Oct. 20, 1931. C. B. FAVERTY 1,828,526

ROAD GRADER MAIN FRAME

Filed July 28, 1928 6 Sheets-Sheet 1

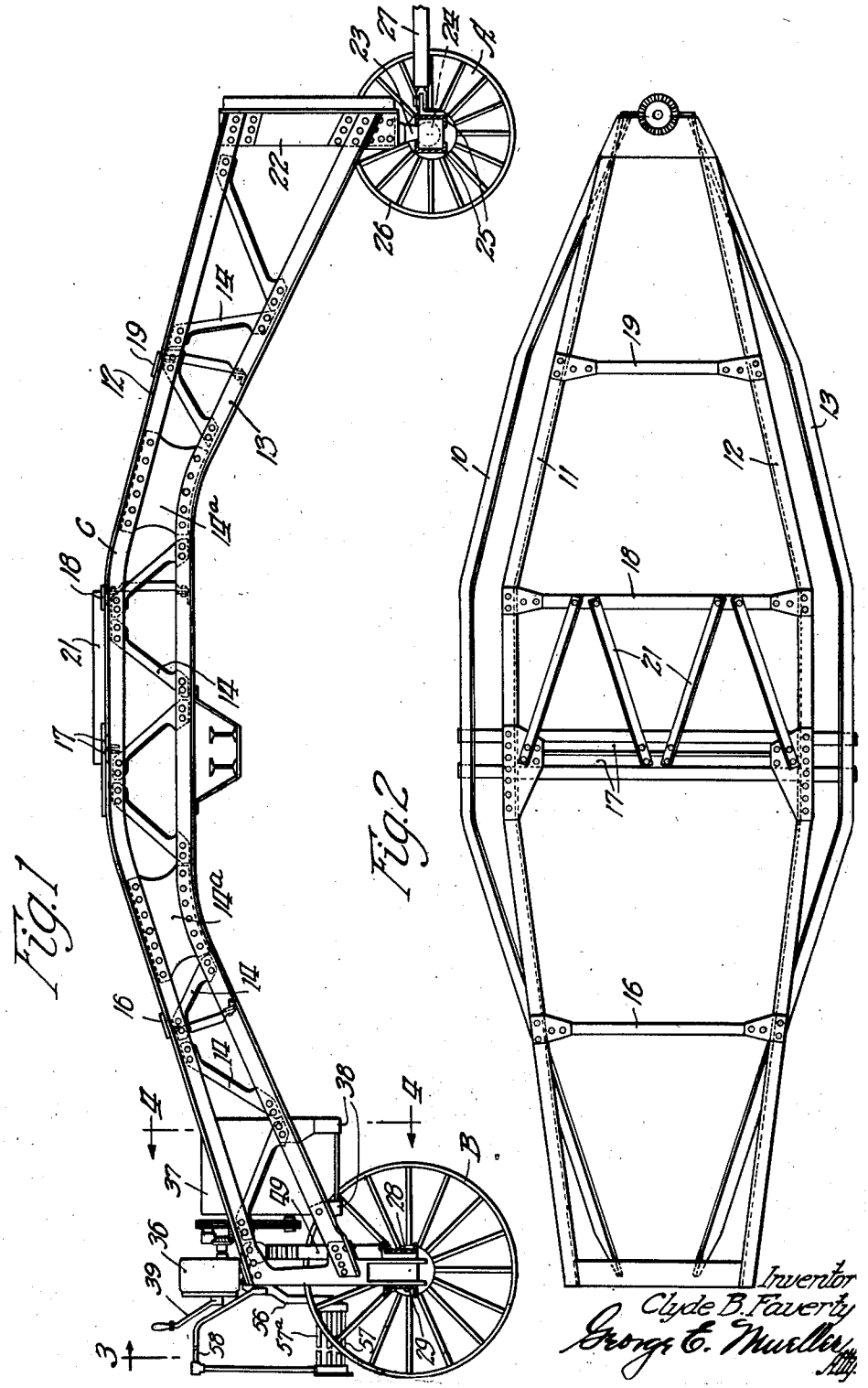


Fig. 1

Fig. 2

