Dec. 22, 1936. A. RONNING 2,065,397

POWER GRADER

Filed Dec. 19, 1935 5 Sheets-Sheet 1

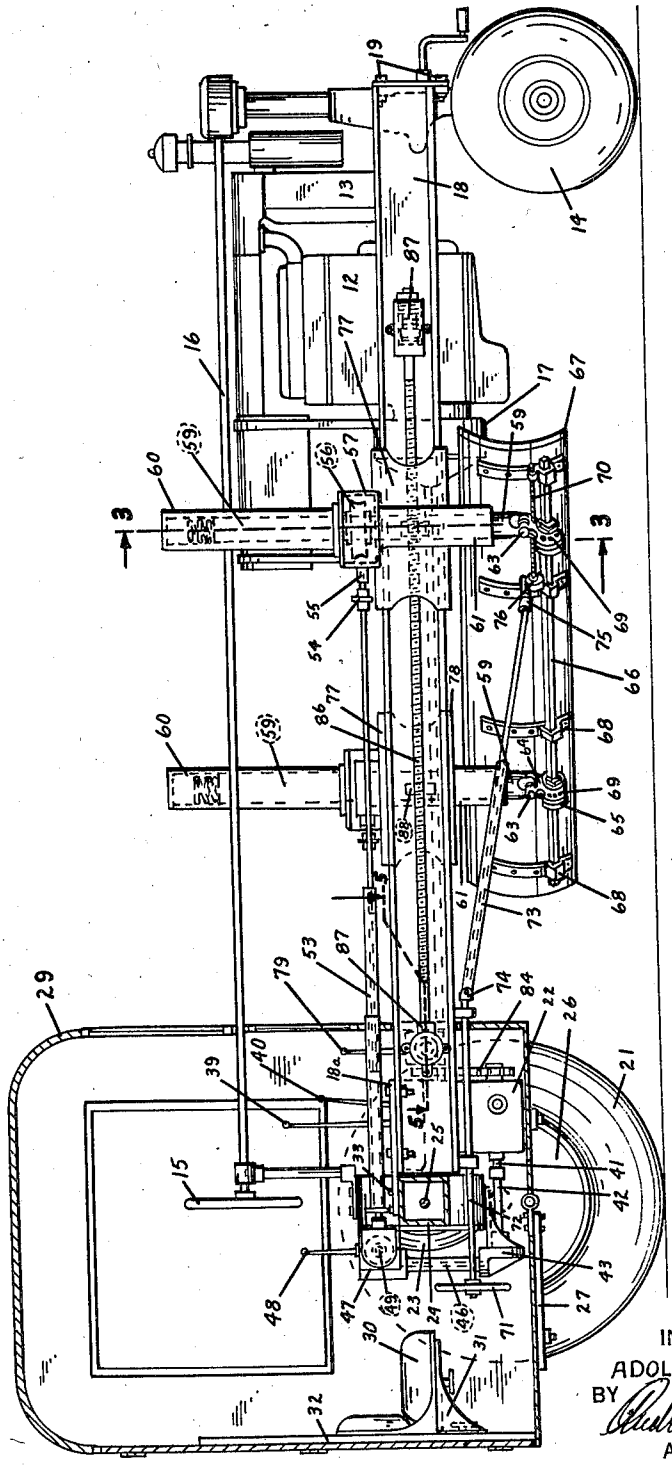


Fig-1-

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POWER GRADER

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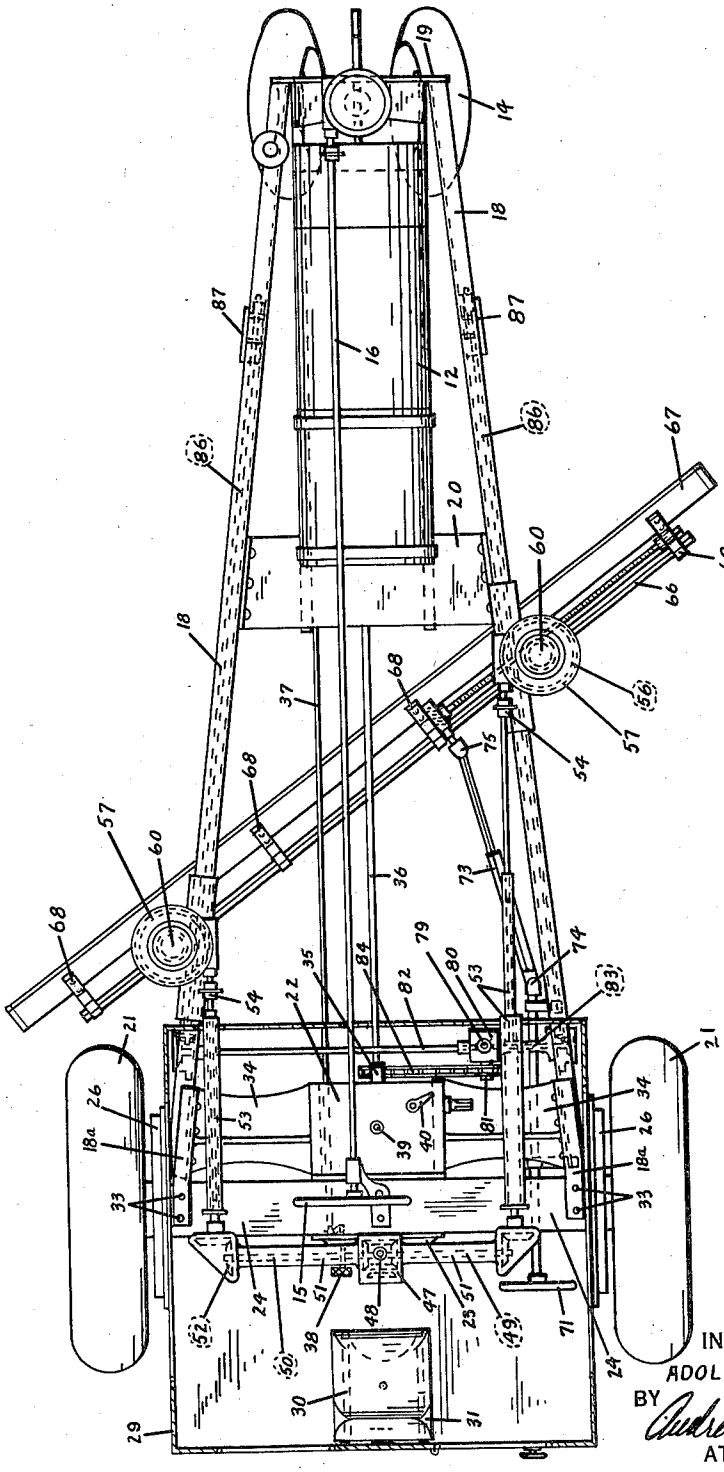


Fig. 2.

