No. 649,594. Patented May 15, 1900.

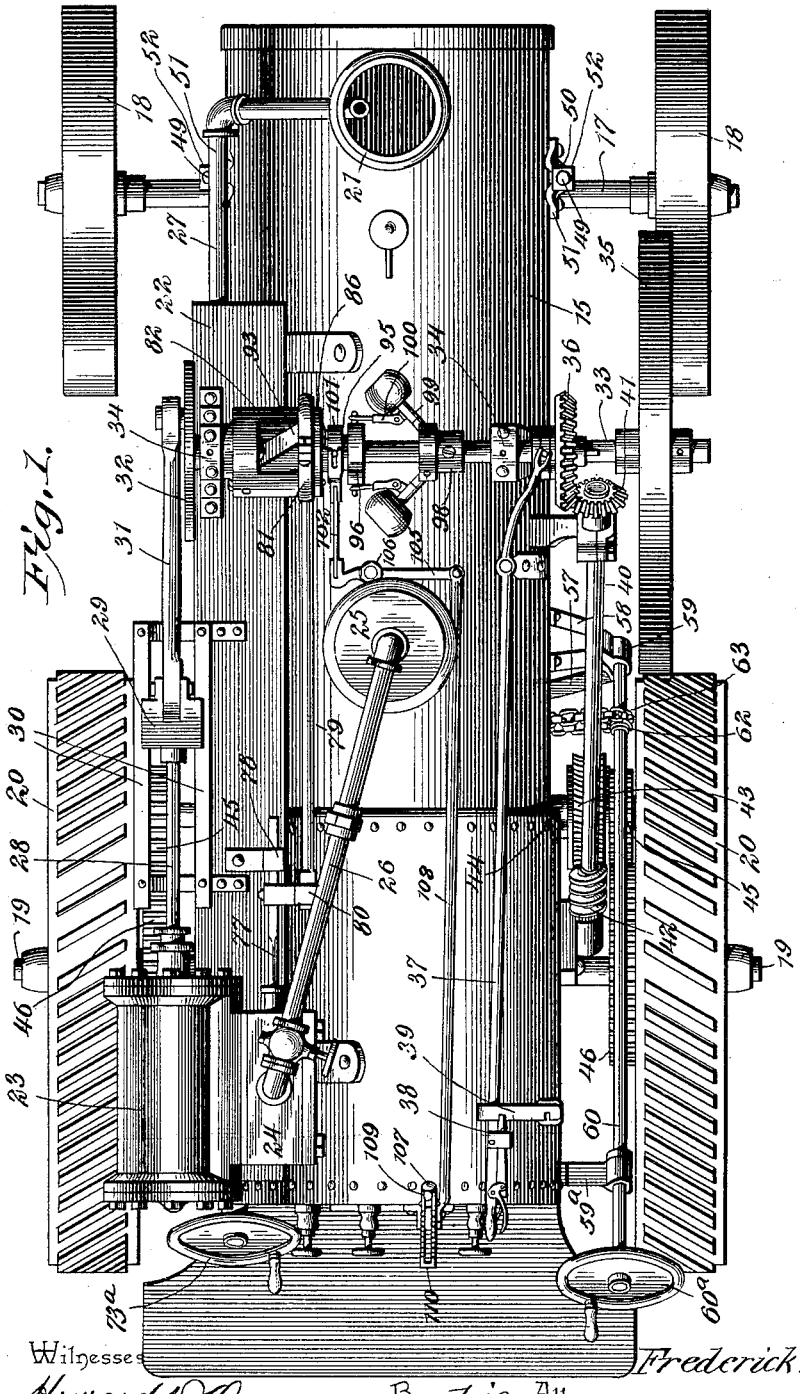
F. W. BOHN.

TRACTION ENGINE.

(Application filed Nov. 21, 1899

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses
Howard K. Orr.
W. J. Berukoff

Frederick W. Bohn, Inventor,
By his Attorneys.
C. A. Snow & Co.

No. 649,594. Patented May 15, 1900.

F. W. BOHN.

TRACTION ENGINE.

(Application filed Nov. 21, 1899.)

(No Model.) 4 Sheets—Sheet 2.

