlarged scale of the tilting, leveling blade assembly and the front and rear pivot points thereof, parts being shown in elevation;

FIGURE 5 is a similar view to a reduced scale showing the blade in tilted position so as to pass over an obstruction;

FIGURE 6 is a fragmentary top plan view of the land leveler to an enlarged scale, parts being broken away for clarity;

FIGURE 7 is a fragmentary, vertical sectional view to an enlarged scale of one of the blade guides, taken on the line 7—7 of FIGURE 1;

FIGURE 8 is a fragmentary sectional view of the means for adjusting the stroke of the piston; and

FIGURE 9 is a fragmentary side elevational view of an attachment for the land leveler which enables super short turns of the elongated frame.

Referring to the drawings, numeral 12 designates the land leveler comprising the present invention as a whole and while the principles of the invention are readily applicable to a self powered vehicle, the land leveler 12 is herein illustrated as a trailer adapted to be pulled by and receive hydraulic power from a tractor, etc.

The leveler 12 comprises a rigid, elongated, triangular truss, box frame 13 formed of tubular steel members rigidly connected as by welding, and supported by pairs of front and rear dual wheels 14 and 15 respectively. The frame 13 may be forty, fifty or sixty feet in length to provide a maximum of leveling consistent with the practical aspects of leveling in corners and the turning area required. The frame is strongly braced at critical span points as by gussets 16 (FIGURE 2) and diagonal truss braces 17 (FIGURE 1) and with the leveling blade retracted or raised, is provided with suitable ground clearance to enable its ready movement from field to field or on highways.

As seen in FIGURES 1 to 3 inclusive, the frame 13 terminates at its front end in a bearing 18 to which is fixed an arcuate bearing housing 21 and in which a fifth wheel pivot pin 19 and a fifth wheel 20 are respectively journalled and retained by a king pin tie bolt 23 and nut. The fifth wheel 20 has a depending cylindrical portion 24 including a pair of integral forwardly extending ears 25 to which a draft tongue 26 is pivotally secured by a horizontally disposed tongue pin 27 and suitable nuts.

The pairs of dual wheels 14 are mounted on the ends of the front axle 28 by suitable bearings and the axle is mounted for rocking movement independent of the main frame 13 by means of a bolster 29 which is pivotally mounted by an axle pin 30 in bearings 33 of the fifth wheel cylinder 24. Thus the tongue 26 will steer the wheels 14 and the latter may also rock with respect to the frame about the horizontal axis of the axle pin 30.

A chain 34 is welded to the periphery of the fifth wheel 20 and its ends are connected to a pair of steering cables 35 which are supported in a plurality of spaced guides 36 and extend along the frame 13 to a point adjacent the rear dual wheels 15, around guide sheaves 37, and are connected to a tie rod 38 by a bracket 39 and turnbuckles 40. The pairs of dual rear wheels 15 are each mounted on axles 43 having a king pin 44 journalled in a bearing 45 and having forwardly extending steering arms 46 whose ends are connected by the tie rod 38.

The tie rod 38 provides adjustment of the alignment of the dual rear wheels 15 and the turnbuckles 40 provide for the steering coordination of the rear wheels with the front wheels 14 and allow adjustment of the "trailing" characteristics of the leveler 12. The adjusting turnbuckles 40 also permit proper tension to be placed on the steering cables 35 so that the steering linkage is positive. As a result, the trailing characteristics are so excellent as to permit transporting the leveler over highways at near the maximum speed limit permitted. The lateral spacing of the wheels 14 and 15 is such that the wheels 15 do not follow the track of wheels 14 or either wheels in the track of the tractor wheels.

It will be appreciated that with the positive steering of the front and rear wheels thus provided, leveling operations are enhanced by permitting shorter turns and greater maneuverability and this materially reduces backing. This is very important in leveling the corners of fields, turning off roads, passing through gates, and in other tight corners, the rockable front wheels, of course, acting to maintain the main frame and the wheels horizontal and to reduce twist and strain in the main frame 13 when passing over ditches and uneven ground.

An arcuate leveling blade 49 (FIGURES 1, 2, and 4–6) having a replaceable cutting edge 50 bolted thereto extends transversely of the frame 13 at about its midpoint and is pivotally connected at aligned points 53 to the front ends of a W-shaped supporting frame 54 having legs 55 which is pivotally supported at its two rear junc-

tion ends to brackets 56 fixed to the main frame 13. The outer legs of the W-shaped frame are double, connected and braced by members 51, and the outer ones extend forwardly of the pivot points 53 and are fixed to the rigidly supported end wings 57.

The blade 49, being pivoted on the frame 54, also pivots with respect to the end wings 57 and is therefore provided with auxiliary end wings 52 fixed to the ends of the blade so as to retain the dirt when the blade is tilted or pivoted forwardly. Arcuate guards 52' are fixed to the wings 57 just forwardly of the auxiliary wings 52 to prevent dirt from getting between the sets of wings and preventing relative movement therebetween.