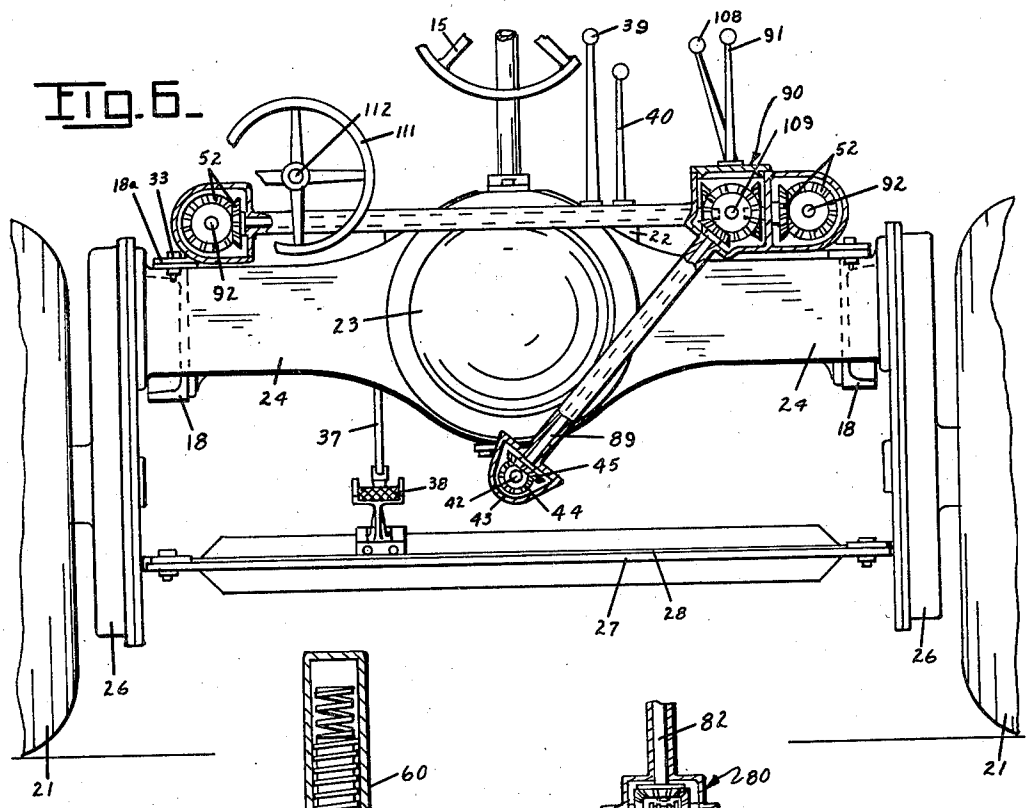
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POWER GRADER

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Fig. 6.



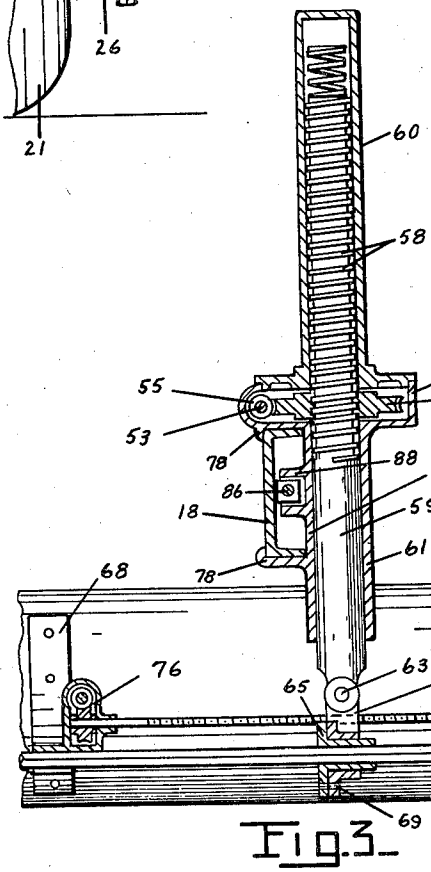


Fig. 3.

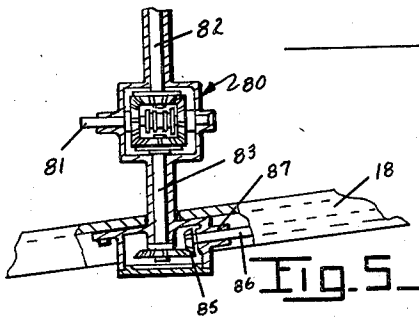


Fig. 5.

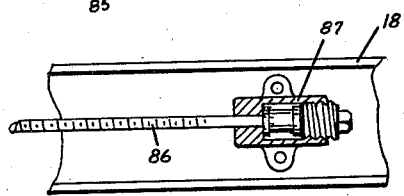


Fig. 4.