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ROAD GRADER MAIN FRAME

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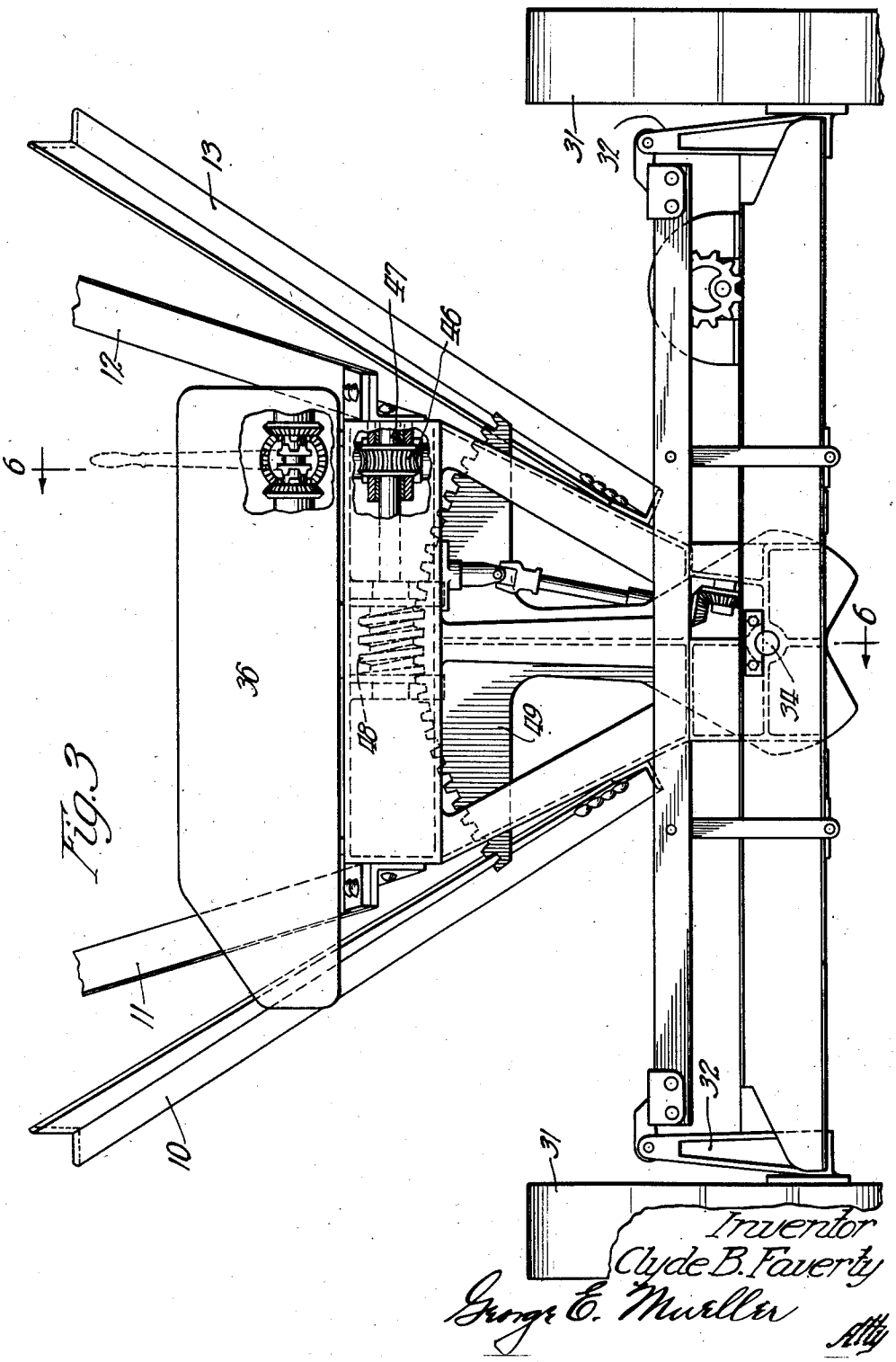


