July 21, 1931. O. E. GRIGSBY 1,815,252

POWER ADJUSTED ROAD GRADER

Filed May 20, 1926 4 Sheets-Sheet 1

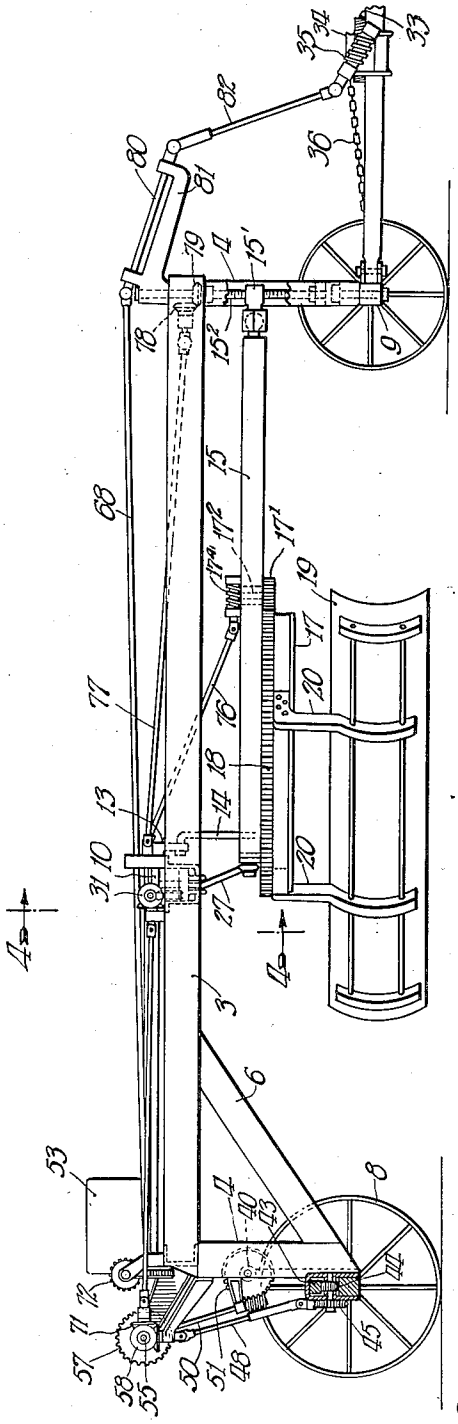

Fig. 1.

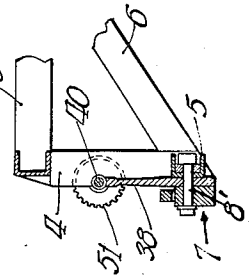

Fig. 8.

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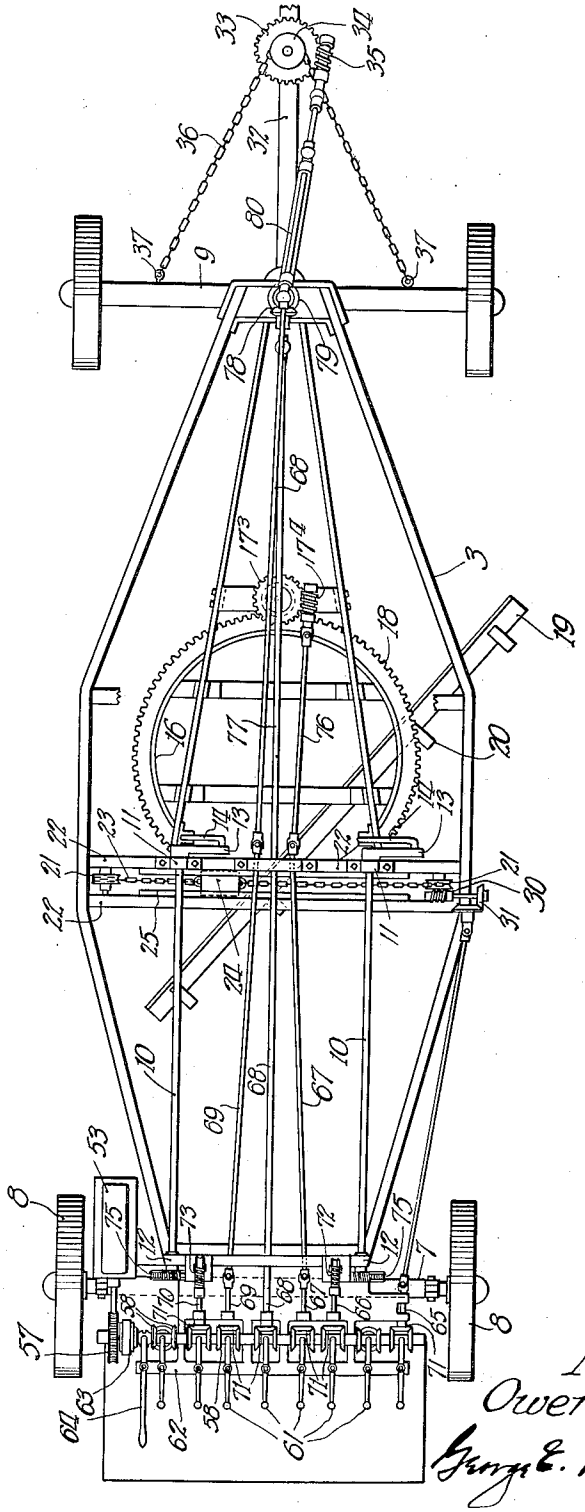