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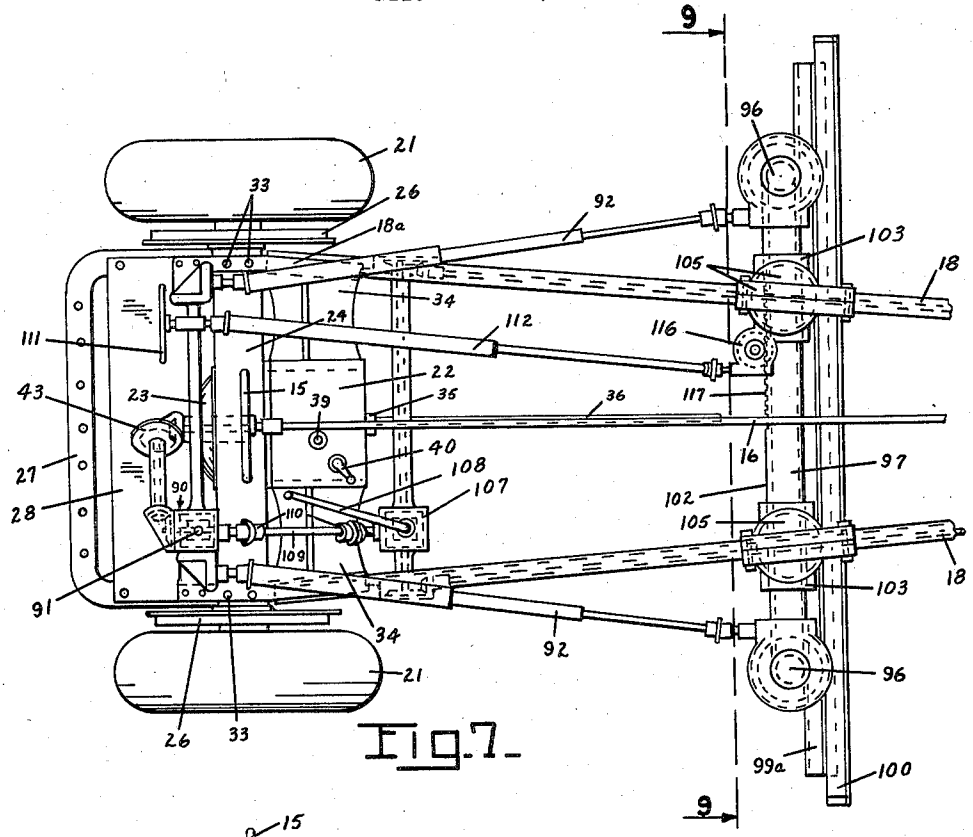


Fig. 7.

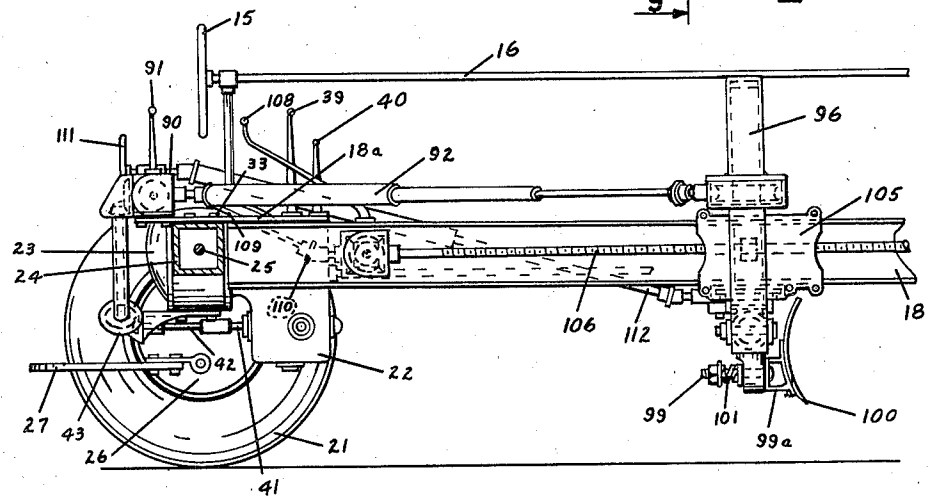


Fig. 8.

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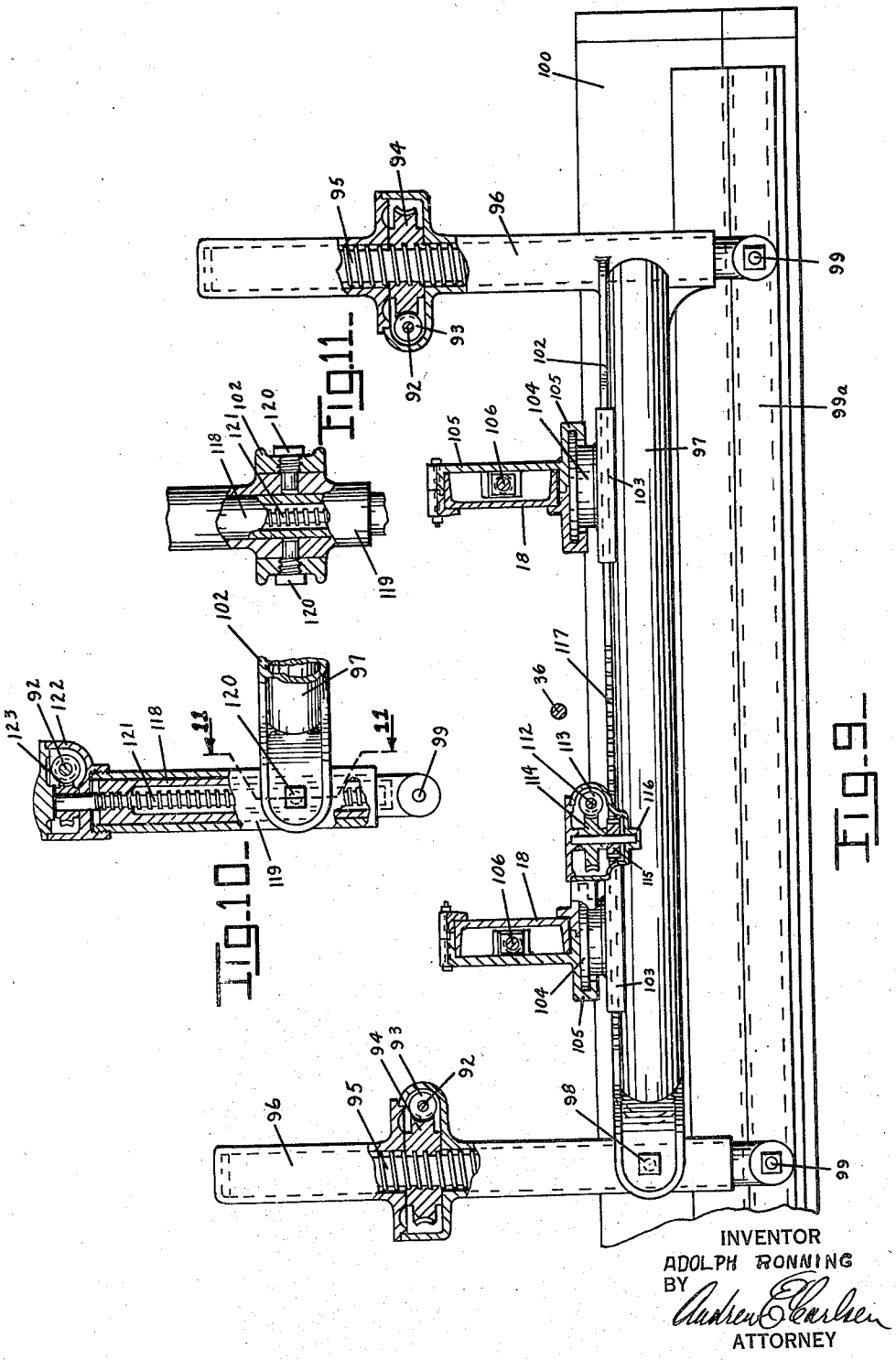


Fig. 9.