Fig. 3

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ROAD GRADER MAIN FRAME

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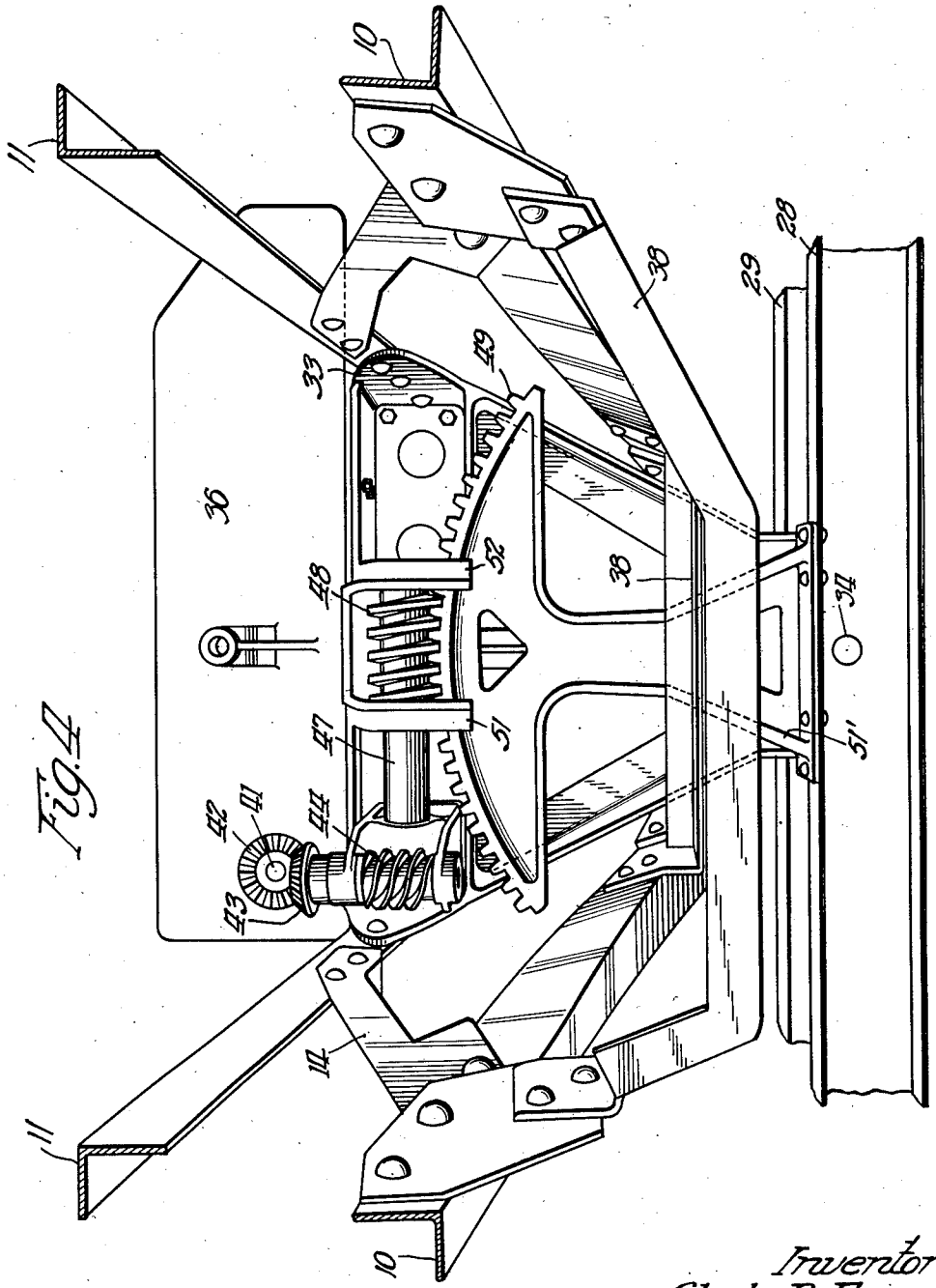


Fig. 7

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Fig. 5

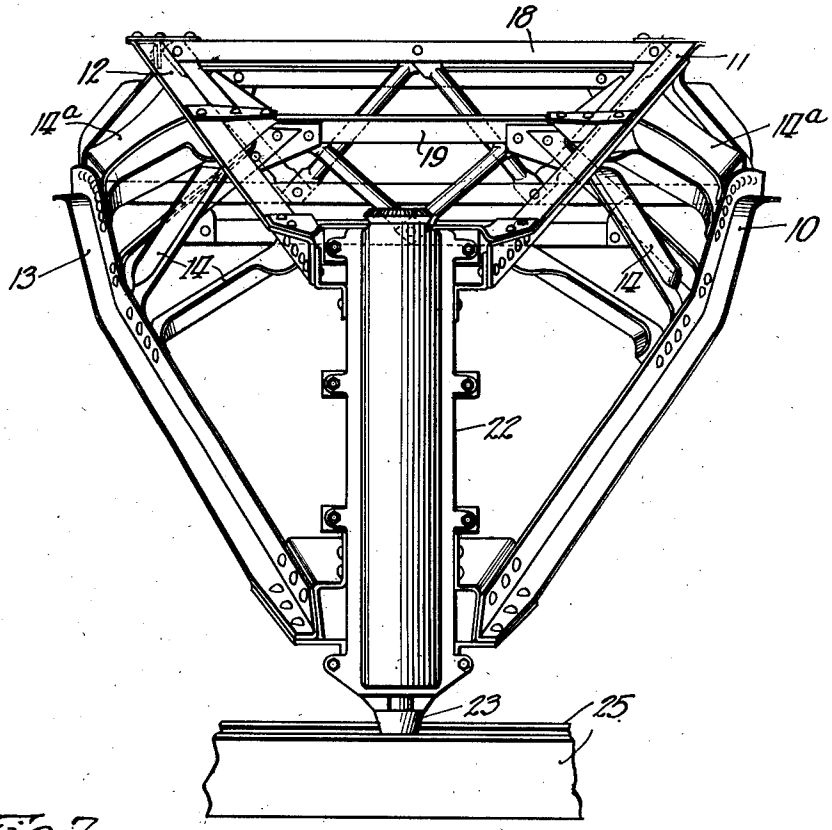
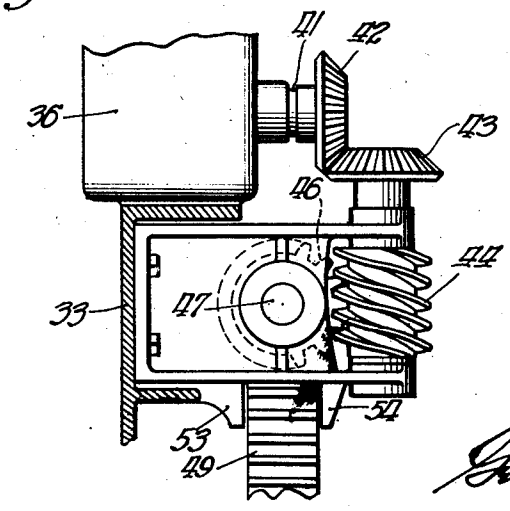


