Oct. 9, 1962 J. CURLETT 3,057,092

VALVE OPERATING UNIT FOR A LEVELING SYSTEM

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5 Sheets-Sheet 1

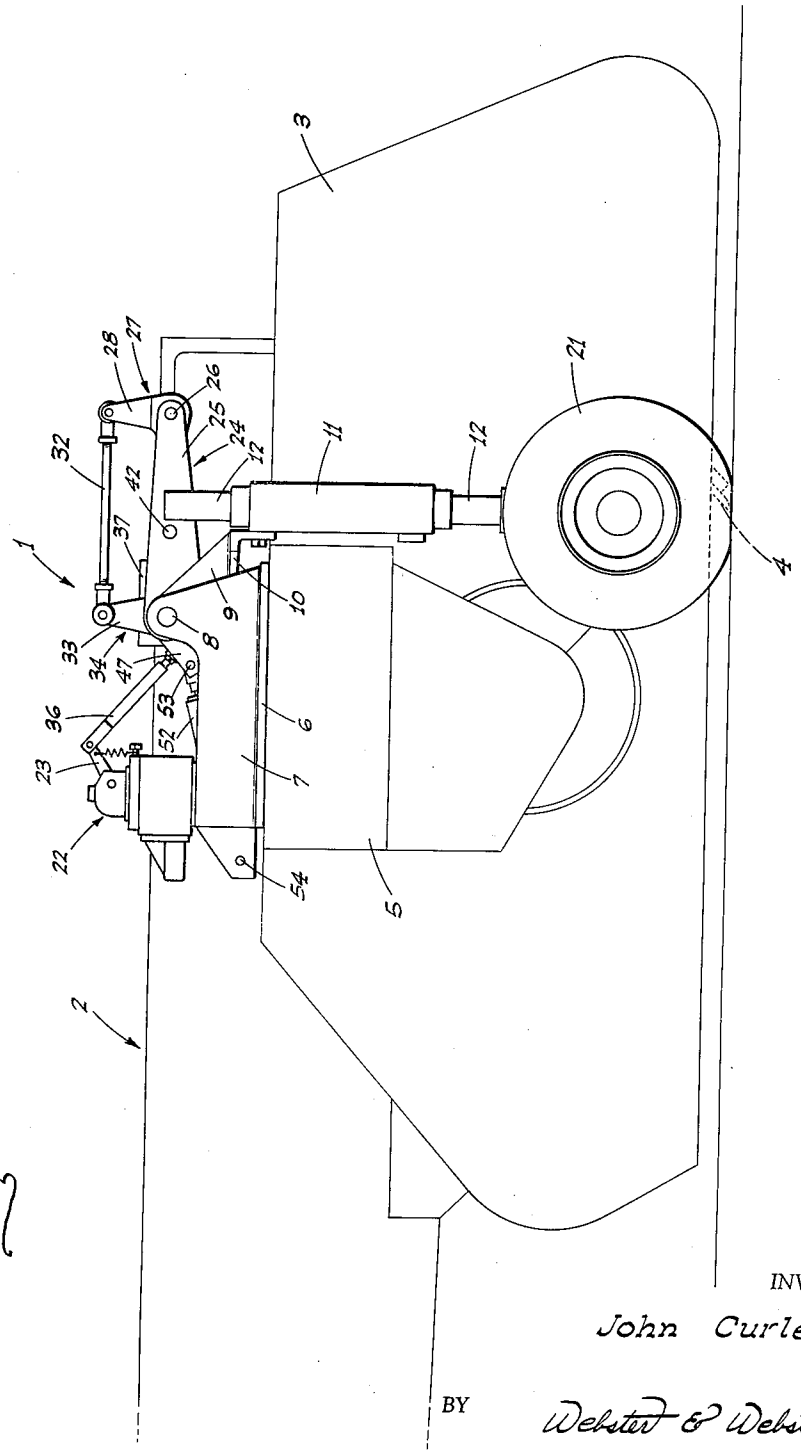


Fig. 1