Fig. 2.

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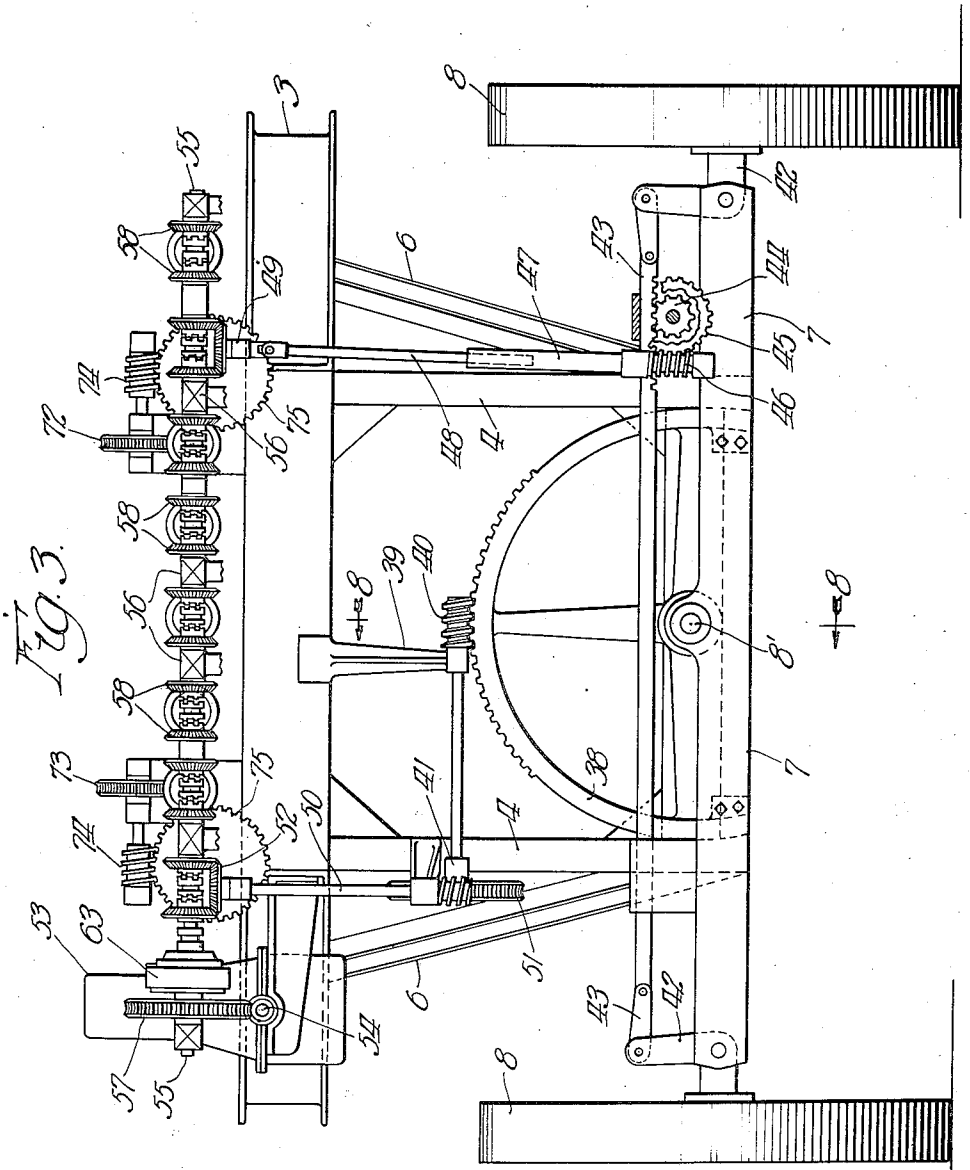