Fig. 7



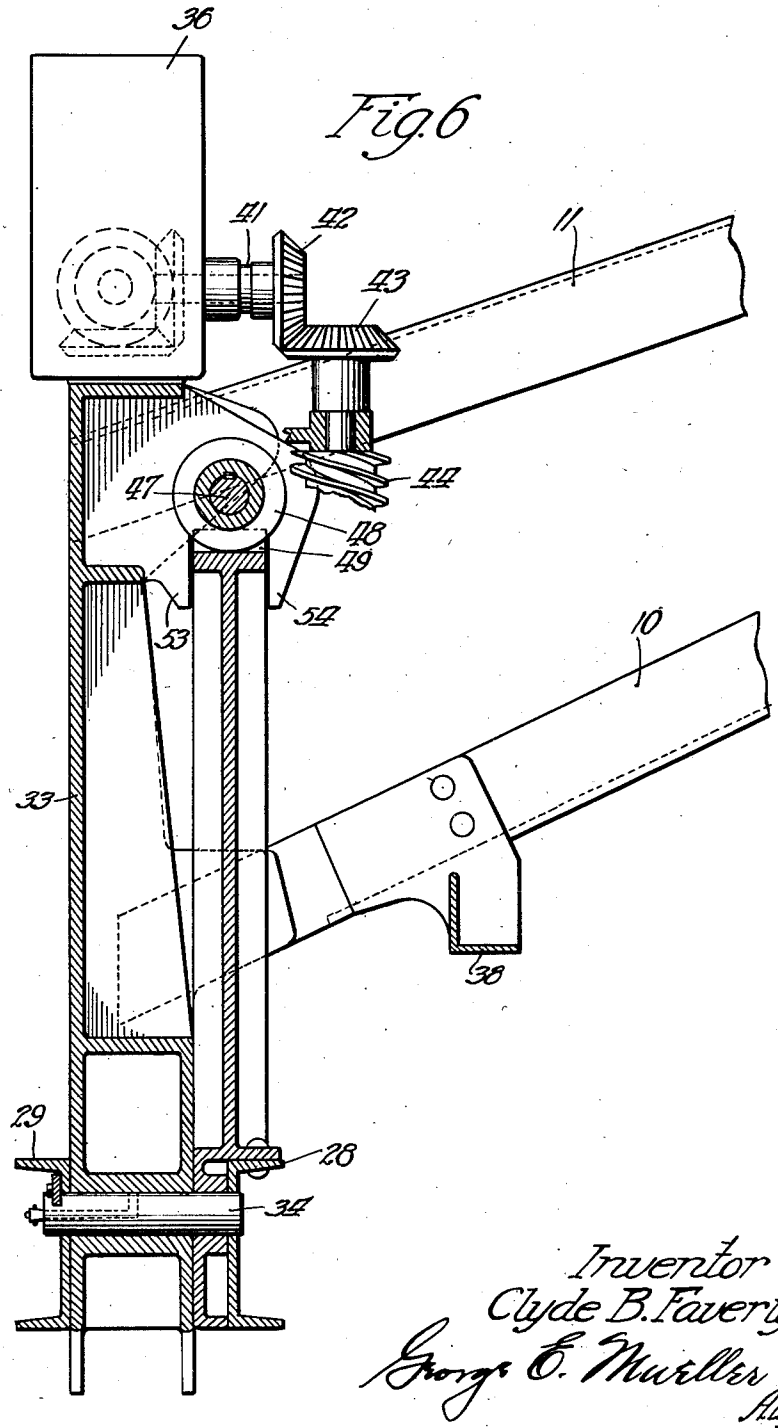
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Fig. 6