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Fig. 2

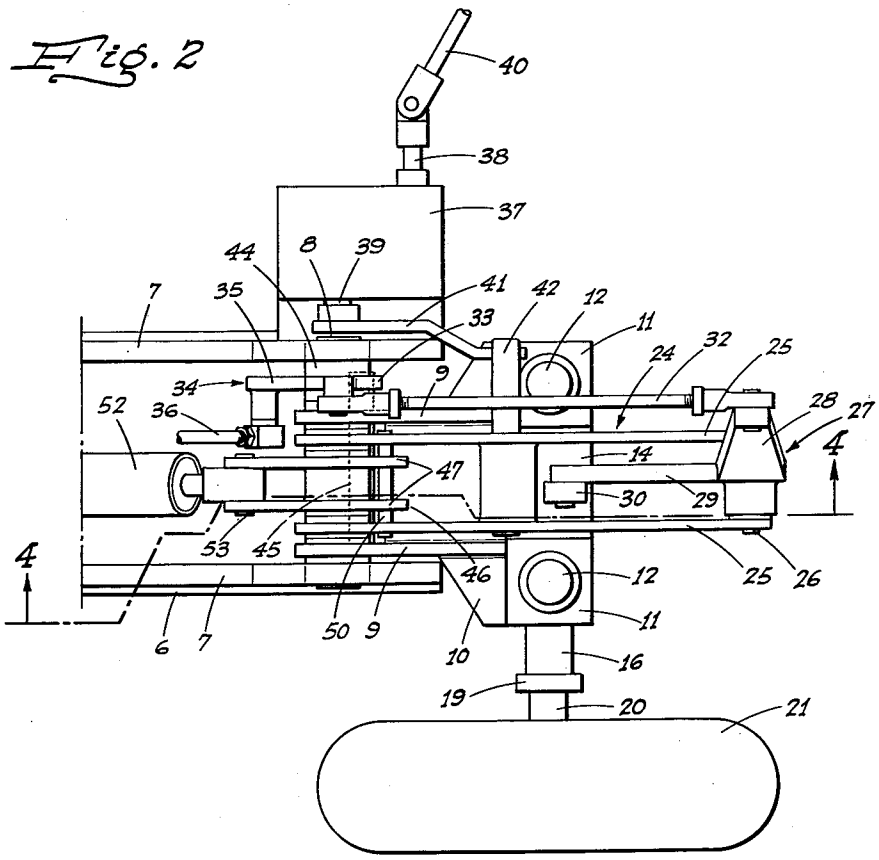
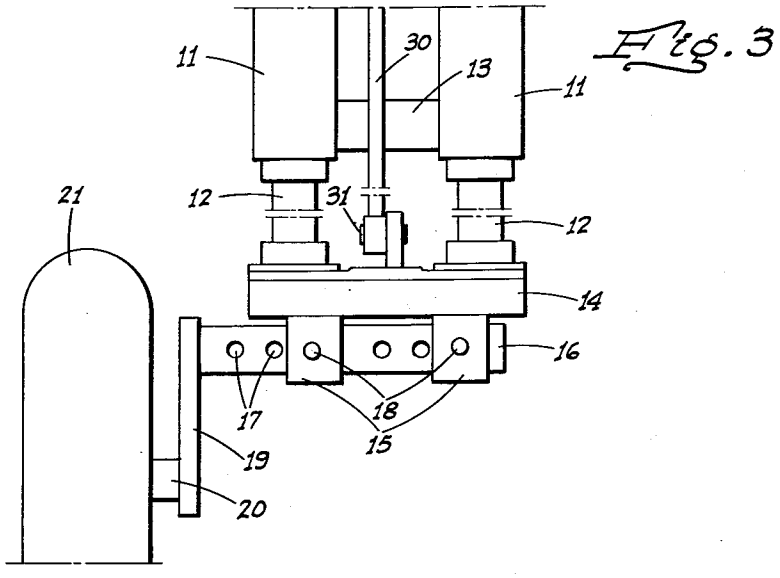


Fig. 3



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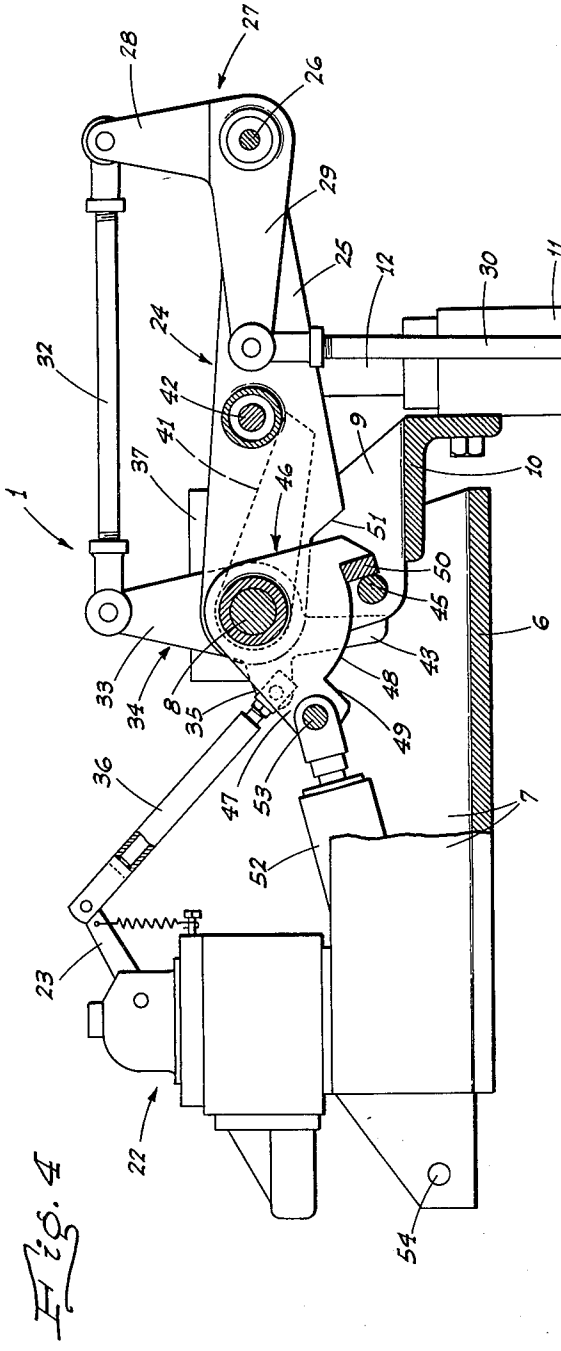


