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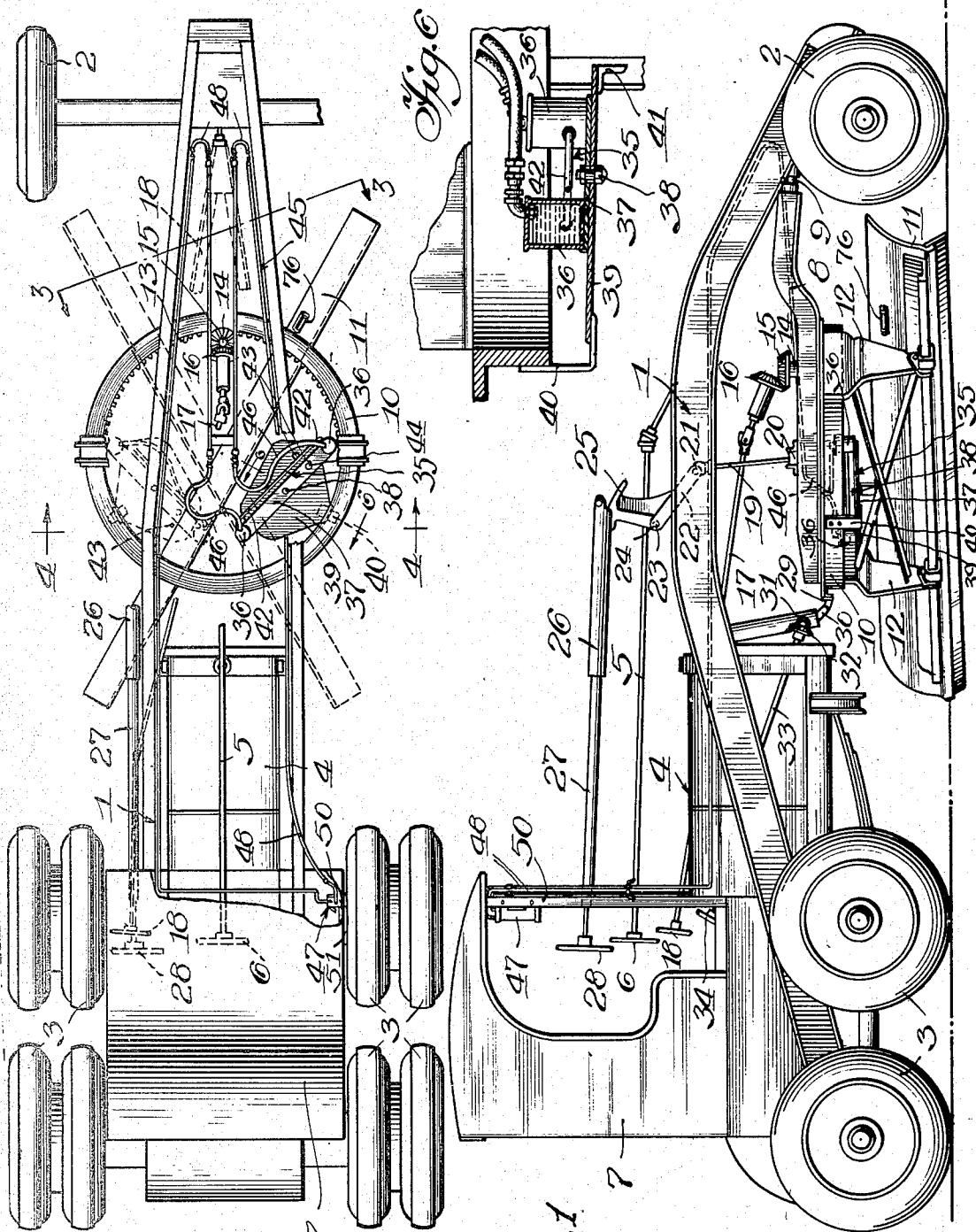
F. D. WILSON