The blade 49 is urged counterclockwise about its pivots 53 by a strong tension spring 58 connected at its front end to the blade 49 by a bracket 59 and at its rear end to a transverse frame member by an adjusting turnbuckle 60. This spring effected counterclockwise motion is limited by the engagement of an angle iron 63 fixed to the back of the blade with a plurality of spaced stops or angle irons 64 fixed to upstanding brackets 65 mounted on the frame arms 55.

An important feature of the invention is that the blade 49 can also pivot clockwise or forwardly about its own pivots 53 and does so against spring tension when the cutting edge 50 encounters an obstruction such as a rock or stump during leveling operations. Such forward pivoting is limited by one or more stop bolts 61 having an adjusting nut 62 fixed to the cutting blade angle iron 63 and passing through one of the angle iron stops 64.

In normal operation, the weight of the blade 49, its curvature, its supporting frame 54, the pivots, and the spring 58 position the blade as shown (FIGURE 4) in a proper angle of "attack" so that the blade will not jump out of the ground during heavy load. The depth of cut of the blade is regulated by a double-acting hydraulic cylinder 66 which is connected at its forward end substantially centrally of a transverse main frame member and is connected to the blade 49 by a novel lost motion linkage which permits the blade tripping action to be described without placing any strain on the cylinder 66.

As is best shown in FIGURES 4–6 inclusive and 8, the threaded piston rod 67 is pivotally connected to an apertured support bracket 68 which is pivoted to the main frame as at 70. A rock shaft 73 extends transversely of the frame and is rotatably mounted in a pair of bushing brackets 74 and connected to spaced parallel angle iron lift arms 75 by rigid links 76. A pair of arms 77, 78 are angularly fixed to the links 76 and to each other at an angle of 90° and are supported by the hydraulic cylinder bracket 68, the arm 78 having an integral apertured lock strap 69 so that a bolt may lock the arm 78 to the support bracket 68 to lock out the lost motion connection for bulldozing work. The lift arm 75 is pivotally connected to one or more adjustable turnbuckles 79 which are pivotally connected to the blade 49 at pivot points 80.

It will be apparent that to increase the depth of cut of the blade, the piston 67 must be retracted to permit counterclockwise rocking of the shaft 73. The cylinder 66 derives its power from the hydraulic system of the towing vehicle by means of steel conduits 83 extending to the front of the main frame 13 and flexible conduits 84 which connect with the vehicle system and are supported by a hose rack 85 to prevent their entanglement with the hitch or tongue 26.

It is to be noted that the leveling blade 49 is a "push" type blade as the supporting frame 54 is behind it so that there are no members in front of it which might catch trash or otherwise hinder efficient handling of the soil. Also, the turnbuckle pivot 80 is intentionally located off-center with respect to the hinge points 53 of the leveling blade 49 so that when an obstacle is encountered, the hinge points 53 can ride over the pivots 80 to permit the blade 49 to pitch or trip forward when an obstacle is encountered. At such time, the entire assembly then also pivots about the blade supporting frame hinge points 56 and rides over the obstacle.

In order to minimize strain and excess wear on the various hinge or pivot points, a pair of triangular guides 86 are fixed to the blade 49 and cooperate with channel sections 87 (FIGURE 7) welded to the outside of the side members of the main frame 13 with the web of the channel sections facing outwardly. The guides 86 keep the blade 49 centered when being tripped or raised and prevent strain on the hinge points, and particularly 56.

The force required to pivot or trip the blade 49 is adjustable by means of the turnbuckle 60 of the spring 58, the latter holding the blade tightly against the stops 64 in normal leveling operations. When the blade encounters an obstruction of greater force than that for which the spring 58 is adjusted, the blade will be tripped, that is, pivoted about the pivots 80 which raises the pivots 53 with respect to the pivots 80 while the frame 54 pivots about the brackets 56 (FIGURE 5) so that the blade rides over the obstruction.

This is an important safety feature which prevents sudden stopping of the leveler 12 and resultant damage thereto or serious injury to the operator, many of whom on prior art type levelers, have been thrown in the path of the vehicle under such circumstances. Obviously, this safety feature may be readily mounted on semi-trailer land levelers.

Damage to the leveler is also prevented upon forward tilting or tripping of the blade 49 when an obstruction is encountered because of the novel lost motion connection afforded between the lift arm 75 and the hydraulic cylinder 66. As illustrated in FIGURE 5, the rigid arms 77, 78 of the lift arm are raised above the supporting hydraulic bracket 68 upon rotation of the rock shaft 73 when the blade is tripped so that no strain or shock is placed on any elements of the assembly. The position of the piston rod 67 and cylinder 66 remains static throughout the tripping action and as earlier noted, retraction of the piston rod 67 and lowering of the supporting bracket 68, as limited by the nuts 71, 72, under valve control from the towing vehicle, results in a greater depth of cut, and vice versa.