Fig. 4

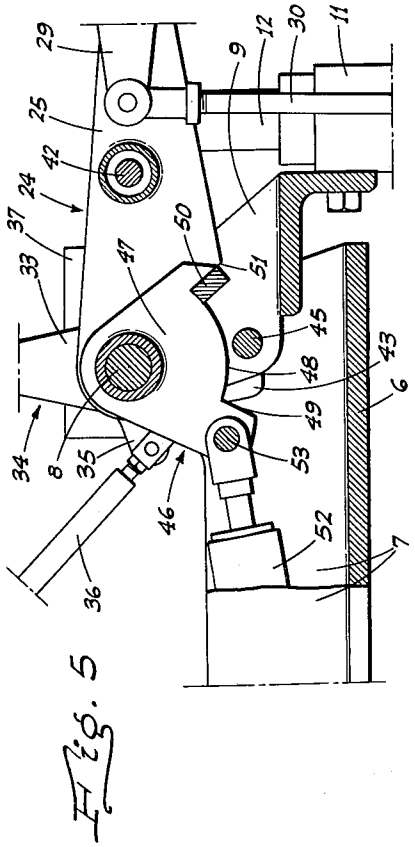


Fig. 5

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Fig. 6

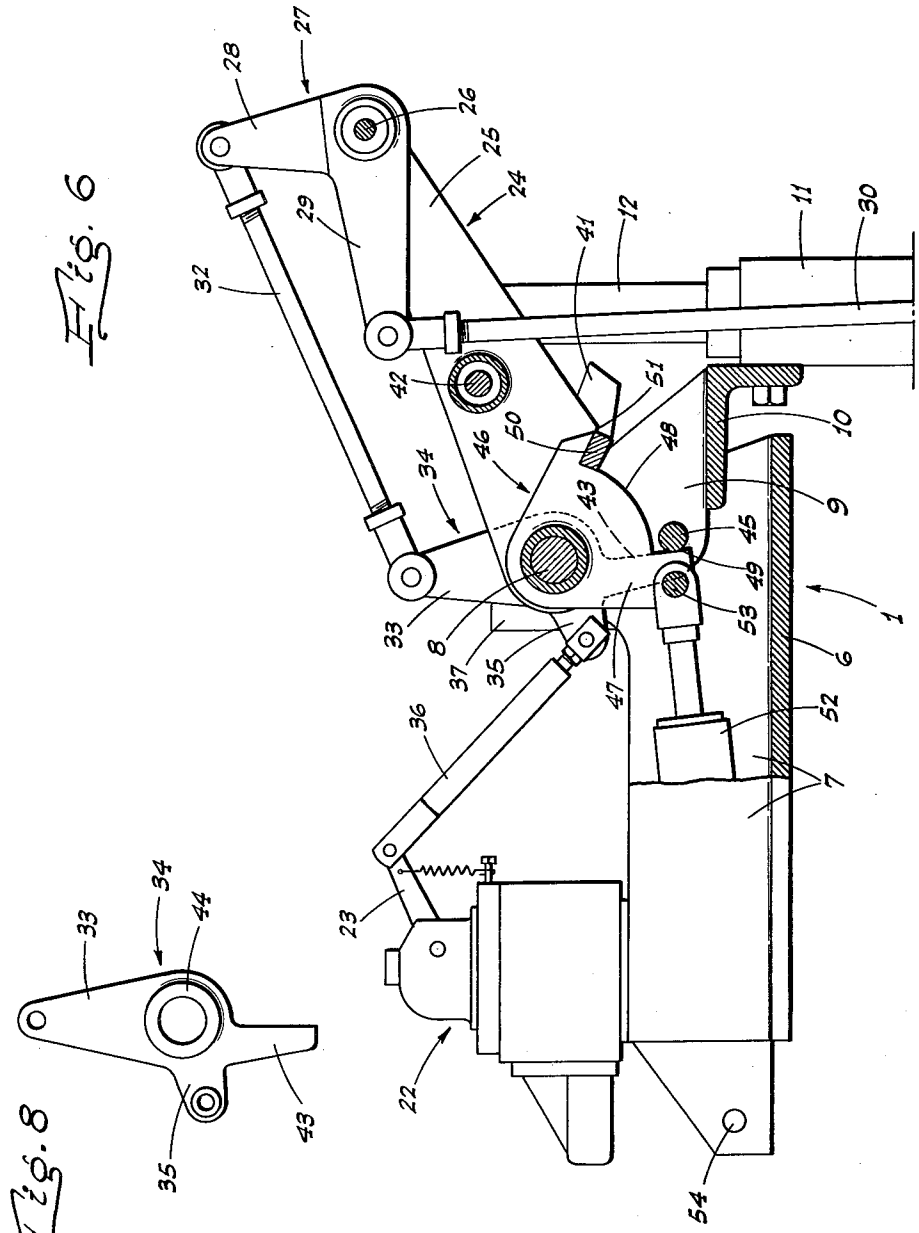


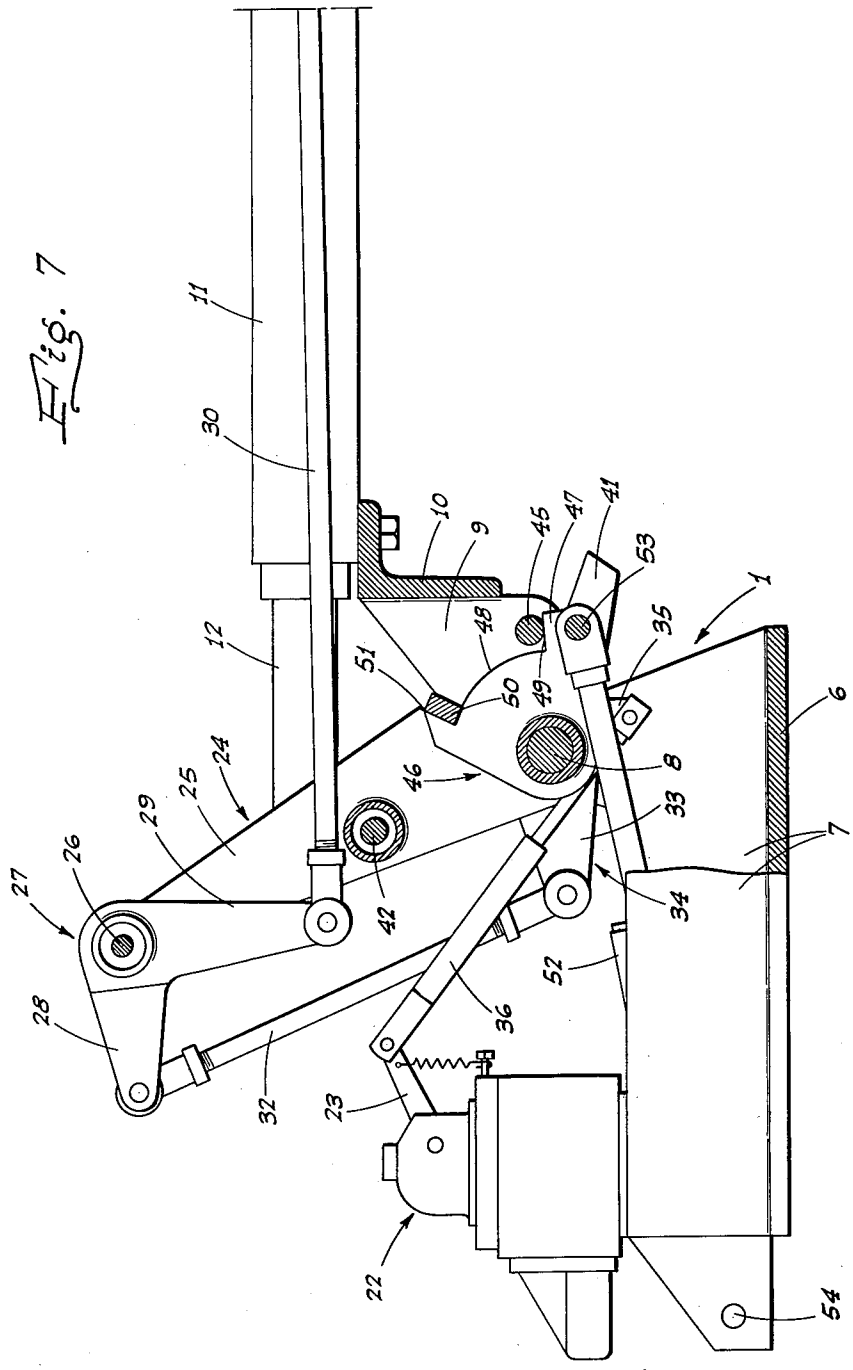
Fig. 8

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Fig. 7



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VALVE OPERATING UNIT FOR A LEVELING SYSTEM

John Curlett, Los Gatos, Calif., assignor to Gurries Manufacturing Co., San Jose, Calif., a corporation of California