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ROAD GRADER MAIN FRAME

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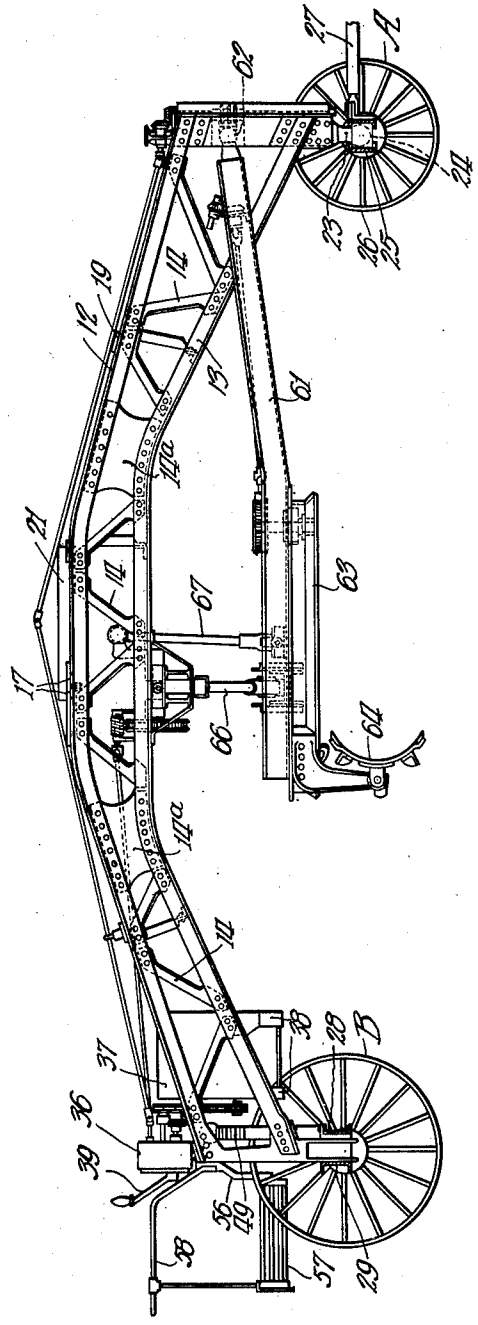


Fig. 8.

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UNITED STATES PATENT OFFICE

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ROAD GRADER MAIN FRAME

Application filed July 28, 1928. Serial No. 295,865.

My invention relates in general to graders. It relates more particularly to an improved type of grader frame having a novel construction not heretofore found in the grader art, or in any analogous art with which I am familiar. By means of the novel construction, the moving parts of the grader are arranged in a form not heretofore possible, and the grader frame although of heavy construction in itself and also supporting a great amount of very heavy apparatus, is nevertheless adjustable to a number of positions which are of use for the purpose of balancing the frame with respect to the grade of a road, and functioning in an auxiliary capacity to supplement the movement of the apparatus carried by the frame, so that extreme positions of a mold board heretofore considered impossible of procurement, are now easily obtained.

These adjustments are in part due to the novel arrangement and combinations of the apparatus carried by the grader frame but there are features of the frame which will be pointed out hereinafter which makes the arrangement and mounting of the apparatus possible and in a practical sense, operable.

Among the principal objects of my invention are the production of an improved grader frame.

Another object is the production of a grader frame adapted to support the full weight of the movable apparatus and take the entire pull of the load.

Another object is to provide a grader wherein the entire weight less the wheels and axles, is supported on a single frame.

Another object is to provide a grader frame wherein a single span results from the front to the rear wheels and all the adjustable grader parts are secured thereon.

Another object is to provide a grader construction in which all of the mechanism is immediately in front of the operator, and wherein his position is changed as the grader is adjusted so that he is always in the same relative position with respect thereto.

Another object is to provide a grader frame of relatively light weight with respect to the overhaul weight of the grader, but with a very great supporting capacity.

Another object is to provide a grader frame with a lattice construction so that the strength-weight ratio thereof is high.

Another object is to provide a grader frame carrying the entire adjustable apparatus and the means for adjusting the same.

Another object is to provide a tiltable frame construction with an operator's platform movable therewith, and furnishing easy access to the control mechanism.

The details of the invention will be understood from a consideration of the following description taken with the accompanying drawings, wherein

Fig. 1 is a side elevation view of a grader equipped with my improved frame, and having the movable parts removed therefrom;

Fig. 2 is a plan view of the skeleton frame;

Fig. 3 is an enlarged view of the frame looking at the rear end of the grader;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a front general view of the skeleton frame;

Fig. 6 is a section view taken along the line 6—6 of Fig. 3,

Fig. 7 is an enlarged fragmentary detailed view showing part of the frame-leaning mechanism, and Fig. 8 is a side elevational view showing the completed grader with the adjustable elements thereon.

The grader of my invention comprises a front axle assembly A, rear assembly B and a main frame C. The frame is supported bridge fashion between the front and rear axle assemblies and is adapted to carry all the apparatus including a draw bar and mold board assembly.

The frame proper includes longitudinal members 10, 11, 12 and 13, these members being preferably angle irons and being formed in the manner shown to result in a high center of relatively great width and sloping downwardly toward the ends and coming together in a general V-shape. Each pair of longitudinal members is supported and braced by lattices 14, these lattices being

riveted to the longitudinal members and being shaped and positioned as the load demands it. Some of them are in the shape of a solid web where the strain is greatest as for example the lattice members 14*a* near the center. The other lattices are of smaller cross-section since they do not have quite the load that the center ones do.