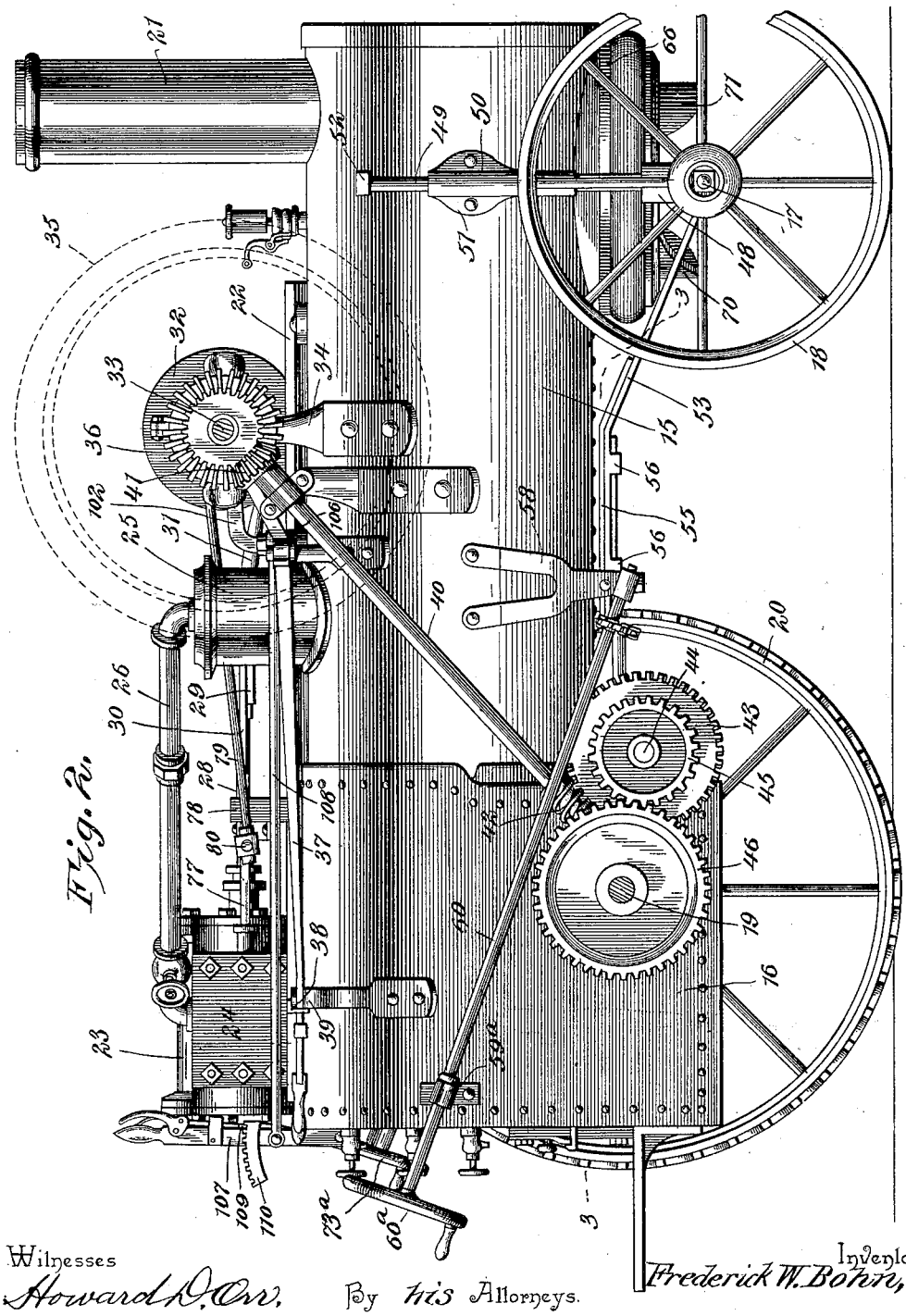


Fig. 2.

Witnesses
Howard D. Orr.
W. J. Benhoff

By his Attorneys.
C. A. Snow & Co.

Inventor,
Frederick W. Bohn,

No. 649,594. Patented May 15, 1900.

F. W. BOHN.

TRACTION ENGINE.

(Application filed Nov. 21, 1899.)

(No Model.) 4 Sheets—Sheet 3.