Filed Jan. 9, 1961, Ser. No. 81,388
11 Claims. (Cl. 37—180)

This invention relates to road building or land leveling machines of the type having hydraulic means to relatively raise and lower the leveling blade of the machine, and a system for actuating such means according to variations in the level or contour of the ground; the system including a valve interposed in the conduits of the hydraulic means, a vertically movable ground engaging gauge wheel, and means between the wheel and the valve to actuate the latter upon vertical movement of the wheel.

Such a system is shown in the copending application of Messrs. Curlett and Gurries, Serial No. 862,276, filed December 28, 1959; the unit of the present invention being particularly an improvement over what is shown in said copending application.

In said application, the gauge wheel is directly connected to the valve, and the latter must move up and down with any major adjustment in the level of the wheel. This necessitated the use of flexible hoses as part of the hydraulic conduits, for obvious reasons. With this arrangement it was also impossible to raise the wheel to a fully inoperative or out-of-the-way position, as is desirable at times.

A major object of the present invention is to so mount the wheel and connect the same to the valve in such a manner that the body of the valve may be mounted in a fixed position, and is not moved or affected by major vertical adjustments of the wheel.

A further object of the invention is to so mount the wheel that it may be vertically adjusted, and maintained at any desired level, by manually actuated means, in a very simple manner which insures greater accuracy of operation than was previously the case.

Another object of the invention is to provide power operated means, functioning independently of said manually actuated means, for swinging the gauge wheel and its mounting means upwardly to an out-of-the-way position while enabling the wheel to be subsequently returned to its previously adjusted setting without any care having to be taken to see that such setting is attained.

It is also an object of the invention to assure that all of the relatively movable parts which are included in the upwardly swingable structure will be pulled into snug and non-movable relation with each other, so that friction and wear between the parts when not in use is avoided.

An additional object of the invention is to provide a practical, reliable, and durable valve operating unit for a leveling system, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

FIG. 1 is a side elevation of the improved valve operating unit as mounted on a road building or grading machine, and shown in its operating position.

FIG. 2 is a fragmentary enlarged top plan of the unit in its operating position, but detached from the machine.

FIG. 3 is a fragmentary rear end elevation of the lower portion of the unit.

FIG. 4 is a fragmentary sectional elevation of the unit in its operating position, taken on line 4—4 of FIG. 2.

FIGS. 5–7 are similar views showing the various steps in the raising of the ground engaging wheel of the unit to its inoperative out-of-the-way position.

FIG. 8 is a side elevation of the intermediate valve actuating lever of the unit, detached.

Referring now more particularly to the drawings and to the characters of reference marked thereon, the improved valve operating unit, indicated generally at **1**, is adapted to be mounted on a leveling or grading machine, indicated generally at **2**, which includes a bowl **3** having a transverse leveling blade **4** and a bolster **5** projecting laterally out from each side of the bowl. A machine of this general type is shown in United States Patent No. 2,883,777 to R. A. Gurries et al., and in the copending application of myself and R. A. Gurries, Serial No. 862,276, filed December 28, 1959.

The unit **1** comprises a frame **6** mounted on one of the bolsters **5**, and which frame includes upstanding, transversely spaced plates **7** which extend lengthwise of the machine.

A heavy shaft **8** is journaled in and extends between the plates **7**; said shaft turnably supporting normally depending transversely spaced ears **9** which project upwardly from and are rigid with a cross bar **10**.

Rigidly secured to and depending from the cross bar are tubular oil-filled guide sleeves or struts **11** in and through which heavy rods **12** are slidable; the sleeves adjacent their lower end being tied together by another cross bar **13**. The rods **12**, which project below the sleeves, are connected at their lower ends by a cross member **14** from which transversely spaced bearings **15** depend; these bearings being alined in a transverse plane. A shaft **16** is adjustably slidable through the bearings; the shaft being provided with a row of holes **17** and the bearings having cross pins **18** detachably projecting through selected ones of the holes **17** so that the shaft may be held in different positions laterally of the member **14**. An arm **19** is rigid with, and depends from, the outer end of the shaft **16**; said arm at its lower end supporting the spindle **20** of a gauge wheel **21** which vertically yieldably maintains its contact with the ground by reason of the weight of the rods **12** and parts connected thereto.