Fig. 10.

Fig. 11.

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2,065,397

POWER GRADER

Adolph Ronning, Minneapolis, Minn.

Application December 19, 1935, Serial No. 55,222

37 Claims. (Cl. 37—155)

This invention relates to power driven and power controlled road grading machines, and a main object is to provide an efficient and practical machine embodying various features and combinations of features that will permit of economy in manufacturing cost, simplicity in design, ruggedness of use, and ease of operation and control. The invention contemplates the employment of conventional tractor parts, for reasons of economy and efficiency, and to this end the tractor is separated, longitudinally, and reassembled in a new organization, much in the manner disclosed in my copending applications Ser. No. 35,727, filed August 12th, 1935, for Power grader, and Ser. No. 52,126, filed November 29th, 1935, for Traction machine. In this arrangement, the power plant being disposed in a forward position with respect to the grading implement, and the wheel base being substantially lengthened, the machine is subjected to greater stability, the weight is better distributed for the work to be done, the engine is removed from proximity with the operator, and does not interfere with full view of the tool and work being done.

As a further object the present invention concerns itself largely with the tool support and position controlling mechanism, and to that end I provide unique and novel tool mounting and power operated adjusters which, under sensitive control of the operator, will immediately adjust the operative position of the tool with respect to the road surface and also longitudinally with respect to the supporting frame, the last mentioned adjustment also being operative to effectively shift the center of gravity of the machine to secure results, under varying circumstances, not otherwise attainable. To simplify operation of these controls they are arranged in two groups, and each group is operated by only one control unit having a single manipulating lever. Thus, a plurality of adjustments can be effected by only two hand members which control the application of power from the power plant to the adjusters. The two control units in question are not shown in full detail inasmuch as they follow the design disclosed in my United States Patent No. 1,883,404, issued October 18th, 1932, for Road maintainer, and division Patents No. 2,005,243, issued June 18th, 1935, for Power operated control mechanism and No. 2,027,618, issued January 14th, 1936, for Power transmission; and particular attention is directed to the last two of these patents for a full disclosure of the control unit as here incorporated.

A further object is to so design the machine that the implement will require a minimum amount of vertical clearance, when raised from the ground, thus eliminating the necessity of arching and thus weakening the main frame or raising it to a level where it will proportionately raise the center of gravity, or be in an objectionably high position. A further object is to provide a novel and practical implement elevating unit which is not only simple and efficient, but which will exclude dust and dirt from the working parts. These and still further and more detailed objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, wherein:

Fig. 1 is a side elevation of the machine, with the near traction wheel removed, and with certain parts in section for purpose of illustration.

Fig. 2 is a plan view of the machine as shown in Fig. 1, but with the cab in section to show the arrangement of controls with respect to the operator's station.

Fig. 3 is an enlarged detail elevation through one of the blade lifting units, as seen substantially on the line 3—3 in Fig. 1, but looking in a direction at right angles to the plane of the blade.

Fig. 4 is an enlarged detail vertical section through a bracket housing which supports the front end of one of the longitudinal control screws.

Fig. 5 is an enlarged detail section on the line 5—5 in Fig. 1.

Fig. 6 is an enlarged rear end elevation of a modified form of machine, as shown in Figs. 7 and 8, with certain parts in section and others broken away for purpose of illustration.

Fig. 7 is a plan view of the machine with certain modifications, and with the front portion of the machine removed inasmuch as such portion is the same as that shown in Fig. 2.

Fig. 8 is a side elevation of the structure shown in Fig. 7, but with certain parts removed.

Fig. 9 is an enlarged sectional elevation on the line 9—9 in Fig. 7, and with parts broken out to illustrate certain features.

Fig. 10 is a detail elevation, partly in section, showing a modified form of lifting unit as disclosed at the left in Fig. 9.

Fig. 11 is a detail section on the line 11—11 in Fig. 10.

As in my previous applications Ser. No. 35,727 and 52,126, I here preferably utilize a tractor of the general type known in the trade as the Farmall, as such tractor can be easily and quickly separated longitudinally into two spaced units, and these units then harnessed in to a connecting main frame.

The front unit of the tractor, as here employed, includes the power plant or engine 12, radiator 13, and steering truck 14 which is controlled by hand wheel 15 through an extension shaft 16. The power plant 12 also incorporates the clutch unit housed within a casing 17 at the rear of the engine.

The front unit of the tractor as thus detached from the rear unit, is harnessed into and rigidly secured to a main frame structure which includes a pair of heavy channel iron side beams 18 which converge forwardly where they are secured as at 19 to the front end of the power plant. At an intermediate point between their front and rear ends the frame beams 18 are rigidly connected by a cross beam 20 to which the rear end of the power plant is secured.

The rear tractor unit is supported on transversely spaced, relatively large traction wheels 21, and includes transmission, differential, drive shaft, and brake mechanisms, all enclosed by rigidly connected housings which, with said mechanisms, form a conveniently grouped assembly which is readily detachable from the front tractor unit. Thus the transmission housing 22 joins with the differential housing 23 which in turn has lateral, hollow extensions 24 enclosing the drive shafts 25 for driving the wheels 21, and cooperate to form a transverse beam terminating at its ends and adjacent the wheels 21 in drive gear and brake housings 26.

The rear unit also includes a draft frame 27 which in the normal tractor supports an operator's platform 28. The conventional tractor also has an operator's seat which has here been removed, but in the structure shown in Figs. 1 and 2, I have shown a cab 29 which is supported on the draft frame 27 and is otherwise suitably secured to the rear end of the machine; and this cab contains a seat 30 which is forwardly and rearwardly adjustable on a frame 31, and the frame 31 is in turn vertically adjustable on guide members 32 secured to the rear wall of the cab 29.

The rear ends of the beams 18 have plate extensions 18a which rest upon and are secured as by bolts 33 to the hollow beam 24, and are further secured by brackets 34 to the transmission housing 22, as more particularly set forth in my application Ser. No. 35,727, with a result that the rear tractor unit is rigidly secured to the rear end of the beams 18. In the normal tractor the transmission housing 22 is disposed adjacent to the clutch housing 17, and has a shaft 35 which is driven from the clutch mechanism. In the rearranged construction the clutch drives the transmission mechanism through an extension shaft 36 which directly connects the two units or, as shown in my application Ser. No. 52,126, may be upwardly offset and driven through intermediate power transmitting mechanisms.