Fig. 3.

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Fig. 4.

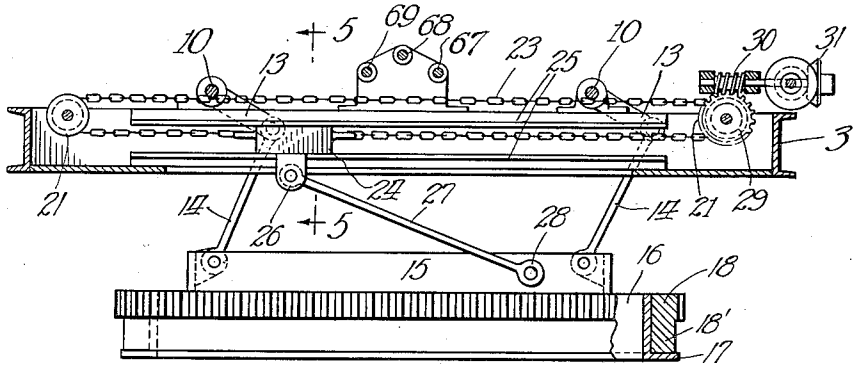


Fig. 5.

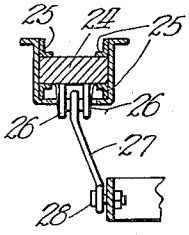


Fig. 6.

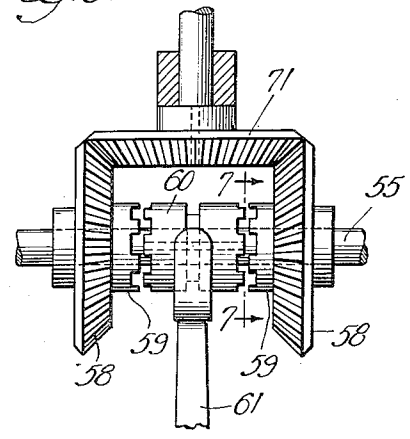
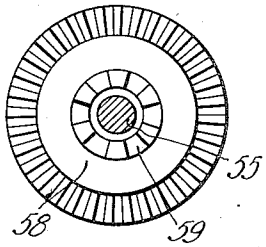


Fig. 7.



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UNITED STATES PATENT OFFICE

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POWER ADJUSTED ROAD GRADER

Application filed May 20, 1926. Serial No. 110,335.

My invention relates to road graders in general and particularly to that type disclosed in co-pending application Serial No. 689,416, filed January 30, 1924, now Patent No. 1,732,892, for road graders, an object being to provide an improved grader of this character having selective power driven adjustments.

In the type of machine set forth in the application above mentioned, the main frame may be tilted or leveled, the mold board tilted, adjusted vertically, axially and transversely, the ground-engaging wheels adjusted to the road, and the machine steered through the medium of selective, hand-operated adjusting devices. These hand-operated adjusting devices are extremely objectionable in that they are laborious to operate and necessitate the expenditure of a maximum period of time.

Having these objections in mind, it is the principal object of the present invention to provide a road grader wherein the various adjustments are effected by manually selective power driven apparatus whereby the mold board may be tilted, adjusted vertically, transversely and axially, the ground-engaging wheels adjusted to the road regardless of the transverse inclination of the latter, the main frame tilted or leveled, and the machine steered.