The two top longitudinal members 11 and 12 are provided with transverse bracing strips 16, 17—17, 18 and 19, with bracing rods 21 extending between the transverse rods 17 and 18 to reinforce the center of the frame where the greatest load is carried.

The grader frame is supported differently at the front and rear, the front connection with the axle being of the universal joint type so that not only can the frame be leaned with respect to the axle, but the entire front axle assembly may be turned with respect to the frame. Since the rear axle is not required to be turned but keeps its normal position at right angles to the line of draft of the grader at all times, a simple pivot connection is formed between the grader and rear axle. At this position, however, the grader leaning mechanism is provided and the construction is such as to permit the proper operation of this mechanism.

At the front of the grader a vertical frame post 22 is provided to either side of which the longitudinal frame members are riveted. The bottom of the post has a stem 23 with a ball 24 depending therefrom and engaged by a pair of channels 25 constituting the major portion of the front axle. A usual type of grader wheel 26 is secured at each end of the axle and a guiding tongue 27 is provided for swinging the axle and wheel about the ball 24 for the purpose of changing the direction of travel of the grader. The details of this construction are shown in my co-pending application Serial No. 215,088 filed August 24, 1927. It is sufficient to state for the present purpose that the universal action referred to takes place between the front end of the frame and the front axle assembly.

The rear axle assembly includes channel irons 28 and 29 disposed with the channels away from each other and having wheels 31 mounted on bell cranks 32 which are pivoted to the ends of the axles and are provided with leaning mechanism as indicated generally in Fig. 3. This mechanism is fully described in my copending application Serial No. 295,864 filed July 28, 1928.

At the rear of the grader the longitudinal frame members are riveted to a bracket 33 which is mounted on a pivot pin 34 secured between the two channel irons of the rear axle. This forms a simple pivot by means of which the entire frame may be given a simple pivotal movement with respect to the rear axle, the movement being in a plane perpendicular to and parallel with the axis of the axle.

The upper part of the bracket 33 has secured thereon a gear box 36 which contains a transmission system for transferring power movement from a central power source carried by the grader to mechanism for operating the various pieces of control apparatus by means of which various grading operations are effected. The central source of power is in the form of a gasoline motor 37 (Fig. 1) supported on cross pieces 38—38 carried between the longitudinal members 10 and 13. Any suitable shafting is provided for conveying the motion of the motor to the gear box and suitable clutch mechanism operated by levers 39—39 is utilized for conveying the motion to suitable shafting leading to the various mechanism referred to.

The drive for the frame leaning mechanism comprises a shaft 41 projecting out of the gear box and having integral therewith a bevel gear 42 meshed with a bevel gear 43 carried on a shaft which terminates in a worm 44, the worm shaft being suitably journaled in a portion of the bracket 33. The worm meshes with a worm gear 46 (Fig. 3) carried on a transverse shaft 47 having suitable journals forming an integral part of the bracket, the shaft 47 bearing a worm 48 which meshes with a worm gear segment 49 forming a part of an upright frame leaning bracket 51′ which is rigidly secured to the channel iron axle member 28 and is hence immovable with respect thereto. It is by this mechanism that the frame is leaned since normally the gear connections described are stationary and the frame and frame bracket 33 are stationary with respect to the pivot 34. When the transmission mechanism is operated to rotate the worm 48 through the gearing described, this worm is caused to advance along the segment 49. This segment being immovable with respect to the axles the worm 48 is constrained to move, carrying the entire frame with it.

The shaft 47 may of course be provided with any suitable type of bearing carried by the bracket 33. A very desirable structure however, is illustrated in Figs. 4 and 6 wherein the bearings for the shaft also serve another valuable purpose. The bracket 33 has as a part thereof, a pair of webs 51 and 52. It is in these webs that the shaft 47 has its bearings, and they also serve to act as a thrust bearing for the worm 48. The webs also extend downwardly in the form of bifurcations 53 and 54 extending on both sides of the gear segment 49. These bifurcations serve as additional bearing surface for the frame to steady the same and in this way another support besides the pivot pin 34 is obtained. The advantage to be secured by this construction is very great and is of particular value when the grader is subjected to any unusual strain

as would result from assuming an extreme position for which it was not intended.

Consideration of Fig. 1 with particular reference to the foregoing description reveals that not only are all of the adjustable parts of the grader secured on the main frame but that in addition thereto all of the adjusting parts including a central power plant and motor controlled gear box having reversing clutch mechanisms selectively operated by the hand operating levers 39. In order to place all of this mechanism more thoroughly under the control of the operator, there is provided as a part of the frame, a novelly arranged operator's platform so designed that the operator will move with the frame and his position with respect to the operating levers 39 and the other apparatus carried by the main frame will always be the same.

A pair of platform brackets 56 are secured to the end of the frame, preferably to the bracket 33, and extend downwardly and support a horizontal platform 57. The center portion of the platform is horizontal but it is provided with upturned end portions 57*a*, so that the operator can brace himself against such portions and will also have a horizontal position on which to stand when the grader frame is leaned to an extreme position. A railing 58 is secured partly to the frame and partly to the platform and serves as an additional protection for the operator when the grader is in use.