The engine clutch in the converted machine is operated by an extension rod 37 which attaches at its rear end to a foot pedal 38 mounted within convenient reach of the operator. The power transmission is controlled by a shift lever 39, and the tractor transmission also normally includes a shift lever 40 for engaging and disengaging the power take-off shaft which is conventionally provided for the purpose of supplying power to mechanisms and devices that may be associated with the tractor, and which require power application independently of the ground wheel travel.

In the present instance the power take-off shaft extends longitudinally through the transmission housing 22, and is designated by the numeral 41. This shaft extends both forwardly and rearwardly outside of the casing, and in the machine shown in Figs. 1 and 2 both ends are utilized for the purpose of supplying power to different adjusting mechanisms. Thus I attach to the rear end of shaft 41 a short extension 42 which extends rearwardly under the differential housing and into a bracket 43 which is secured to the differential housing and contains intermeshing bevel gears (like 44 and 45 in Fig. 6), the first of which is mounted on shaft 42, while the second of which is secured to the lower end of a shaft 46 which, in the design of machine shown in Figs. 1 and 2, extends vertically up to a control unit housing 47.

The control unit 47 is constructed like that shown in my Patent No. 2,027,618, issued January 14th, 1936, wherein the driving shaft 8 applies power selectively or simultaneously and in either direction of rotation to shafts 10 and 11 through friction clutches 20, 21, 25, and 26 controlled by a shift lever 12. In the present disclosure a corresponding shift lever 48 controls the unit 47 to similarly transmit and apply power from the shaft 46 to shafts 49 and 50 extending from unit 47 through sleeves 51, so that the shafts 49 and 50 may be driven selectively or simultaneously, and in either direction of rotation.

As shown in Figs. 1 and 2, the shafts 49 and 50 operate through bevel pinions (similar to pinions 52 in Fig. 6), to drive longitudinally extending shafts 53. The shafts 53 are formed of telescopically connected sections, the sections of each shaft being splined, or squared, in cross sections, so that they will rotate in unison while permitting the shafts to be extended and contracted during operation of the machine.

At their front ends the shafts 53 are provided with universal joints 54, and worms 55 which mesh with worm gears 56 in housings 57 (see Fig. 3). Each gear 56 is held against vertical movement in and by the housing, and is internally threaded to receive the screw threads 58 of a heavy vertical bar 59, with a result that when the gear 56 is rotated the bar 59 will be moved up or down depending upon the direction of rotation of the gear. The bar 59 guides in upwardly and downwardly extending sleeves 60 and 61 which are rigid with the casing 57 and serve to protect the threads 58 from dust and dirt while also functioning to maintain a lubricant supply for facilitating adjustments of the bar. Upon the upper end of the bar 59 I place a normally inactive coil spring 62, which will contact against the upper, closed end of the sleeve 60 to cushion the stopping of the bar 59 should it inadvertently be raised too high, and thus eliminate any possibility of damage to the power transmitting and control mechanism.

At their lower ends the bars 59 are pivoted as at 63 to brackets 64, in which brackets are rotatably secured collars 65 having square axial holes through which pass a square beam 66, this beam being rigidly secured at spaced points throughout its length to the grader blade 67, as by brackets 68.

The face angle of the blade 67 with respect to the road surface is adjusted by turning the collars 65 in the brackets 64, and these members are provided with holes 69 in which a removable pin is selectively secured to lock the adjustment. The pivot connections 60 permit angular adjust-

ments of the blade transversely with respect to the machine under movement of one or the other of the bars 59, and as such movement changes the center distance between the two pivots 63, the unit 64—65 at the left side of the machine is free to move longitudinally with respect to the beam 66. To provide for transverse shifting of the blade with respect to the machine I provide a threaded bar 70 which is journaled upon the back of the blade 67 and screws through one of the brackets 64 (Fig. 3). This bar is manually rotated by a hand wheel 71, acting through a rear shaft section 72, a telescopic section 73, universal joints 74 and 75, and a worm and worm gear unit 76.

The blade lifting and lowering screw lift units 53—65 are respectively carried by block members 77 which are disposed upon the outer sides of the beams 18 but are slidably secured thereto by flange portions 78. The longitudinal adjustments of these members 77 on the frame beams is utilized to adjust the working angle of the blade with respect to the direction of travel, and also to shift the entire blade and its supporting units longitudinally of the machine. This may be done to better position the blade with respect to the operator and ground wheels, and also functions to alter the center of gravity so as to better distribute the load under different working conditions.

The adjustments last above referred to are accomplished by engine power manually controlled by a shift lever 79 of a control unit 80 (Figs. 2 and 5). This unit 80 is in all essential respects identical with unit 47, and with the unit disclosed in detail in my Patent No. 2,027,618. In the present instance rotation of a shaft 81 is selectively, simultaneously, and reversibly applied to cross shafts 82 and 83. The shaft 81 is driven by sprocket chain 84 from the front end of the transmission take-off shaft 42. The cross shafts 82 and 83 operate through bevel pinions 85 (Fig. 5), to rotate long threaded shafts 86 which are longitudinally journaled as at 87 in the channels of the beams 18. These shafts 86 are threaded in nuts placed in square sockets, in lugs 88 of the traveller blocks 77 (Fig. 3), with a result that when the shafts 86 are rotated the blocks 77, together with the blade and blade lifting units will be correspondingly adjusted longitudinally of the frame 18.

In the modified form of machine illustrated in Figs. 6 to 11, inclusive, the adjuster controls are all powered from only the rear end of the power take-off shaft 42. In this instance power is transmitted through gears 44 and 45, and a transversely inclined shaft 89 to a control unit 90 which is similar to unit 47 and is controlled by a shift lever 91 to apply power through gears 52 to shafts 92 which in turn operate worms 93 and worm gears 94 to raise and lower screw shafts 95.