2,029,455

GRADE FINDING MECHANISM

Filed July 31, 1933

3 Sheets-Sheet 1



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GRADE FINDING MECHANISM

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3 Sheets-Sheet 2

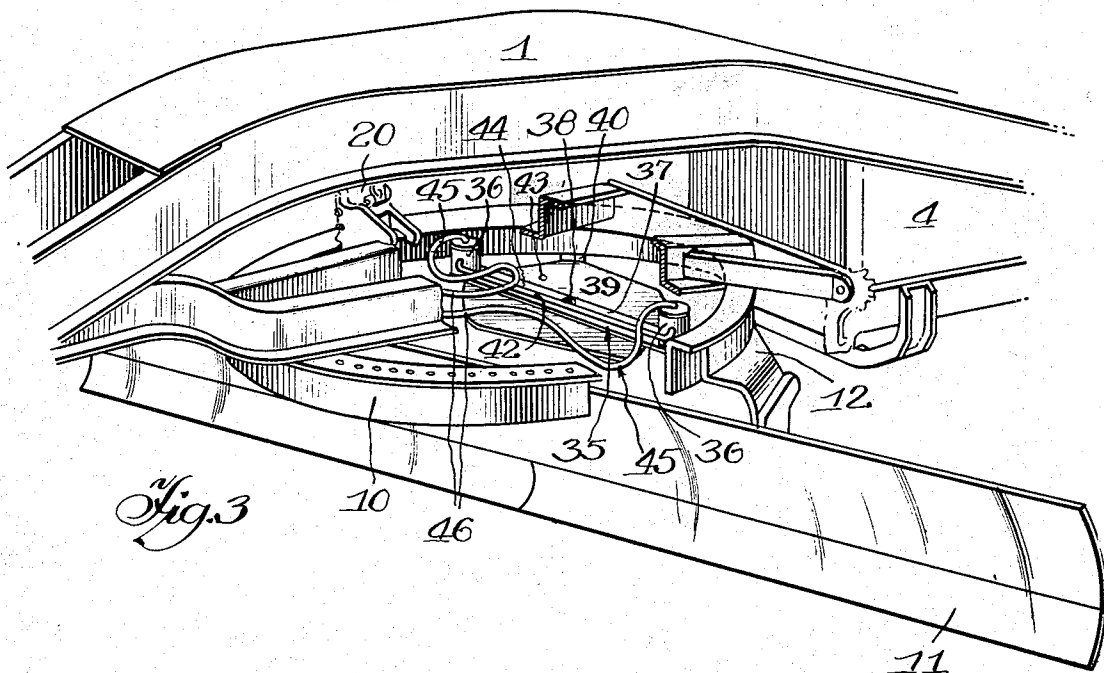


Fig. 7

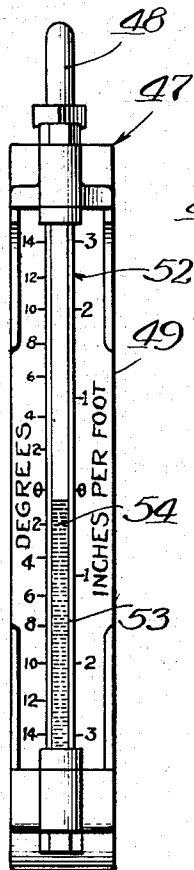


Fig. 8

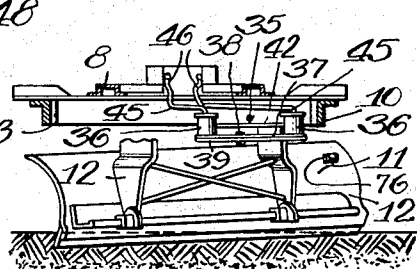
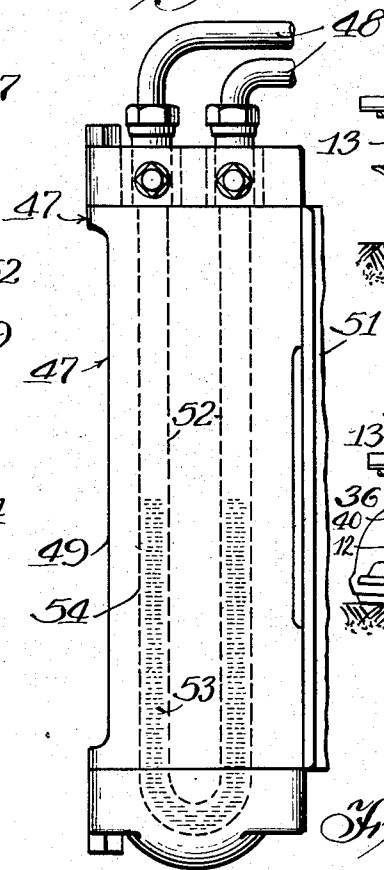