The wheel mounting parts are arranged so that the vertical axis of the wheel is substantially vertically alined with the blade **4**, as indicated in FIG. 1.

The level-control valve, indicated generally at **22**, and which is controlled by relative vertical movement of the gauge wheel, is preferably of the same type as shown in U.S. Patent No. 2,792,651, as well as in said copending application, Serial No. 862,276. Said valve is supported on the frame plates **7** at their forward end, and includes a pivoted actuating arm **23** projecting rearwardly at an upward angle.

The arm **23** is connected to the relatively vertically movable member **14** of the wheel mounting means by the following structure:

Turnable on the shaft **8** between the ears **9** is a dual arm unit **24** consisting of a pair of transversely spaced, rigidly connected arms **25**; said arms normally projecting rearwardly from the shaft to a point some distance rearwardly of the transverse plane of the sleeve **11**.

A cross pin **26** is supported by arms **25** at their rear ends, on which pin a bellcrank lever **27** is turnable. This bellcrank lever comprises a normally upstanding arm **28** and a normally forwardly projecting arm **29**. A tension

or push-pull link 30 is pivoted to and depends from the arm 29 to a connection with cross member 14 between the rods 12, as shown at 31 in FIG. 3. Another push-pull link 32 connects arm 28 and the normally upstanding arm 33 of another bellcrank lever 34 turnable on shaft 8 between the laterally inner ear 9 and the adjacent frame plate 7, as shown in FIG. 2; the arm 33 being the same length as arm 28.

The bellcrank lever includes a relatively short, forwardly projecting arm 35 which is connected to the valve arm 23 by a telescopic link 36; the valve including spring loading means for arm 23 tending to swing said arm downwardly and maintain the link 36 telescoped.

In operation, with the arm unit 24 in a fixed position, it will be seen that upon relative vertical movement of the gauge wheel 21 and link 30, such movement will be transmitted, through bellcrank 27, link 32, bellcrank 34, and link 36, to turn the valve arm 23 in one direction or the other to actuate the valve 22 from a normally inoperative or neutral position, for the purpose and with the result set forth in the aforementioned Patent 2,883,777 and copending application.

In order to set and hold the wheel 21 at any predetermined normal level relative to the blade 4 of the machine, the following arrangement is provided:

Secured to the laterally inner frame plate 7 is a reduction gear box 37 having a drive shaft 38 projecting from its laterally inner side and an outlet or driven shaft 39 projecting from the opposite side of the box in axial alinement with shaft 8. Rotation of the shaft 38 is manually controlled by means of an extension shaft 40 connected thereto and extending thence laterally of the machine to a point of suitable control thereon.

An arm 41 is secured on and projects rearwardly from shaft 39 and engages in supporting relation under a rigid stop 42 projecting laterally from the arm unit 24 intermediate its ends. The arm 41, which is normally immovable because of the gearing within box 37, thus supports arm unit 24 at a definite level or position on the machine, and by reason of the bellcrank 27 which is mounted on said arm unit the gauge wheel is maintained in a corresponding normal position or height relative to the leveling blade 4.

By raising or lowering the supporting arm 41 of the arm unit 24, said arm unit and parts supported therefrom are either raised by upward movement of said arm 41 or are allowed to drop of their own weight as arm 41 moves down; said arm unit 24 turning about the shaft 8 as an axis.

At the same time the bellcrank 27 maintains substantially the same position relative to a horizontal or vertical plane, due to its parallel-linkage connection with the bellcrank 33. Said bellcrank is capable of movement in a forward direction from a normal position to an extent only sufficient to open the valve 22, by reason of a finger 43 depending from the shaft engaging hub 44 on said bellcrank (see FIG. 8) in position to engage a stop 45, connected to and rigid with the ears 9, upon a relatively small amount of swinging of said bellcrank forwardly from its normal position, as shown for instance in FIG. 4. The gauge wheel 21 is thus positively raised or lowered any desired distance relative to the blade 4 with an accompanying actuation of the control valve 22 of sufficient duration to correspondingly lower or raise the blade of the implement.

In order to raise the wheel 21 and its mounting structure to an inoperative position when the use of the wheel is not desired, the following arrangement is provided:

Turnable on and depending from the shaft 8 between arms 25, and independently thereof, is a dual lift arm unit 46 comprising spaced arms 47, the main portion of the lower edges 48 of which clear the stop 45, as shown. At their forward ends the arms are formed with rearwardly facing shoulders 49 below said edges 48 disposed in the path of and normally ahead of the stop 45 some distance. At their rear ends the arms 47 are provided with a cross bar 50 depending below the edges 48 rearwardly of the stop 45 and normally engaging the same, as shown in FIG. 4. The ends of the cross bar 50 project laterally beyond the arms 47, as shown in FIG. 2, in position to engage forwardly facing shoulders 51 on the arms 25 adjacent their forward ends and below the shaft 8; such engagement only taking place upon a predetermined amount of movement of the arm unit 46 rearwardly of the point of engagement of the cross bar 50 with stop 45, as shown in FIG. 5.