The lift screws 95 operate in hollow vertical standards 96 which are not, however, directly connected with traveller blocks, as in Figs. 1–3, but are outwardly spaced therefrom. One of the standards is rigidly integral, near its lower end, with a transversely extending tubular beam 97, as shown at the right in Fig. 9; while the opposite standard 96 is pivotally secured, as at 98, to the other end of the beam. The lower ends of the lift shafts 95 are pivotally secured, as at 99, to an elongated bracket 99a on the back of the blade 100 to adjustably support the latter, and the purpose of pivot connection 98 is to permit slight tilting of the standard 96 which it supports when one end of the blade is adjusted lower than the other end, in which event one of the pivots 99 will move in a short arc with respect to the other pivot 99. The securing bolts 99 carry the blade 100 and to do so most effectively are preferably slightly tapered and may be secured against play and vibration by springs 101.

The beam 97 is provided with a longitudinal, upper flange 102, slidably supported in a pair of guides 103, having integral flanged arbors 104, which are rotatably secured, for oscillation on vertical axes, in castings 105. The castings 105 are sectionally formed to permit assembly over the flanged arbors 104 and also that they may be slidably secured upon the frame beams 18. The members 105 are adjusted on the frame beams by screw shafts 106, in all respects similar to the previously described screw shafts 86 (Figs. 8 and 9). These shafts 106 are power driven from a control unit 107 (Fig. 7), having a shift lever 108, in the same manner as shafts 86 are operated from unit 80 in response to manipulations of shift lever 79. In the present instance, however, the unit 107 is not driven directly from the power take-off shaft 41, but receives power from the control unit 90 through an auxiliary shaft 109 having flexible or universal joints 110.

The blade structure of Figs. 6–9, is shifted transversely of the machine by manual operation of a hand wheel 111, at the rear end of a shaft 112, also extensible and having suitable universal joints to permit required flexibility of movement. The fore end of the shaft 112 has a worm 113 meshing with a worm gear 114 of a pinion 115 (Fig. 9), which is journaled in a housing extension 116 of the casting 103. The spur pinion 115 meshes with rack teeth 117 formed in one edge of the beam flange 102. Turning the hand wheel 111 will rotate the pinion 115 in either direction desired and will accordingly shift the blade 100 transversely of the machine.

In Figs. 10 and 11, I have illustrated a modified and possibly preferred design of blade lift unit from that shown in Fig. 9. In this disclosure the blade supporting pin 99 is not attached directly to the lifting screw, but to an inner sleeve 118 which is slidable in an outer sleeve 119. This outer sleeve is pivotally anchored to the forked end of the beam 97 by stud bolts 120 (Fig. 11). The lifting screw or threaded shaft 121 is journaled at its upper end in a head 122 of the sleeve 119 and is threaded in the upper end of sleeve 118 so that when turned it will lift and lower the latter. The screw is rotated from shaft 92 through gear means 123.

In the use and operation of the machine as shown in Figs. 1 to 5, inclusive, the movement and direction of travel is controlled by the clutch pedal 38, the gear shift lever 39, and the steering wheel 14, as in the normal tractor; and the desired face angle of the blade with respect to road surface is effected by adjusting the collars 65 in the brackets 64. The required transverse position of the blade with respect to the frame is secured by turning the hand wheel 71, and this can be done when the machine is in motion as varying conditions may necessitate.

To secure other blade adjustments the shift lever 40 is moved to transmit power to the take-off shaft 41. When the operator now desires to bodily lower the blade he merely presses the shift lever 48 directly forwardly, and pulls it rearwardly to raise the blade. By pressing the

lever sidewise, and forwardly or rearwardly, one side only of the blade will be raised or lowered, thus producing angular adjustments in a plane transversely of the machine. All of the adjustments are produced by friction contacts and therefore will not cause breakage or damage when meeting with abnormal resistance.

In a similar manner the operator may, by shifting the hand lever 79, shift the blade unit forwardly or rearwardly with respect to the main frame, and may also change the working angle of the blade with respect to the direction of travel.

It will now be seen that the operator may, by numerous combinations of adjustments, manipulate the blade into any desired operating position, through engine applied power and under sensitive and accurate control. Furthermore, the operator can conveniently produce the adjustments while in a convenient position for observing the road and operating conditions of the implement, and without interfering with his observation and control of the tractor.

In the modified machine of Figs. 7 to 11, inclusive, the blade 100 is similarly controlled through the manipulation of shift levers 91 and 108.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. The combination with the main frame of a vehicle and an implement disposed thereunder, of a pair of laterally arranged supporting devices slidably associated with the frame for connecting the implement to the frame, and means for selectively or simultaneously adjusting the devices longitudinally of the frame to adjust the working angle of the implement with respect to the direction of travel, and to bodily adjust the implement longitudinally of the machine.

2. A traction implement comprising a wheel supported power plant, a power transmission mechanism spaced longitudinally from the power plant and connected therewith to receive power therefrom, traction means supporting said mechanism, a frame rigidly connecting the power plant and transmission mechanism, and including laterally extending side beams, an implement supported under the intermediate portion of the frame for working engagement with the ground as the machine moves forwardly, devices depending from the side beams to carry the implement and for maintaining the same against ground resistance when the machine is being operated, and manually controlled devices, power driven from said transmission mechanism, for adjusting the operative position of the implement.

3. A traction implement comprising a wheel supported power plant, a power transmission mechanism spaced longitudinally from the power plant and connected therewith to receive power therefrom, traction means supporting and driven by said mechanism, a frame rigidly connecting the power plant and transmission mechanism, and including laterally extending side beams, an implement supported under the intermediate portion of the frame for working engagement with the ground as the machine moves forwardly, devices depending from the side beams to carry the implement and for maintaining the same against ground resistance when the machine is being operated, and manually controlled means receiving power from the transmission mechanism for adjusting the said devices to adjust the operative position of the implement.

4. A traction implement comprising a wheel supported power plant, a power transmission mechanism spaced longitudinally from the power plant and connected therewith to receive power therefrom, traction means supporting said mechanism and driven thereby, a frame rigidly connecting the power plant and transmission mechanism, and including laterally extending side beams, an implement supported under the intermediate portion of the frame for working engagement with the ground as the machine moves forwardly, devices depending from the side beams to carry the implement and for maintaining the same against ground resistance when the machine is being operated, and manually controlled means receiving power from the transmission mechanism for adjusting the said devices longitudinally of the side beams to adjust the position of the implement angularly and longitudinally with respect to the frame.

5. A traction implement comprising a wheel supported power plant, a power transmission mechanism spaced longitudinally from the power plant and connected therewith to receive power therefrom, traction means supporting said mechanism, a frame rigidly connecting the power plant and transmission mechanism, and including laterally extending side beams, an implement supported under the intermediate portion of the frame for working engagement with the ground as the machine moves forwardly, devices depending from the side beams to carry the implement and for maintaining the same against ground resistance when the machine is being operated, means for adjusting said devices longitudinally of the beams, and manually controlled means, connected to receive power from the transmission mechanism, for actuating said devices to vertically and angularly adjust the implement.