Fig. 4

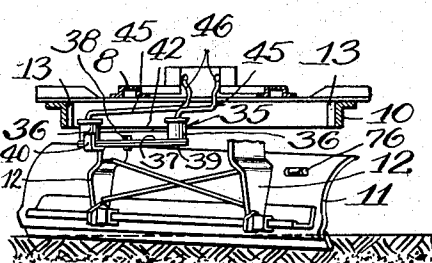


Fig. 5

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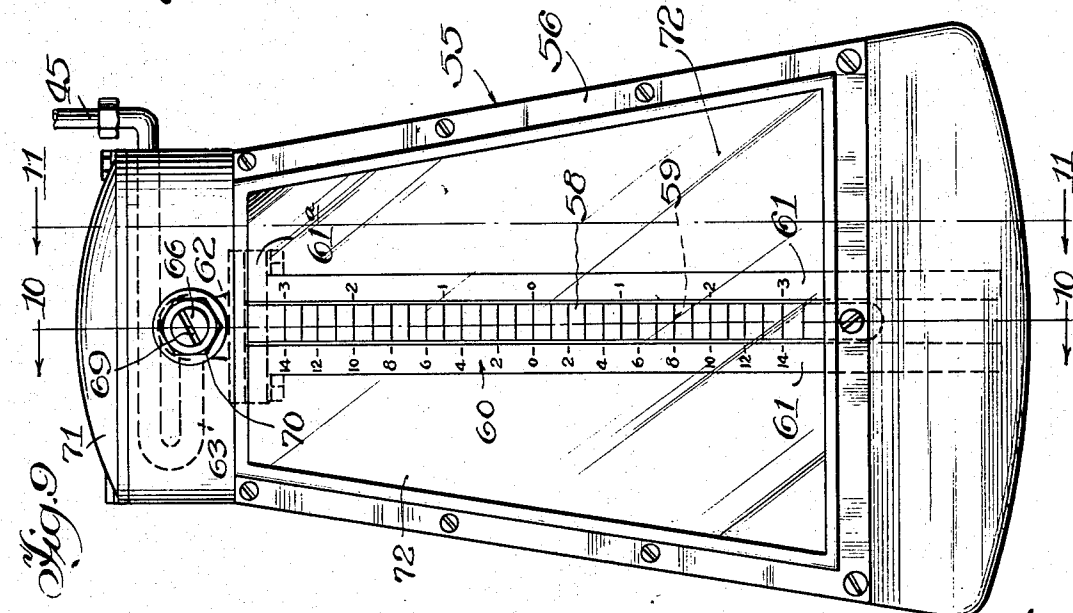
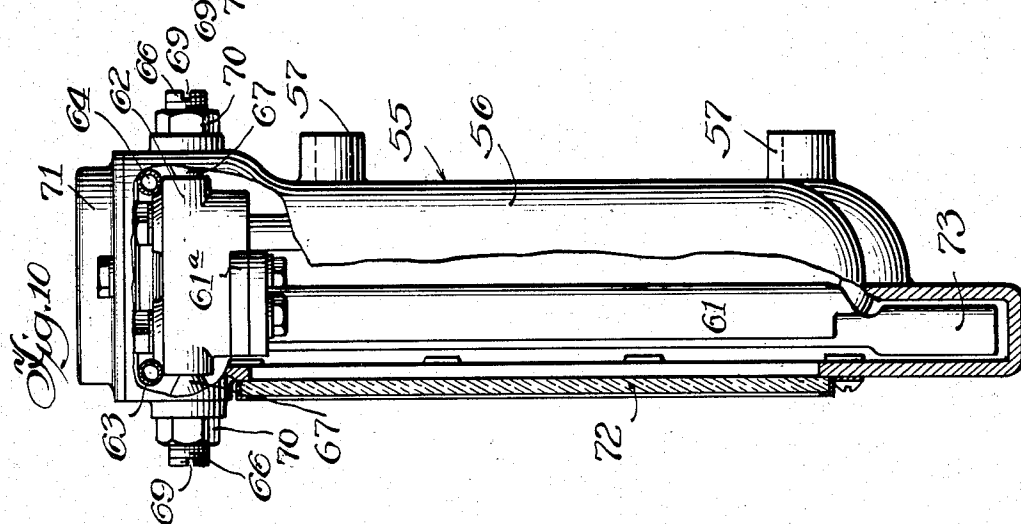
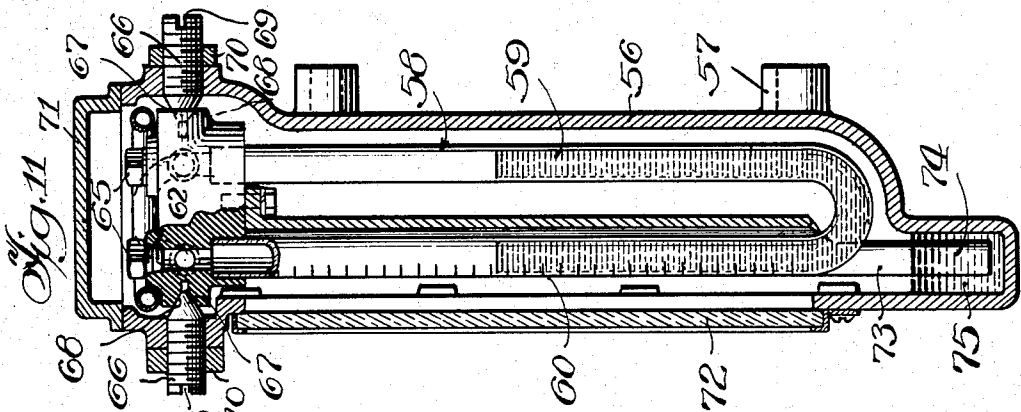
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GRADE FINDING MECHANISM