It is seen that the frame is of a truss type and besides supporting all of the load of the apparatus, takes the full pull of the load at the universal joint 24. This is considerably different from most other types of graders wherein the pull on the mold board is not directly through the frame, but an auxiliary connection generally through the draw bar, serves to take the pull away from the frame proper.

Considerable advantage is obtained by having the motor positioned immediately in front of the operator within easy reach, with the gear box just behind the motor and the platform on which the operator stands behind the gear box. In this way, he not only has all of the adjustable apparatus immediately in front of him but in addition thereto all of the mechanism with which the adjustments are secured. He moves with the whole frame as it is adjusted, and consequently has the "feel" of the machine much more than if he were otherwise positioned with respect to the gear box, motor etc.

Fig. 8 shows a complete road grader in side elevation. The frame carries the various adjustable elements including a drawbar 61 connected in the front post by a universal joint 62, and arranged to be adjusted vertically within such front post. A circular frame 63 is adjustably carried by the drawbar and supports moldboard 64. At the rear of the drawbar links 66 and 67 (there are two links 67) support the drawbar from the frame, and a mechanism is provided in connection with the links 66 and 67 for adjusting the position of the rear end of the drawbar.

A shaft extends from the gear box 36 to the various adjustments, and all of the adjustable members and means for affecting the adjustment thereof are carried by the main frame.

Although I have described in detail the specific arrangement of the grader frame and mechanism associated therewith, it is obvious that the grader is not necessarily confined to this particular form and the invention is limited only by the scope of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In a road grader a main frame comprising four longitudinal members, two on each side of the frame, the pairs of members extending upwardly and outwardly in the center with the lower members of the two sides extending outwardly farther than the upper members, lattices connecting the longitudinal members at each side of the frame, transverse brace members connecting the two top members and connecting members at each end of the frame having the ends of the longitudinal members secured thereto.

2. The combination with a frame as defined in claim 1 of front and rear axle assemblies with a pivotal connection between said connecting members and said axles, so that the entire frame may be moved with respect to said axles.

3. In a road grader a front axle assembly, a rear axle assembly, a main apparatus carrying frame with a universal joint connection with the front axle and a pivotal connection to the rear axle and being supported only by the axles at these two points, a gear segment secured integral with the rear axle, a gear carried by the frame, and power means carried by the grader frame for turning said gear in either direction to incline the frame with respect to said axles.

4. In a road grader a front axle assembly, a rear axle assembly, a main frame comprising a truss frame with a frame post at the front thereof and a bracket at the rear, a ball at the bottom of said post disposed in the front axle as in a socket to form a universal joint, a pivot pin extending through the rear bracket and through the rear axle to form a standard pivot connection, a gear segment secured integral with the rear axle, a gear carried by the frame and meshing with said segment and power means carried by the grader frame for turning said gear in either direction to incline the frame with respect to said axles.

5. In a power adjusted road grader, a main frame having a plurality of longitudinal members, a frame post to which said members are secured in the form of a V at the front end thereof, a bracket to which the

rear ends of the longitudinal members are secured in converging relation so that the frame is wider at the center, motor brackets positioned on said longitudinal members, a motor supported on said brackets and disposed immediately in front of said main frame bracket, a gear box of the class described secured at the top of said bracket, and a driving connection between said motor and gear box.

6. The combination described in claim 19 wherein an operator's platform is secured to said main frame bracket behind said gear box, so that the position of the operator is immediately behind the gear box with the motor in front of the same.

7. In a road grader, a front axle assembly, a rear axle assembly, a main frame comprising a plurality of longitudinal members in truss form with a frame post at the front thereof and a relatively wide triangular bracket at the rear, a ball at the bottom of said frame post disposed in the front axle to form a universal joint, a pivot pin extending through the lower corner of said bracket and through the rear axle to form a fixed pivot, means for moving the frame in either direction on said pivot, and an operator's platform secured to the rear of said bracket so as to move with said main frame.

8. In a road grader, a front axle assembly, a rear axle assembly, a main frame comprising a plurality of longitudinal members in truss form with a frame post at the front thereof and a relatively wide triangular bracket at the rear, a ball at the bottom of said frame post disposed in the front axle to form a universal joint, a pivot pin extending through the lower corner of said bracket and through the rear axle to form a fixed pivot, means for moving the frame in either direction on said pivot, and an operator's platform secured to the rear of said bracket so as to move said main frame, and said platform having a guard approximately waist high to an operator, and side edges upturned at an angle to facilitate the operator's standing on the platform as the frame is leaned.