6. A traction implement comprising a wheel supported power plant, a power transmission mechanism spaced longitudinally from the power plant and connected therewith to receive power therefrom, traction means supporting said mechanism, a frame rigidly connecting the power plant and transmission mechanism, and including laterally extending side beams, an implement supported under the intermediate portion of the frame for working engagement with the ground as the machine moves forwardly devices depending from the side beams to carry the implement and for maintaining the same against ground resistance when the machine is being operated, means for adjusting said devices longitudinally of the beams, and manually controlled means, connected to receive power from the transmission mechanism, for actuating said devices to vertically and angularly adjust the implement, said last mentioned means including extensible shafts permitting said longitudinal movements of the devices on the beams.

7. A mechanism for adjusting the operative position of an implement carried by a traveling machine frame, comprising a continuously rotatable power driven shaft, a pair of manually operative control members each mounted for selective movement in a plurality of directions, means operative upon adjustments of one of the control members for establishing power connections with the shaft to adjust the position of the implement in certain directions, and means op-

erative upon adjustments of the other control member for establishing power connections with the shaft to adjust the position of the implement in certain other directions.

8. A mechanism for adjusting the operative position of an implement carried by a traveling machine frame, comprising a continuously rotatable power driven shaft, a pair of manually operative control members each mounted for selective movement in a plurality of directions, means operative upon adjustments of one of the control members for establishing power connections with the shaft to adjust the position of the implement vertically and angularly with respect to the ground surface, and means operative upon adjustments of the other control member for establishing power connections with the shaft to adjust the position of the implement longitudinally and angularly with respect to the median line of the machine.

9. A mechanism for adjusting the operative position of an implement carried by a traveling machine frame, comprising a power driven shaft, a pair of support members connecting the implement to the frame, a single manually operative control element movable in a plurality of directions, and operative connections between said element and support members capable of translating power from the shaft, by selected movements of the control element, to either or both of said support members to move them longitudinally with respect to the frame.

10. A mechanism for adjusting the operative position of an implement carried by a traveling machine frame, comprising a continuously rotatable power driven shaft, a pair of manually operative control members each mounted for selective movement in a plurality of directions, means operative upon adjustments of said control members for establishing power connections with the shaft to adjust the position of the implement vertically, angularly in a transverse plane, longitudinally of the machine, and angularly with respect to the direction of travel.

11. A mechanism for adjusting the operative position of an implement carried by a traveling machine frame, comprising a continuously rotatable power driven shaft, a pair of manually operative control members each mounted for selective movement in a plurality of directions, means operative upon adjustments of said control members for establishing power connections with the shaft to adjust the position of the implement vertically, angularly in a transverse plane, longitudinally of the machine, and angularly with respect to the direction of travel, and means for adjusting the blade transversely with respect to the direction of travel.

12. In a road machine, the combination comprising a frame, a road working implement disposed transversely under the frame, a pair of laterally arranged devices supportably connecting the implement to the frame and each including a pair of screw members adapted upon being operated to raise and lower one side of the implement and to thereby adjust its working angle with respect to the road surface, and means for adjusting the devices lengthwise of the frame, said screw members of each device including a rotatable nut secured at a fixed elevation with respect to the frame, and a threaded bar engaged in the nut and having supporting engagement with the implement.

13. In a road machine, the combination comprising a frame, a road working implement disposed under the frame, a pair of blocks secured one to each side of the frame and being adjustable longitudinally of the frame, lift nuts rotatably supported by the blocks, threaded bars operating in said nuts and secured at their lower ends to the implement, and means for selectively turning the nuts to raise and lower the bars.

14. In a road machine, the combination comprising a frame, a road working implement disposed under the frame, a pair of blocks secured one to each side of the frame and being adjustable longitudinally of the frame, lift nuts rotatably supported by the blocks, threaded bars operating in said nuts and secured at their lower ends to the implement, and extensible means for operating the lift nuts while permitting said block adjustments longitudinally of the frame.

15. In a road machine the combination with a supporting frame, of a pair of blocks mounted on the frame for adjustment longitudinally thereof, upper and lower telescoped members carried by the blocks for supporting an implement under the frame, and screw means for relatively adjusting the telescoped members of each block.

16. In a road machine the combination with a supporting frame, of a pair of blocks mounted on the frame for adjustment longitudinally thereof, upper and lower telescoped members carried by the blocks for supporting an implement under the frame, and screw means for relatively adjusting the telescoped members of each block, one of said telescoped members comprising a threaded bar and the other of said members being of tubular form to inclose and protect the bar threads.

17. In a road machine having a supporting frame including side beams, an implement disposed transversely under the frame, a pair of support blocks mounted one on each side beam and for longitudinal adjustment with respect thereto, vertically adjustable telescopic hangers supporting the implement from said support blocks, screw means for adjusting at least one of the support blocks on the frame to thereby adjust the working angle of the implement with respect to the direction of travel, and screw means to actuate the telescopic hangers to thereby adjust the implement vertically and angularly with respect to the road surface.

18. In a road machine having a supporting frame including side beams, an implement disposed transversely under the frame, a pair of support blocks mounted one on each side beam and for longitudinal adjustment with respect thereto, vertically adjustable telescopic hangers supporting the implement from said support blocks, screw means for adjusting the blocks on the beams and the telescopic hangers with respect to the blocks, and screw means for adjusting the implement transversely under the frame.

19. In a road grader having a main frame and a grading tool disposed transversely thereunder; a pair of laterally disposed support members secured to the frame, telescopic hangers depending from said support members and connected at their lower ends to the grading tool, and pivoted connections between the tool and said hangers permitting angular movement of the tool with respect to the frame in a transverse plane thereunder when said telescopic hangers are relatively adjusted.

20. In a road grader having a main frame and a grading tool disposed transversely thereunder; a pair of laterally disposed support members secured to the frame, telescopic hangers depending from said support members and connected at

their lower ends to the grading tool, and pivotal connections between the tool and said hangers permitting angular movement of the tool with respect to the frame in a transverse plane thereunder when said telescopic hangers are relatively adjusted, said hangers constituting the sole supports for the tool from the frame in counteracting the road resistance to the tool when the latter is in operation.