Filed July 31, 1933

3 Sheets-Sheet 3



Witness:
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UNITED STATES PATENT OFFICE

2,029,455

GRADE FINDING MECHANISM

Fred D. Wilson, Harvey, Ill., assignor to
Western-Austin Company

Application July 31, 1933, Serial No. 682,992

22 Claims. (Cl. 37—156)

The present invention relates to grade finding mechanisms, and more in particular to such a construction for use on road machines, including trucks and other vehicles, upon which there is provided a scraper or maintainer blade or other road working tool adapted to be angularly adjusted with respect to a horizontal plane, or to the plane of the road bed or surface upon which the tool is operating.

10 In the operation of a road machine or other vehicle provided with a scraper blade or road working tool, difficulty has always been experienced in adjusting the blade or tool at the proper and desired angle and maintaining it at such angle. This difficulty is readily apparent
15 when one considers that in surfacing and/or maintaining a road bed, the blade must not only form the surface of the highway, but must shape the contour as well, and frequently mix the material forming the surface.

20 It is well known that highways are generally and should be slightly higher at the center than at the sides or edges in order that they may drain properly. Frequently this amounts to but two inches in a thirty foot highway; i. e. the road is but two inches higher in the middle than it is at the edges. It is practically impossible with the prior constructions for an operator positioned in his cab or at his station, to accurately determine
25 whether he has adjusted the blade at the proper angle and has maintained the blade at such adjustment.

30 When such a blade is mounted on a road machine utilizing the chassis of a truck or vehicle, the operator is practically helpless to control the blade from his position in the cab which normally is in front of the blade.

35 Another use for such a road machine is the cutting of a slope on the inside or outside of a ditch. In many States the specifications are very exacting and the engineers require that such slope be at a specified angle. It should be quite apparent that were such requirement, for instance, for an angle of sixty degrees (60°), it would be almost impossible with the equipment now on the
40 market, for an operator to throw one of these large blades up or down to one side and be certain that he is cutting the slope at exactly an angle of sixty degrees rather than at an angle of fifty five degrees or sixty five degrees. This is particularly true when it is understood that at the time such blade is supposed to be cutting the angle of the slope accurately, the machine or truck is running on an uneven surface which
45 may be many degrees off level.

The present invention comprehends an accurate and efficient means and method of determining and maintaining the blade or tool at a desired angle.

5 Among the objects of the present invention is to provide a grade finding mechanism to enable an operator of a road machine to determine whether the blade is operating level or at a desired predetermined angle.

10 A further object is to provide an indicating device mounted in a position where it is clearly visible to the operator, for disclosing or indicating the angle or position at which the blade or tool of a road machine is operating, regardless of whether such blade or tool is visible to him.

15 Another object of the present invention is the provision of a novel indicating means for accurately registering the inclination at which a blade or tool of a road machine is operating in all of its various positions of adjustment, whether
20 it be transverse or lateral of the line of travel of the machine or at any angle with respect to a horizontal plane or the plane of the road bed or surface upon which the blade or tool is operating.

25 Still another object of the invention is the provision of a novel means for indicating the angle at which a blade or other tool should and does operate so that the operator may readily adjust the blade or tool and maintain the same
30 at the proper operating level or angle.

35 Yet another object of the invention is to provide a novel construction of liquid gauge or indicating device adapted to be positioned in the operator's cab or station and connected with the blade or tool to indicate the angle at which the blade is operating. This gauge or indicating device is disclosed as provided with graduations to indicate the degrees at which the blade or tool is operating and the inches per foot inclination
40 of the blade or tool.

45 Still another object is to provide a novel liquid gauge or indicating device adapted to accurately indicate the angle or operating position of the blade regardless of the position or angle of the machine upon which it is mounted. In the present embodiment, the invention contemplates a tube mounted adjacent its upper end for pivotal movement whereby the tube will at all times seek a vertical plane. Additional means are provided
50 for stabilizing or dampening the swinging movement of this tube so as to maintain the same in as nearly as possible a vertical plane or position.

A still further object is to provide a grade finding mechanism provided with a level or U- 55

tube arrangement on the blade or operating tool of a road machine or vehicle, connected with an indicating device at the operator's station or in the cab where it is clearly visible to the operator, for indicating to him the level or angle at which the blade or tool is operating. The communication of the liquid level in the U-tube to the indicating device at all times apprises the operator of the precise angle of the blade or tool in its cutting, leveling or working operation, and to what extent or angle it need be shifted.