9. In a road grader, a front axle assembly, a rear axle assembly, a main frame comprising a plurality of longitudinal members in truss form with a frame post at the front thereof and a relatively wide triangular bracket at the rear, a ball at the bottom of said frame post disposed in the front axle to form a universal joint, a pivot pin extending through the lower corner of said bracket and through the rear axle to form a fixed pivot, means for moving the frame in either direction on said pivot. and an operator's platform secured to the rear of said bracket so as to move with said main frame, a motor secured between said longitudinal members immediately in front of said bracket, and means immediately in front of the operator and behind said motor for inter-connecting the drive shaft of the motor and the frame moving means to incline said frame in either transverse direction.

10. In a road grader, a front axle assembly, a rear axle assembly, a main frame comprising a plurality of longitudinal members in truss form with a frame post at the front thereof and a relatively wide triangular bracket at the rear, a ball at the bottom of said frame post disposed in the front axle to form a universal joint, a pivot pin extending through the lower corner of said bracket and through the rear axle to form a fixed pivot, means for moving the frame in either direction on said pivot, and an operator's platform secured to the rear of said bracket so as to move with said main frame, a motor secured between said longitudinal members immediately in front of said bracket, and a gear box secured to the top of said bracket adapted to be operated from a standing position on said platform to interconnect the motor drive shaft with the frame moving means or other adjustable grader elements to drive the same in either direction.

11. In a power adjusted road grader, a front axle assembly, a rear axle assembly, a main frame pivoted to said axles to permit sidewise tilting thereof, a source of power carried by the grader frame, a gear segment on said rear axle, a shaft journaled in the frame transversely thereof, and having a worm meshing with said segment adapted to be turned to tilt the frame, a worm gear also carried by said shaft, a driving worm meshing with said worm gear and a gear box having a connection to said driving worm and carried by the frame, said gear box being adapted to form a power connection between the motor and said driving worm to drive the same in either direction to tilt said frame.

12. In a power adjusted road grader, a front axle assembly, a main frame having a frame post at the front thereof and a triangular bracket at the rear, a universal joint connection between said frame post and said front axle, a pivot pin extending through the lower corner of said triangular bracket and the rear axle to pivot the rear portion of the frame to said axle, a gear segment carried by said rear axle, a shaft journaled in said frame bracket transversely thereof and having a worm meshing with said segment, and means carried by the frame for driving said worm in either direction to tilt the frame.

13. In a power adjusted road grader, a front axle assembly, a rear axle assembly, a main frame having a frame post at the front thereof and a triangular bracket at the rear, a universal joint connection between said frame post and said front axle, a pivot pin extending through the lower corner of said triangular bracket and the rear axle to pivot

the rear portion of the frame to said axle, a gear segment carried by said rear axle, a shaft journaled in said frame bracket transversely thereof and having a worm meshing with said segment, a motor carried by the frame, a gear box of the character described secured to said bracket above said transverse shaft, a connection between the motor drive shaft and said gear box, and a driving connection from said gear box to said transverse shaft.

14. In a power adjusted road grader, a front axle assembly, a rear axle assembly, a main frame having a frame post at the front thereof and a triangular bracket at the rear, a universal joint connection between said frame post and said front axle, a pivot pin extending through the lower corner of said triangular bracket and the rear axle to pivot the rear portion of the frame to said axle, a gear segment carried by said rear axle, a shaft journaled in said frame bracket transversely thereof and having a worm meshing with said segment, a motor secured to the frame in front of said frame bracket, a gear box of the character described secured on top of said bracket and above said transverse shaft, a connection between the motor shaft and said gear box, a driving connection between the gear box and said transverse shaft, operating and controlling means on the gear box at the rear thereof, and an operator's platform secured to said bracket in the rear of said gear box and within easy reach of said operating means.

15. In a power adjusted road grader, a front axle assembly, a rear axle assembly, a main frame having a frame post at the front thereof and a triangular bracket at the rear, a universal joint connection between said frame post and said front axle, a pivot pin extending through the lower corner of said triangular bracket and the rear axle to pivot the rear portion of the frame to said axle, a gear segment carried by said rear axle, a shaft journaled in said frame bracket transversely thereof and having a worm meshing with said segment, a motor secured to the frame in front of said frame bracket, a gear box of the character described secured on top of said bracket and above said transverse shaft, a connection between the motor shaft and said gear box, a worm gear on said transverse shaft, a vertical shaft journaled in the bracket and having a worm thereon meshing with said worm gear to drive the same, a horizontal shaft projecting from the gear box, and a bevel gear connection between said vertical shaft and said horizontal shaft.

16. In a road grader a front axle assembly, a rear axle assembly, a main frame comprising a truss frame with a frame post at the front thereof and a bracket at the rear, a universal joint connection between said frame post and front axle, a pivot pin extending through the rear bracket and through the rear axle to form a standard pivot connection, a gear segment secured integral with the rear axle, a gear carried by the frame and meshing with said segment and power means carried by the grader frame for turning said gear in either direction to incline the frame with respect to said axles.

In witness whereof, I hereunto subscribe my name this 1st day of May, 1928.

CLYDE B. FAVERTY.