21. In a road machine, a frame, an implement disposed transversely under the frame, a pair of blocks secured laterally to the frame and adjustable longitudinally thereof, and vertically adjustable means connecting the implement to the blocks and for vertically and angularly supporting the implement.

22. In a road machine, a frame, an implement disposed transversely under the frame, a pair of telescopic hangers carried by the frame, pivot means connecting the lower ends of the hangers to the implement, and permitting angular movements of the implement, in a plane transversely of the machine, when one or both of said hangers is telescopically adjusted, and means for adjusting the hangers longitudinally with respect to the frame.

23. In a road machine, a frame, an implement disposed transversely under the frame, a pair of telescopic hangers carried by the frame, pivot means connecting the lower ends of the hangers to the implement, and permitting angular movements of the implement, in a plane transversely of the machine, when one or both of said hangers is telescopically adjusted, means for adjusting the hangers to change the angle of the implement with respect to the direction of travel, and means for adjusting the implement transversely of the frame.

24. In a road machine, a frame, an implement disposed transversely under the frame, a pair of hangers supported at opposite sides of the frame and connected at their lower ends to the implement, means for vertically adjusting the hangers to vertically and angularly adjust the implement, means for adjusting the implement transversely with respect to the lower ends of the hangers, and means for adjusting the hangers to vary the working angle of the implement with respect to the direction of travel.

25. In a road machine, a frame, an implement disposed transversely under the frame, a pair of hangers supported at opposite sides of the frame and connected at their lower ends to the implement, means for vertically adjusting the hangers to vertically and angularly adjust the implement, means for adjusting the implement transversely with respect to the lower ends of the hangers, and means for adjusting the hangers longitudinally of the frame to thereby shift the entire implement forwardly and rearwardly of the machine.

26. In a road machine, a wheel supported frame having laterally disposed beams, a road working blade extending transversely of and under the frame, blade supporting devices attached to said frame beams and adjustable longitudinally of the machine to adjust the angle of the blade with respect to the direction of travel, said devices including vertically adjustable bars pivotally secured at their lower ends to the blade to permit angular adjustment of the blade transversely with respect to the road surface.

27. In a road machine, a wheel supported frame having laterally disposed beams, a road working blade extending transversely of and under the frame, blade supporting devices attached to said frame beams and adjustable longitudinally of the machine to adjust the angle of the blade with respect to the direction of travel, said devices including vertically adjustable bars pivotally secured at their lower ends to the blade to permit angular adjustment of the blade transversely with respect to the road surface, and means for adjusting the blade in the direction of its length transversely under the frame.

28. In a road machine, a wheel supported frame having laterally disposed beams, a road working blade extending transversely of and under the frame, devices connecting the blade to said beams and constituting the sole support for the blade in resisting the road action thereagainst, said devices being adjustable to vertically and angularly adjust the cutting edge of the blade with respect to the road surface, and being horizontally adjustable to move the blade longitudinally or angularly with respect to the frame, and means attaching the blade to the support devices permitting adjustment of the blade on an axis extending lengthwise of the blade, an operator's station, and controls extending within reach of an operator at said station for effecting all of said adjustments.

29. The combination with a traveling machine frame and an implement disposed thereunder, of a device for adjustably securing the implement under the frame comprising a cross beam extending transversely under the frame and secured thereto by means permitting adjustment of the beam about a vertical axis, and devices connecting the ends of the beam to the implement and for vertically and angularly adjusting the latter, one of said devices being swingably attached to the beam for movement in the vertical longitudinal plane thereof to permit angular adjustment of the implement with respect to the beam.

30. In a grader, a frame, a beam extending transversely under the frame and secured thereto for adjustment in a generally horizontal plane lengthwise of the frame, vertically adjustable screw lift units at the ends of the beam, a grading blade carried by said units, and means for adjusting the units to angularly and vertically adjust the blade in a plane parallel with the vertical, longitudinal plane of the beam.

31. In a grader, a frame, a beam extending transversely under the frame and secured thereto for adjustment about a vertical axis, vertically adjustable extensible devices supported at opposite ends of the beam, a cutting blade disposed in substantial parallelism with the beam and pivotally secured to the lower ends of said extensible devices for angular adjustment transversely of the frame, and in a vertical plane parallel with the longitudinal vertical plane of the beam.

32. In a grader, a frame, a beam extending transversely under the frame and secured thereto for adjustment about a vertical axis, vertically adjustable extensible devices supported at opposite ends of the beam, a cutting blade disposed in substantial parallelism with the beam and pivotally secured to the lower ends of said extensible devices for angular adjustment transversely of the frame, and means for adjusting the beam longitudinally of itself and transversely of the frame.

33. In a grader, a frame, a beam extending transversely under the frame and secured thereto for adjustment about a vertical axis, vertically adjustable extensible devices supported at opposite ends of the beam, a cutting blade disposed in substantial parallelism with the beam and

pivotally secured to the lower ends of said extensible devices for angular adjustment in the vertical longitudinal plane of the blade, and means for adjustably shifting the said beam, devices, and blade as a unit forwardly and rearwardly of the frame.

34. In a road machine having lateral frame beams, primary support members slidably mounted on the respective beams, secondary support members pivotally secured to the primary support members for adjustment about vertical axes, a tool beam carried by the secondary support members and slidable transversely therein, and means for selectively or simultaneously adjusting the primary support members longitudinally on the frame beams to angularly adjust the tool beam, or to shift it bodily with respect to the frame beams and thereby adjust the center of gravity of the machine.

35. In a road machine, a frame, a tool support beam secured transversely to the frame, vertically disposed tubular housings carried one at each end of the beam and projecting substantially thereabove, threaded bars disposed in and projecting downwardly from the housings, threaded means engaging the bars to raise and lower the same, an implement attached to the bars, and means for adjusting said tool support beam longitudinally of itself to thereby adjust the implement transversely of the frame.

36. In a road machine, a frame, a beam carried by the frame in a generally transverse position but adjustable about a vertical axis, screw lift devices secured at the outer ends of the beam, one relatively rigid and the other tiltable with respect to the beam and in the vertical longitudinal plane thereof, and an implement carried by said devices and for adjustment thereby angularly and vertically with respect to the road surface.

37. In a road machine, a frame, a beam carried by the frame in a generally transverse position but adjustable about a vertical axis, vertically adjustable devices secured at the outer ends of the beam, one relatively rigid and the other tiltable about an axis transverse with respect to the beam, and an implement carried by said devices and for adjustment thereby angularly with respect to the length of the beam and vertically with respect to the road surface.

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