Further objects are to provide a construction of maximum simplicity, efficiency, and ease of assembly, operation and maintenance, and such further objects, advantages, and capabilities as will later more fully appear and as are inherently possessed thereby. It is to be understood that the disclosed preferred embodiment is susceptible of modification and change and comprehends other details and constructions without departing from the spirit of the invention.

In the drawings:

Fig. 1 is a view in side elevation of a road machine equipped with a novel grade finding mechanism;

Fig. 2 is a top plan view of the road machine with parts broken away;

Fig. 3 is a fragmentary view in vertical cross section taken in a plane represented by the line 3—3 of Fig. 2, with parts broken away to more clearly show the novel invention;

Fig. 4 is a view in vertical cross section taken in a plane represented by the line 4—4 of Fig. 2;

Fig. 5 is a similar view taken in the same plane, but with the blade shifted to the dotted line position in Fig. 2;

Fig. 6 is a fragmentary view taken on the irregular line 6—6 of Fig. 2;

Fig. 7 is a view in front elevation of the novel indicating means or gauge;

Fig. 8 is a view in side elevation thereof;

Fig. 9 is a view in front elevation of an alternate construction of indicating means or gauge;

Fig. 10 is a view in vertical cross section taken in a plane represented by the line 10—10 of Fig. 9;

Fig. 11 is a view in vertical cross section taken in a plane represented by the line 11—11 of Fig. 9, but disclosing an alternate means for dampening or stabilizing the swinging movement of the indicating means or gauge.

Referring more particularly to the drawings, the embodiment selected to illustrate the invention consists of a road machine having a frame 1 which is arched intermediate its ends and provided at the front end with steering wheels 2 and at its rear end with traction or drive wheels 3. These drive wheels are mounted on and driven by a motor or power plant 4. The front wheels 2 are operated by a steering mechanism including a steering shaft 5 and steering wheel 6 operable from the operator's station or cab 7.

Mounted below the frame 1 is a triangularly shaped frame 8, the forward end 9 of which floats on a vertical pivot pin or universal connection (not shown). This frame carries on its under side, a blade supporting wheel or circle 10 upon which is mounted a grader blade or surfacing tool 11 by means of arms or bracket members 12. This blade supporting wheel 10 is rotatably mounted on the frame 8, and for this purpose, the inner periphery of the wheel or circle 10 is provided with an arcuate rack having teeth 13 in mesh with a spur gear (not shown)

mounted on the shaft 14. This shaft 14 has at its upper end a bevel gear 15 meshing with a bevel gear 16 mounted on and rotated by an operating shaft 17. A hand wheel 18 is adapted to rotate the shaft 17 which in turn rotates the blade carrying circle 10 through the medium of the bevel gears, spur gear and rack.

A pair of arms or rods 19, there being one on each side of the frame 8, are provided for shifting the position of this frame and the blade or tool carried thereby. Each of these arms or rods is pivotally mounted at 20 upon the frame 8, and at its upper end is pivotally connected at 21 to an arm 22 which in turn is mounted at 23 upon a shaft 24 extending across the main frame 1.

This shaft is connected to bell cranks 25, one on each side of the shaft, and these bell cranks are each in turn connected to a tubular casting 26 internally threaded to receive a threaded shaft 27 operated by a hand wheel 28. Any rotation of the hand wheel will necessarily operate the shaft 27 and due to its threaded connection with the casting 26, will retract or push forward the bell crank 25 so as to raise or lower the arms 22 and the frame 8. By reason of there being two of these operating mechanisms, one on each side of the machine, either or both sides of the triangular frame 8 may be raised or lowered as desired whereby to angularly adjust the blade with respect to a horizontal plane or the plane of the road or surface being operated upon.

In order to provide lateral adjustment of the frame 8 and its blade 11, transverse of the line of travel of the machine or the longitudinal axis thereof, the frame 8 is provided with a threaded block or nut 29. Threadedly engaging this block or nut is a threaded shaft 30 upon which is mounted a bevel gear 31 adapted to mesh with a bevel gear 32 upon a shaft 33 provided with a hand wheel 34 for operating the same. Thus whenever the operator rotates the hand-wheel 34, he necessarily rotates the bevel gears 31 and 32 and the threaded shaft 30 which by reason of its threaded connection with the nut or block 29, swings the frame 8 and blade or tool assembly in a horizontal plane about the pivotal connection at the forward end 9 of the triangular frame 8. This construction is fully disclosed in Patent No. 1,829,622, granted October 27, 1931 to Fred D. Wilson.