A further object of the invention is to provide a road grader of this character having a common operating or adjusting mechanism arranged as a unit at a point on the machine where the various controls may be conveniently reached by the operator.

The invention also contemplates an improved road grader wherein power drive elements are operatively connected with the adjustable parts of the machine, together with a mechanism to selectively actuate any one of the drive elements and thereby actuate the corresponding adjustable part.

On the drawings:—

Fig. 1 is a side elevation of a road grader embodying my improvements;

Fig. 2 is a top plan view of the same;

Fig. 3 is a rear end elevation of the grader, showing the motor-driven shaft and selective actuating means;

Fig. 4 is a vertical sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is a detail sectional view taken on line 5—5 of Fig. 4;

Fig. 6 is a fragmentary view of one of the clutch units and actuating gears;

Fig. 7 is a detail view of one of the drive elements used in conjunction with the invention along line 7—7 of Fig. 6; and

Fig. 8 is a fragmentary detail view, partly in section taken on line 8—8 of Fig. 3 and partly in elevation showing the pivot mounting at the rear end of the frame.

Referring to the drawings in detail, wherein corresponding characters of reference denote corresponding parts in the several views, a frame is designated at 3 and is supported at the rear by vertical standards 4 attached to a horizontal channel bar 5, the latter and the frame 3 being braced by angularly disposed braces 6. A rear axle is designated at 7 and is pivotally attached to the bar 5 by a pivot pin 8′, and is provided with ground-engaging wheels 8. The forward end of the frame is supported by a wheeled steering axle 9.

Extending longitudinally of the frame 3 from a point adjacent the rear end thereof to a point intermediate its ends, and disposed at opposite sides of the frame, is a pair of shafts 10, whose forward ends are supported in bearings 11, while their rear ends are received in bearings 12. A crank arm 13 Fig. 4 is fixed to the inner end of each of these shafts 10 and is pivotally connected to suspending links 14, the latter being pivotally connected to the rear end of a horizontally arranged, tiltable draw bar 15, to which a mold-board support or annulus 16 is attached. This mold-board support or annulus is formed with an annular, horizontally disposed flange 17 at its lower edge, upon which a ring gear 18, and circle frame 18′ or annular support, rests. Arranged below the annulus 16 is a mold-board 19 provided with upstanding arms or brackets 20, which are attached to and fixed to rotate with the ring gear 18.

The draw bar 15 carries a swiveled, internally threaded collar 15′ at its forward end, through which a vertical screw 15^2 extends, the screw being mounted on the front steering axle 9, as shown in Fig. 1. Rotatably supported beneath the draw bar and engaging the ring gear 18 is a drive pinion 17′. A stub shaft 17^2 is fixed to the pinion 17′ and carries a worm gear 17^3 at its upper end, the latter being engaged by a horizontally disposed worm 17^4.

A pair of transversely aligned pulleys 21 is journaled between a pair of parallel bars 22 extending transversely across the frame 3. A chain 23 is engaged around the pulleys 21 and has its ends attached to a carriage 24, the latter being slidable in trackways 25 arranged between the bars 22. This carriage 24 is provided with depending ears 26, between which one end of a relatively long link 27 is attached. The link 27 extends obliquely with respect to the horizontal and has its lower end pivotally attached to the rear end of the draw bar 15, as at 28. One of the pulleys 21 is provided with a worm gear 29, the latter being engaged by a worm shaft 30 arranged at one side of the frame 3 and extending transversely of the latter, and carries upon its outer end a drive gear 31.

Mounted upon a draft tongue 32, extending forwardly from the axle 9, is a worm wheel 33 carrying a pulley 34 upon its upper face. A worm shaft 35 is journaled adjacent the worm wheel 33 and engages the latter, as shown in Fig. 2. A steering, a flexible element 36 passes around the pulley 34 and has its ends attached to the steering axle 9 by means of eye bolts or other fastenings 37.