A hydraulic ram 52, to swing the arm unit 46, is pivotally connected at its rear end to the forward end of said unit, preferably at a point adjacent the shoulders 49, as at 53, and at its forward end is pivoted to the frame 6, as at 54.

Upon the fluid flow to the valve 22 being shut off by the operator, and the ram 52 being actuated and extended from its normal retracted position to swing the lift arm unit 46 rearwardly from its normal position, the cross bar 50 leaves the stop 45 and engages the shoulders 51 of the arm unit 24, as shown in FIG. 5. Further extension of the ram and swinging of the arm unit 46 causes the arm unit 24 to be swung upwardly by the cross bar 50, and relative to the wheel guide structure, until the stop shoulders 49 engage the stop 45, as shown in FIG. 6. At the same time, the upper arm 33 of bellcrank 34 is swung forwardly until the finger 43 engages the stop 45, allowing the spring means of the valve structure 22 to correspondingly swing the arm 23 down. This upward swinging of the arm unit 24 has the same action on the wheel mount as if said arm unit had been raised by the lift arm 41 in the manner and with the result previously described. This upward swinging of the arm unit 24 by the lift arm unit 46 is sufficient to cause the cross member 14 of the wheel mount to be drawn closely against the lower end of the guides 11 so that all slack is taken up.

It will be noted that depending on the normal position of the arm unit 24, as determined by the setting of the arm 41, the position of the shoulders 51 relative to the normal position of the cross bar 50 will vary. With a relatively raised position of the arm unit 24, therefore, the shoulders 51 will be further from the cross bar 50 than when said arm unit 24 is relatively lowered. In any case, however, the shoulders 49 are positioned on arm unit 46, relative to cross bar 50, so that said shoulders will not engage stop 45 until arm unit 24 is in a position to cause the cross member 14 of the wheel mount to be drawn up snugly against the lower end of the sleeves 11.

Upon further actuation of the ram 52 and swinging of the arm unit 46, the ears 9, cross bar 10, together with the wheel mount guides 11 and the rods 12, and the wheel 21 supported therefrom, are swung upwardly as a unit and about shaft 8 as an axis. This movement may continue until the sleeves 11 are horizontally disposed as shown in FIG. 7.

With such further movement the valve arm 23 is not pulled down from the position it assumed when the finger 43 of the bellcrank 34 once engaged the stop 45, since with the swinging of said bellcrank 34 through a substantially 90 degree arc along with the arm unit 24 and associated parts from their initial position, the telescopic link becomes extended without pulling on said arm 23.

With such upward swinging and lifting of the wheel 21 and associated parts, the position of the adjustable supporting arm 41 for the arm unit 24 is not affected. Therefore, when the ram 52 is allowed to contract, and the weight of the upwardly swung parts will cause them to then swing down of themselves, the arm unit 24 will be stopped by arm 41 and thus held at its original setting. The ears 9 and parts connected thereto will, however, continue on down until the wheel 21 reengages the ground.

From the foregoing description it will be readily seen that there has been produced such a device as will sub-

stantially fulfill the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. In a leveling system for a road building machine and which system includes a control valve, and a relatively elevated frame adapted to be secured on the machine at one side thereof on which the valve is mounted in a fixed position, said valve including an operating arm projecting rearwardly relative to the machine at an upward angle; an operating unit for the valve comprising a gauge wheel normally engaging the ground rearwardly of the position of the valve, mounting means for the wheel including a normally upwardly projecting rod, a rigid guide sleeve through which the rod is supportedly slidable, a transverse shaft mounted in the frame in a plane between the valve and rod, supporting means for and rigid with the sleeve mounted on the shaft, an arm unit normally projecting rearwardly from and swingably mounted on the shaft independently of said supporting means, manually controlled means to thus swing the arm unit about the shaft, and a connecting mechanism between the wheel mounting means, the arm unit and the valve arm to actuate the latter upon relative vertical movement of the wheel and its mounting means.

2. A unit, as in claim 1, in which said swinging means for the arm unit comprises a stop element rigid with and projecting laterally from the arm unit, a lift arm projecting under the element in supporting relation, said unit tending to swing downwardly about the shaft by gravity action, means supporting the arm for rotation axially of the shaft, and manually actuated means to rotate the arm.

3. A unit, as in claim 1, in which said sleeve supporting means is turnable on the shaft, and means separate from the arm unit swinging means to swing the sleeve supporting means, together with the gauge wheel and its mounting means, and the arm unit upwardly about the shaft to a substantially horizontal position of the sleeve.