The novel grade finding mechanism for enabling an operator of a road machine including a truck or other vehicle provided with a road working tool or scraper blade, to determine whether the blade is operating level or at a desired predetermined angle, comprises a substantially U-shaped tube 35 consisting of upright reservoirs or stand pipes 36 mounted upon a strip or bar of metal 37 so as to be substantially rigid therewith. This member 37 is pivoted at 38 upon a plate 39 which in turn is mounted on the circle 10 by means of brackets 40 and 41. A pipe 42 connects the bottles or reservoirs 36 in order that the water or liquid may flow from one to the other freely and the liquid level be maintained. In the plate 39 are provided openings 43 and in the strip or bar 37 is provided an aligned or complementary opening 44. A pin is adapted to be passed through one of the openings 43 and into the opening 44, depending upon the position of the blade or tool in moving the material to the left or right, as clearly shown in full and dotted outline in Fig. 2. This adjustment is possible by reason of the pivot 38.

Connected to each of the reservoirs, stand pipes or bottles 36 of the U-tube is a tube or conduit 45 leading therefrom to the circle 10 and from this circle along the frame 8 to adjacent the front of the main frame 1 and from there rearwardly along the frame to the station or cab 7 for the operator. Because of the various adjustments of the frame 8, circle 10 and blade or surfacing tool 11, the connection between the reservoirs or U-tube and the indicating means or gauge in the cab is a flexible one. This tubing 45 includes flexible sections 46 and forms a closed circuit between the U-shaped tube or sleeve 35 and the indicating device or gauge 47 mounted in the cab or at the operator's station.

Likewise, the front portion of the tubing which is designated 48 and which connects the tubing between the main frame 1 and the auxiliary or blade carrying frame 8 is formed of rubber or other flexible material.

Throughout its remaining extent the tube 35 may be formed of copper tubing or the like. The rubber or flexible connection at the several points in the circuit is desirable for the reason that the frame 8, circle 10 and blade 11 are frequently shifted and twisted in order that the blade or tool may be adjusted to the proper cutting or operating angle or position.

Mounted within or upon an accessible support of a cab or operator's station 7 at the front end thereof where it may be readily and easily read by the operator, is mounted the indicating device or gauge 47. The housing 49 thereof is suitably attached to an upright support or brace 50 by means of a bracket 51. The indicating device consists of a U-tube or level 52 partially filled with a liquid 53, the level of which may be read through the outer leg 54 of the glass tube. Upon the housing adjacent the leg 54 are provided markings, the markings on one side indicating the angle at which the blade or tool is operating, and those on the other side indicate the inches per foot inclination at which the blade or tool is operating.

In Figs. 9, 10 and 11, there is disclosed an alternate construction of indicating device or gauge 55 adapted to be mounted in the operator's cab or station. The housing 56 thereof is suitably attached to a support on the frame of the cab or station and for this purpose, the rear of the housing or casing 56 is provided with spaced bosses 57 which are internally threaded to receive supporting bolts or other attaching means for mounting the indicating device or gauge in position.

Positioned within the housing or casing is a U-tube or level 58. This tube is partially filled with a fluid 59, the level of which may be clearly noted through the transparency of the tube. The outer or forwardly extending leg of this tube is graduated as at 60 and markings are provided adjacent these graduations. The numerals at the left of the graduations designate the degree at which the blade or tool is operating with reference to a horizontal plane or the plane of the road bed or surface, while the numerals or indications to the right of the graduations on this tube designate the inches per foot inclination at which the blade is operating. It is of course to be understood that this embodiment is illustrative only and the graduations and indications may be varied.

The indications or markings at the sides of the tube are disclosed on a pendulum which will cause tube 58 to at all times keep a vertical position regardless of any inclination the machine as a

whole may take, and to maintain as nearly as possible, this vertical position. In the illustrated embodiment in Fig. 9, this pendulum is shown as comprising downwardly extending legs or projections 61 spaced apart so that the U-tube may be positioned therebetween. Each of these legs or projections is provided with one of the series of markings or indications so that the fluid level within the tube may be accurately read at all times regardless of the position of the machine or cab within which the gauge or indicating device is mounted.

Each leg or projection 61 is provided with a rearwardly and outwardly extending attaching flange 61^a for mounting the same upon a head or part 62. The ends of the U-tube seat within openings in the base of this head or part 62 and are cemented or otherwise attached thereto in an air-tight manner.

These ends are at all times in communication with sections of rubber hose or tubing 63 and 64 which in turn are connected to the tubing 45 communicating with the U-tube on the blade or tool. In view of the shifting position of the U-tube or level 58 due to the rocking or inclination at which the machine is operated, it is desirable that these sections of hose or tubing be flexible. In order to secure access to the tube or level 58, the openings or inlets leading thereto are each provided with a threaded plug 65.