As a practical matter, the blade 49 is raised or lowered by the hydraulic cylinder 66 only for highway travel and it is apparent that it is impractical to adjust the depth of cut by the several turnbuckles 79 in the field nor could it be accurately done by the operator. Therefore a tamperproof single adjustment (FIGURE 8) is provided by the threaded piston rod 67 whose stroke may be adjusted by the relative positions of an inner exteriorly and interiorly threaded nut 71 and a knurled, concentric and mating interiorly threaded outer nut 72. Shortening the stroke increases the depth of cut as for bull dozing work while lengthening the stroke of the piston rod 67 decreases the depth of cut.

When the blade 49 has passed over the obstruction, it and the supporting frame 54 returns to normal leveling position at the depth of cut for which the cylinder 66 is set (FIGURE 4) under the action of the spring 58, the components of the assembly pivoting about the pivots 80, 53, and 56. It will be appreciated that with the structure described, obstructions are automatically passed over by the blade and the operator does not have to stop, back up, and raise the blade, etc. as has been necessary heretofore. Furthermore, the dirt leveled at the point of the obstruction will be no higher than the highest point of the obstruction so that a high degree of land leveling efficiency is attained even at the position of such obstructions.

There are occasions in many farm areas when it is desirable and necessary for the elongated frame 12 to make a shorter turn than even the described structure is capable of. This is readily effected (FIGURE 9) by

mounting a set of dual wheels **90** on a stub axle **92** journalled in a crank **93** fixed to rotatable shaft **94** arranged transversely of the frame **12** in bearings **95** and with the wheels longitudinally positioned just forwardly of the pivots **56** of the blade supporting frame **54**.

A double acting hydraulic cylinder **96** having fluid conduits connected with the tractor hydraulic system is fixed at one end to a transverse frame member and is connected to a second crank arm **97** of the shaft **94** by its piston rod **98**. It will be apparent that retraction of the piston as shown, will force the short turn wheels **90** into ground engagement to act as a turning pivot for the front wheels **14**, the rear wheels **15** being lifted off the ground. The short turn can then be effected and subsequent extension of the piston rod **98** under control of a lever mounted on the tractor will raise the wheels **90** and lower the rear wheels **15** back onto the ground for normal operation of the leveler **12**.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departure from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A land leveler comprising, in combination, an elongated rigid main frame, front and rear wheels supporting said frame, a blade supporting frame pivoted to said main frame and extending forwardly to a point substantially midway thereof, an upwardly projecting stop mounted on said blade supporting frame, a ground engageable blade arranged transversely of said main frame pivotally mounted on the forward end of said blade supporting frame, and means mounted on said main frame and operably connected with said blade to hold it against said stop in ground leveling position.

2. The combination recited in claim 1 wherein said means is yieldable to permit forward pivoting of said blade upon engagement with an obstruction in the ground.

3. The combination recited in claim 1 wherein said means comprises a spring to permit forward pivoting of said blade upon engagement with an obstruction in the ground.

4. The combination recited in claim 3 wherein means are connected between said spring and said main frame to adjust the tension of said spring to yield at predetermined loads.

5. The combination recited in claim 2, and a guide fixed to said blade adjacent said main frame for cooperation therewith during pivoting of said blade to prevent twisting thereof.

6. The combination recited in claim 2 and means fixed to said blade and engageable with said stop to limit forward pivoting of said blade.

7. The combination recited in claim 1, and stop means mounted on said frame and connected with said blade to limit the depth of cutting engagement of said blade with the ground.

8. The combination recited in claim 7 wherein said stop means includes a lost motion connection permitting forward tilting of said blade upon its engagement with an obstruction.

9. The combination recited in claim 7 wherein said stop means includes separately operable means for adjusting the depth of cut of said blade.

10. The combination recited in claim 9 wherein said operable means comprises at least one turnbuckle and a hydraulic cylinder piston.

11. A land leveler comprising, in combination, an elongated rigid main frame, front and rear wheels supporting said frame, a blade supporting frame pivoted to said main frame and extending forwardly to a point substantially midway thereof, an upwardly projecting stop mounted on said blade supporting frame, a ground engageable blade arranged transversely of said main frame pivotally mounted on the forward end of said blade supporting frame, means mounted on said main frame and operably connected with said blade to hold it against said stop in ground leveling position, stop means mounted on said frame and connected with said blade to limit the depth of cutting engagement of said blade with the ground, said stop means including a lost motion connection permitting forward tilting of said blade upon its engagement with an obstruction, and lock means forming a part of said stop means for rendering said lost motion connection ineffective.

12. A semi-trailer land leveler having one end adapted to be supported on and towed by a vehicle comprising, in combination, an elongated rigid main frame, rear wheels supporting the other end of said frame, a blade supporting frame pivoted to said main frame and extending forwardly to a point intermediate the length thereof, a blade stop mounted on said blade supporting frame, a ground engageable blade arranged transversely of said main frame pivotally mounted on said blade supporting frame, and means mounted on said main frame and operably connected with said blade to hold it against said blade stop in ground leveling position.

13. The combination recited in claim 12 wherein said means is yieldable to permit pivoting of said blade upon engagement with an obstruction in the ground.

14. The combination recited in claim 13, and means fixed to said blade and engageable with said stop to limit forward pivoting of said blade.

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