4. A structure, as in claim 3, said separate means comprising a second arm unit turnable on and depending from the shaft independently of the first named arm unit, power means to swing said second arm unit rearwardly from a normal inactive position, cooperating elements on the arm units arranged to engage each other to swing the first named arm unit upwardly to also lift the wheel supporting means upon swinging of the second arm unit from said normal position, and other cooperating elements on the second arm unit and the sleeve supporting means to swing the latter upwardly about the shaft, along with said first arm unit, upon a further swinging of said second arm unit.

5. A unit, as in claim 1, with means included with the wheel mounting means for adjusting the wheel laterally relative to the rod.

6. A unit, as in claim 1, in which said mechanism comprises a bellcrank pivoted on the arm unit rearwardly of the rod, said bellcrank comprising a normally horizontal forwardly projecting arm and a normally vertical arm, a depending link connecting the horizontal arm and the wheel mounting means, a second bellcrank turnably mounted on the shaft and comprising a normally vertical arm and a relatively short forwardly projecting arm, the vertical arms of the bellcranks being the same length, a link connecting said vertical arms, another link connecting said short bellcrank arm and the valve arm to actuate the latter upon swing movement of said second bellcrank, and stop means between the second bellcrank and the sleeve supporting means preventing other than a relatively small amount of forward rotation of said second bellcrank from the normal position thereof.

7. In a leveling system for a road building machine and which machine includes a control valve having a body, and a relatively elevated frame adapted to be secured on the machine at one side thereof, and on which the valve body is mounted in a fixed position, said valve including an operating arm projecting rearwardly relative to the machine at an upward angle; an operating unit for the valve comprising a gauge wheel normally engaging the ground rearwardly of the position of the valve, mounting means for the wheel including a normally upwardly projecting rod, a rigid guide sleeve through which the rod is supportedly slidable, means mounting the guide sleeve in connection with the frame in a normally depending position, a mechanism between the wheel mounting means and the valve arm to actuate the latter upon relative vertical movement of the wheel due to ground contact, manually controlled means included in part with said mechanism to move the wheel and mounting means vertically relative to the sleeve, a transverse shaft mounted on the frame, an element rigid with the sleeve turnable on the shaft, and other means to swing the sleeve and element, together with the rod and wheel, about the shaft to effect a substantially horizontal position of the sleeve without the valve arm moving further than a valve opening position thereof in one direction.

8. In a leveling system for a road building machine and which machine includes a control valve having a body, and a relatively elevated frame adapted to be secured on the machine at one side thereof, and on which the valve body is mounted in a fixed position, said valve including an operating arm projecting rearwardly relative to the machine at an upward angle; an operating unit for the valve comprising a gauge wheel normally engaging the ground rearwardly of the position of the valve, mounting means for the wheel including a normally upwardly projecting rod, a rigid guide sleeve through which the rod is supportedly slidable, means mounting the guide sleeve in connection with the frame in a normally depending position, a mechanism between the wheel mounting means and the valve arm to actuate the latter upon relative vertical movement of the wheel due to ground contact, manually controlled means included in part with said mechanism to move the wheel and mounting means vertically relative to the sleeve, a transverse shaft mounted on the frame, an element rigid with the sleeve turnable on the shaft, the mounting means for the wheel including a cross bar rigid with the rod below and normally clear of the lower end of the sleeve, and power operated means to first swing the arm unit upwardly about the shaft sufficiently to cause the lower end of the cross bar to engage the lower end of the sleeve and to then swing said arm unit and the wheel mounting means upwardly together to a substantially horizontal position of the sleeve.

9. A structure, as in claim 6, in which said other link is of normally contracted telescopic form.

10. In a leveling system for a road building machine and which system includes a control valve having an operating arm projecting therefrom and movable in opposite directions to open the valve from a predetermined neutral position, and a mounting frame for the valve adapted to be mounted on the machine at one side thereof; an operating unit for said arm comprising a ground engaging gauge wheel, a normally substantially horizontal arm unit, means pivoting the unit at one end on the frame transversely of the machine, means including a normally vertical sleeve supporting the wheel from the free end of the arm unit for vertical movement relative thereto and independent swinging movement therewith about said pivot means, a mechanism included in part with the wheel supporting means, connecting the

arm unit and the valve arm to move the latter upon vertical movement of the wheel relative to the arm unit and when the latter is in said normal position, and power means to swing the arm unit upwardly to dispose the sleeve in a substantially horizontal position; said mechanism being arranged to function without moving the valve arm further than a valve opening position thereof in one direction.

11. A structure, as in claim 10, in which said mechanism includes a normally contracted telescopic link connected to and extending between said valve arm and the arm unit and becoming extended as the arm unit is swung upwardly.

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