In order that the U-tube or level 58 may assume a nearly vertical position regardless of the position of the road machine, the invention comprehends pivotally mounting this tube so that it may swing freely within the casing or housing 56. Such pivotal mounting comprises the provision of adjustable cone-shaped studs 66 having their ends 67 seating within cone-shaped openings 68 in the head or part 62. Each stud is provided with a slot 69 and a lock nut 70 for maintaining the adjustment of the stud. In order to secure access to the interior of the casing or housing 56, there is provided a removable closure 71, and to protect the indicating device and at the same time permit accurate reading thereof, the front of the casing or housing 56 is provided with a glass cover or other transparency 72.

In order to dampen or stabilize the swinging movement of the pendulum and tube within the indicating device which takes place when the vehicle passes over an uneven surface, the invention provides means for checking or stabilizing such swinging movement or action. In Fig. 10 this dampening or stabilizing is accomplished by means of a weighted end 73. In Fig. 11 this is accomplished by having the end 74 of the pendulum submerged in a liquid bath 75.

This stabilizing or dampening of the swinging movement of the U-tube is highly desirable for the reason that in order to secure an accurate reading of the fluid level within this tube, the tube should be in a vertical or substantially vertical position.

Upon the rear of the blade and adjacent one end thereof there may be mounted a hand level 76 for periodically testing and checking the adjustment and position of the road working mechanism.

From the above description and the disclosure in the drawings, it will be readily apparent that the invention comprehends a novel means and mechanism for indicating and recording the grade or angle at which the blade or tool is operating.

Having thus disclosed the invention,

I claim:

1. In a road machine provided with a scraper blade capable of diagonal adjustment around a vertical axis, mechanism for angularly adjusting said blade with respect to a horizontal plane, a fluid gauge at the operator's station for measuring said angular adjustment while the blade is adjusted in any position around its vertical axis, and means for transmitting said angular adjustment of the blade to the fluid gauge.
2. In a road machine provided with a scraper blade adapted to be adjusted transverse or lateral of the line of travel of said machine, mechanism for angularly adjusting said blade with respect to the plane of the road bed or surface upon which the blade is operating, a measuring means at the operator's station for indicating the angular adjustment of said blade with respect to the plane of the road bed or surface, in any transverse or lateral position of the blade with respect to the line of travel of the machine, and means for transmitting said angular adjustment of the blade to the measuring means.
3. In a road machine provided with a road working tool capable of diagonal adjustment around a vertical axis, mechanism for angularly adjusting said tool with respect to the plane of the road bed or surface upon which the tool is operating, a fluid gauge at the operator's station actuated by the angular position of said tool for indicating the angle thereof, and means for transmitting the angular position of the tool to the fluid gauge.
4. A grade finding mechanism for road machines provided with a scraper blade capable of diagonal adjustment around a vertical axis and also angular adjustment or inclination with respect to a horizontal plane, comprising a U-tube mounted adjacent the blade and actuated by the angular adjustment or inclination at which the blade is operating, and indicating means at the operator's station connected with said tube for indicating the angular position or inclination of the blade while said blade is adjusted in any position around its vertical axis.
5. A grade finding mechanism for road machines provided with a scraper blade capable of being adjusted about a vertical axis and adapted to be angularly inclined with respect to a horizontal plane, means adjacent said blade and actuated by the angle at which the blade is inclined, and indicating means at the operator's station on the machine for indicating the angle of inclination of the blade in any of its angular positions with respect to the horizontal plane.
6. A grade finding mechanism for road machines provided with a scraper blade capable of complete transverse adjustment about a vertical axis and angular inclination about a horizontal plane, comprising a fluid level adjacent said blade and actuated by the inclination of the blade to the horizontal plane, and means in the operator's station associated with said fluid level for indicating the angle of inclination of the blade.
7. A grade finding mechanism for road machines provided with a scraper blade capable of angular adjustment transverse or diagonal of the longitudinal axis of the road machine, comprising means for adjusting the angle of the blade with respect to the horizontal, and mechanism for indicating the angle at which said blade is operating with respect to the horizontal and in any transverse or diagonal position of adjustment of the blade, said mechanism including means actuated by the inclination of the blade and means at the operator's station communicating with the means on said blade for indicating to the operator the angle of inclination of the blade.
8. In a road machine provided with a road working tool capable of adjustment about a vertical axis, mechanism for angularly adjusting said tool with respect to the horizontal plane of the road bed or surface upon which the tool is operating, a tube associated with the tool and containing a fluid adapted to shift its position upon a change in angular adjustment of the tool, and indicating means connected to said tube and actuated by the fluid therein for indicating the angle of said tool with respect to said longitudinal plane in any of its positions of adjustment about said vertical axis.
9. In a road machine provided with a road working tool capable of lateral adjustment with respect to a vertical axis, mechanism for angularly adjusting said tool with respect to the plane of the road bed or surface upon which the tool is operating, a tube associated with the tool and containing a fluid adapted to shift its position upon a change in angular adjustment of the tool, and indicating means actuated by the fluid in said tube and spaced therefrom for indicating the angle of said tool in any of its positions of lateral adjustment.
10. In a road machine provided with a road working tool capable of complete adjustment transverse or diagonal of the longitudinal axis of the machine, mechanism for angularly adjusting said tool with respect to the plane of the road bed or surface upon which the tool is operating, and a fluid gauge for indicating the angle and the inclination in inches per foot at which said tool is operating regardless of the transverse or diagonal position of adjustment thereof.
11. In a road machine provided with a road working tool capable of adjustment transverse or diagonal of the longitudinal axis of the machine, mechanism for angularly adjusting said tool with respect to the plane of the road bed or surface upon which the tool is operating, a tube associated with the tool and containing a fluid adapted to shift its position upon a change in angular adjustment of the tool and a fluid gauge communicating with said tube for indicating the angle of said tool in any of its transverse or diagonal positions of adjustment.
12. In a grade finding mechanism for indicating the angular position of a road working tool with respect to a horizontal plane and in any of its positions of adjustment around a vertical axis, an indicating device comprising a fluid gauge associated with said tool for visibly indicating the degrees of and inches per foot of inclination of the tool with respect to the longitudinal plane in any of its positions of adjustment around the vertical axis.
13. In a grade finding mechanism for a road working tool mounted on a vehicle and capable of diagonal adjustment about a vertical axis, comprising a fluid gauge mounted in the operator's station or cab on the vehicle and associated with said tool for indicating the angular adjustment of the tool with respect to a horizontal plane in any of its positions of adjustment about the vertical axis, and means for transmitting angular changes of said tool to said gauge.
14. In a grade finding mechanism for a road working tool capable of diagonal adjustment about a vertical axis, an indicating device comprising a U-tube containing a fluid actuated by