A vertically extending toothed quadrant 38 is arranged at the center of the axle 7 and is attached to the latter as illustrated in Fig. 3. A bracket or bearing 39 depends from the frame 3 above the axle 7 and receives one end of a worm shaft 40 meshing with the toothed segment 38, and whose opposite end is journaled in a bearing 41. A vertically arranged worm shaft 50 engages a worm gear 51 on the worm shaft 40, while its upper end carries a beveled gear 52 driven from the power shaft. The rear wheels 8 are connected with the axle 7 by means of the stub axles 42, which are in the form of bell-crank levers and are operatively connected together through the medium of a transversely shiftable rack bar 43, the latter being engaged by an actuating pinion 44 fixed to a worm wheel 45 mounted slightly above the axle 7. The worm wheel 45 is engaged and driven by a vertically arranged worm shaft 46 whose upper end is formed with a tubular extension 47 receiving a longtitudinally adjustable driven shaft 48, to the upper end of which a pinion 49 is universally attached driven from the power shaft.

In the co-pending patent application above set forth, the main frame, steering axle, rear wheels, supporting axle therefor and the mold board are adjusted by means of hand-operated wheels for transmitting power to the various gears or drive elements of these parts. The present invention eliminates these hand-operated devices, and, in lieu thereof, contemplates a common driving mechanism and selective means for attaining any one of the main frame or mold-board adjustments above enumerated, adjusting the rear wheels to tilt them to the transverse inclination of a road and actuate the rear wheels, to dispose them in parallel relation, and steer the steering axle. This mechanism comprises an internal combustion engine 53 whose drive shaft is in the form of a worm 54.

A main power shaft 55 is arranged above the frame 3 and supported in bearings 56 thereon. Power is transmitted to the shaft 55*a* through the instrumentality of a worm wheel 57 fixed to one end of the shaft and engaged by the worm shaft 54.

Pairs of beveled gears 58 are loosely mounted upon the shaft 55, and each pair is spaced by the bearings 56. The inner faces of the beveled gears 58 are provided with clutch faces 59, (Fig. 6) and a double clutch 60 is arranged between each pair of these clutch faces and is keyed to the shaft 55. A horizontally arranged, actuating lever 61 is operatively connected with each of the double clutches 60, and is pivoted intermediate the ends to a horizontal bar or support 62. (Fig. 2.) Also arranged upon the shaft 55 is a main clutch 63, with which an actuating lever 64 is connected, the latter being also pivotally attached to the bar 62. Thus, when it is desired to render the shaft 55 operative or inoperative, the clutch lever 64 will be actuated accordingly. A plurality of power take-off shafts are designated at 65, 66, 67, 68, 69 and 70, each of which carries a drive pinion 71 at its inner end engaged by its corresponding beveled gears 58. The shafts 66 and 70 are in the nature of worm shafts and mesh with worm gears 72 and 73, respectively. The worm gears 72 and 73 carry oppositely extending worm shafts 74 engaging worm gears 75 fixed to the inner ends of the shafts 10. The power take-off shaft 67 extends longitudinally of the frame and has operative connection with the worm shaft 17^4 by means of a universal shaft connection 76. The shaft 68 extends the entire length of the frame and is universally connected with a shaft 80 journaled in an angularly-disposed bracket 81 attached to the upper face of the frame 3 above the ground-engaging

wheels of the latter. A shaft 82 universally connects the shaft 80 and the worm shaft 35. Similarly, the shaft 69 extends longitudinally of the frame 3 and is universally connected with an angularly-disposed shaft 77 which extends to the forward end of the frame 3 and carries a beveled gear 78 meshing with a beveled gear 79 fixed to the upper end of the screw 15^2.

Assuming the shaft 55 to be rotating, the operation of my improved road grader is as follows:

When it is desired to adjust the position of the mold board axially to the right or left, the shaft 67 is rotated from the shaft 55 by engaging the double clutch with the corresponding beveled gear 58. Power is thus transmitted to the worm shaft 17^2 to drive the pinion 17', the latter in turn rotating the ring gear 18. When the ring gear has reached the place where the mold board will be disposed at the desired point, the clutch will be moved to a neutral position. Assuming it is desired to adjust the mold board transversely of the frame 3, the worm wheel 29 is set in operation by rendering the shaft 65 operative by means of the corresponding clutch. This operation moves the carriage 24 to the right or left, as the case may be, to correspondingly shift the mold-board support 16. Various adjustments of the mold board may also be made by the shafts 10 which are driven to swing the arms 13 independently through a complete circle and correspondingly adjust the rear end of the draw bar and mold-board support. The mold-board may also be tilted or adjusted by raising or lowering the forward end of the draw bar by connecting the shaft 77 to rotate the screw 15^2 to raise or lower the collar 15' to which the draw bar is attached.

It will be observed that the shafts 10 may be utilized to longitudinally tilt the mold-board to the right or left, to raise or lower it, or to shift it transversely for road shoulder, back slope or ditch operation.

To tilt or level the main frame for various purposes, the hand lever is shifted to connect shaft 50 to thereby rotate worm 40 to move along on circular rack 38 and thereby bodily rotate the main frame 3 on its end pivots to the desired position.

To tilt the wheels 8 or adjust them vertically according to conditions, the shaft 48 is connected to rotate the worm gear 45 to the right or left, the latter causing the pinion to correspondingly move the rack 43 transversely of the axle 7 and adjust the wheels.

When it is desired to shift the draft tongue 32 the shaft 68 is connected to drive the worm 35, which in turn rotates the worm wheel 33 to rotate the pulley 34 along the chain 36 and move the tongue accordingly.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is:

1. A road grader including a wheeled frame, a mold-board arranged beneath the same for tilting, axial, vertical and transverse adjustments, a common driven shaft, and selective means co-operating with the driven shaft for effecting any one of such adjustments.

2. A mold-board mounting including a support, a tiltable, vertically and horizontally movable frame, a mold-board carried thereby and arranged for axial adjustment thereon, a power shaft, selective means co-operating between the power shaft, frame and mold-board, whereby to tilt the frame, adjust it vertically or horizontally, or adjust the mold-board axially.

3. In a road-grading machine, a transversely tiltable main frame having a rear axle and tiltable wheels therefor, a mold-board supported beneath the frame and arranged for various independent adjustments, a power driven shaft supported on the frame, and selective means on the shaft for tilting the main frame on the axle, tiltably adjusting the wheels, and effecting any of the adjustments of the mold board.

4. In a road-grading machine, a wheeled frame, a draw bar beneath the frame and arranged for transverse, horizontal, vertical movements, a mold-board axially adjustable on the draw bar, a driven shaft on the frame, and manually-operative selective drive means between the driven shaft, draw bar and mold-board arranged to be actuated to effect any one of such adjustments of the draw bar and mold-board.

5. A road grader comprising a wheeled frame, a mold-board associated therewith and arranged for tilting, transverse, horizontal, vertical and axial adjustments, a driven shaft on the frame, and selective means operated by the shaft for effecting any one of such adjustments of the mold-board.

6. A road grader including a wheeled frame, a tiltable, horizontally, vertically and axially adjustable mold board arranged beneath the frame, and selective motor-actuated means for tilting the mold-board, adjusting it vertically, horizontally and axially, and including a rotating shaft, normally idle drive elements thereon, and means for selectively causing any one of said drive elements to rotate with the shaft.

7. In a road grader, a wheeled frame, mechanism for tilting the frame, mechanism for leaning the frame wheels, a mold board supported beneath the frame mechanism for effecting longitudinal and transverse tilting, axial, vertical, and transverse adjustments

of said mold board, a continuously operated source of power carried by the frame, a continuously driven shaft connected to said source of power, and selective reversible means associated with said continuously driven shaft for interconnecting any one or group of said adjusting mechanisms and said continuously driven shaft.

8. In a road grader, a wheeled frame, mechanism for tilting the frame, mechanism for leaning the frame wheels, a mold board supported beneath the frame mechanism including said frame tilting and wheel leaning mechanism for effecting longitudinal and transverse tilting, axial, vertical, and transverse adjustments of said mold board, a continuously operated source of power carried by the frame, a continuously driven shaft connected to said source of power, and selective reversible means associated with said continuously driven shaft for interconnecting any one or group of said adjusting mechanisms and said continuously driven shaft.

In witness whereof, I hereunto subscribe my name this 15th day of April, 1926.

OWEN E. GRIGSBY.