the angular position or adjustment of said tool with respect to a horizontal plane and in any position of diagonal adjustment, and indications on said tube for indicating the angle of said tool with respect to said horizontal plane.

15. An indicating device for indicating the angular position of a road working tool with respect to the plane of the road bed or surface upon which the tool is operating, said tool being capable of complete adjustment transverse or diagonal of the road bed or surface, comprising a tube containing a fluid actuated by the angular position of said tool, and indications on said tube for indicating said angle.

16. A fluid gauge for road machines for indicating the angular position of a road working tool with respect to the plane of the road bed or surface upon which the tool is operating in any position of transverse or diagonal adjustment thereof with respect to a vertical axis, comprising a tube mounted at the operator's station and containing a fluid actuated by the angular position of said tool and indications on said tube for indicating said angle.

17. A fluid gauge for road machines for indicating the angular position of a road working tool with respect to the plane of the road bed or surface upon which the tool is operating in any transverse or diagonal position of adjustment with respect to a vertical axis, comprising a tube associated with the tool and containing a fluid actuated by the angular position of said tool, and indications on said tube for indicating said angle, said tube being pivotally mounted so as to be maintained in a substantially vertical plane regardless of the position of the road machine.

18. A fluid gauge for road machines for indicating the angular position of a road working tool with respect to the plane of the road bed or surface upon which the tool is operating, comprising a tube associated with the tool and containing fluid actuated by the angular position of said tool, markings on said tube for indicating said angle, said tube being swingably mounted so as to be maintained in a position to accurately

determine the angle of said tool regardless of the position of the road machine, and means for dampening or checking the swinging of said tube

19. A gauge for indicating the angular position of a road working tool with respect to the plane of the road bed or surface upon which the tool is operating, comprising a freely swinging indicating means associated with the tool and recording the angular position thereof, means for transmitting angular changes to said indicating means, and means for dampening or checking said swinging movement.

20. A gauge for indicating the angular position of a road working tool with respect to the plane of the road bed or surface upon which the tool is operating, comprising a pivotally mounted indicating means actuated by the angular position of the tool and indicating the angular position thereof, said means being adapted to be maintained in a substantially vertical plane regardless of the position of the road machine, and means for stabilizing the swinging movement of said indicating means.

21. In a grade finding mechanism for road machines provided with a road working tool, comprising a level positioned adjacent the tool and adjustable therewith, said level consisting of a pair of fluid receptacles, a pipe connecting said receptacles for the passage of fluid therebetween, and indicating means in the operator's cab and connected with said receptacles for recording the level of the fluid in said receptacles.

22. In a grade finding mechanism for road machines provided with a road working tool and mechanism for adjusting the angular position of said tool relative to the road bed, comprising a plate mounted on said mechanism and stationary therewith, a plate adjustable on said first mentioned plate and pivotally connected thereto, fluid receptacles positioned on the opposite ends of said second mentioned plate, and a pipe connecting said receptacles for the free passage for fluid therebetween.

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