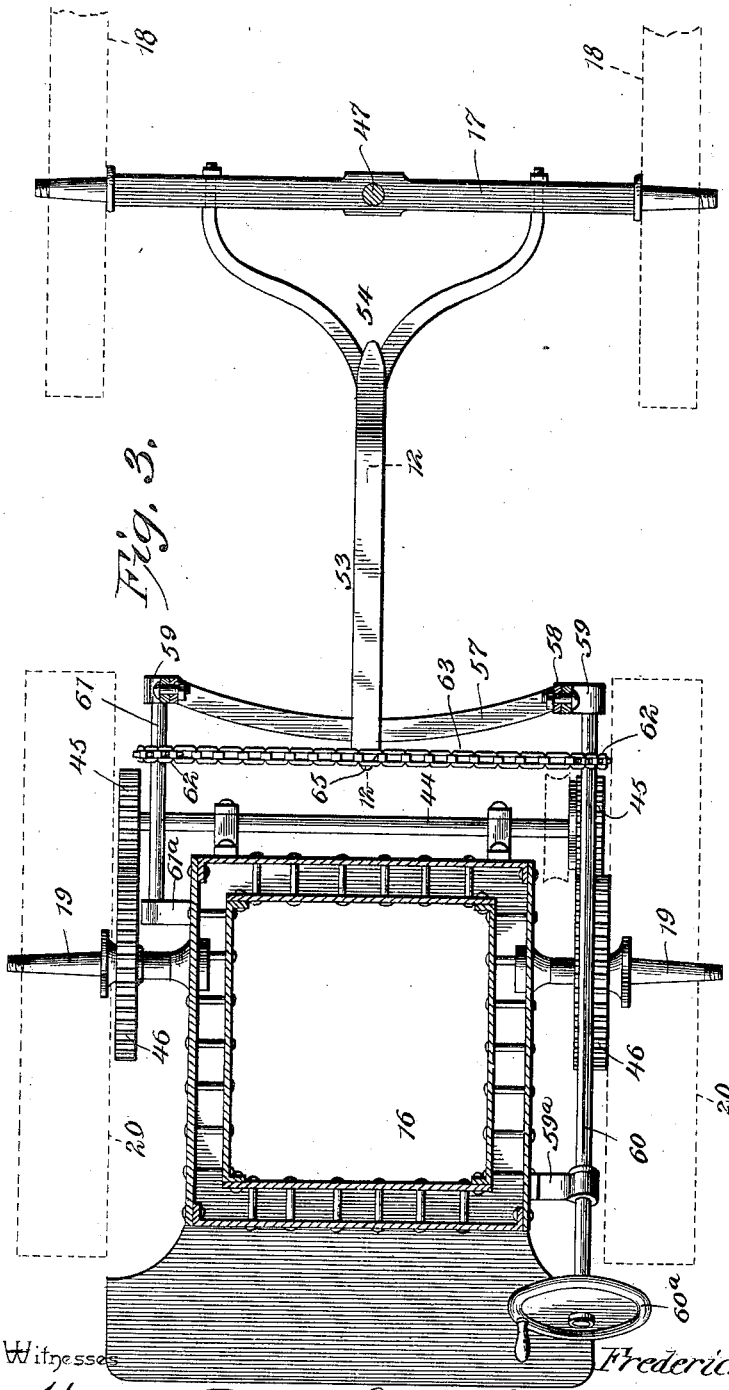


Fig. 3.

Witnesses
Howard P. Orr.
H. J. Bernhof

Frederick W. Bohn, Inventor,
By His Attorneys,
C. A. Snow & Co.

No. 649,594. Patented May 15, 1900.

F. W. BOHN.

TRACTION ENGINE.

(Application filed Nov. 21, 1899.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

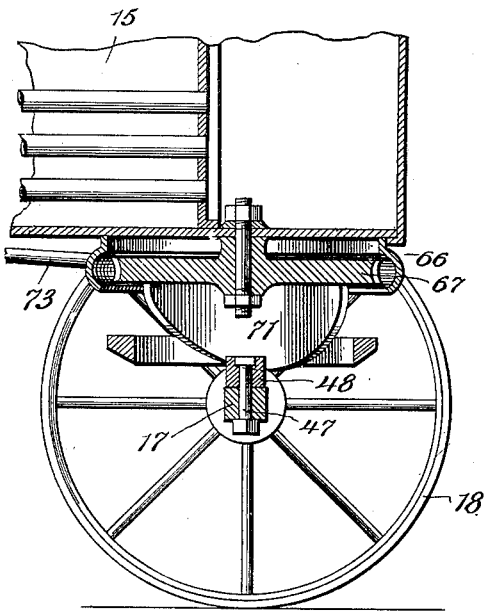


Fig. 5

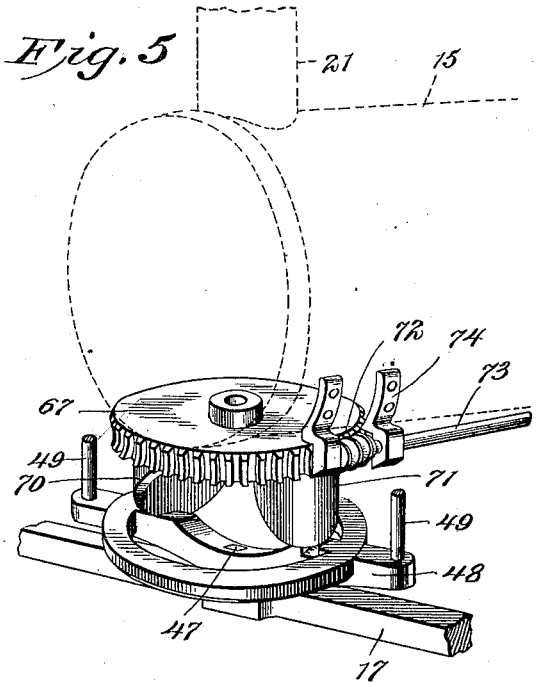
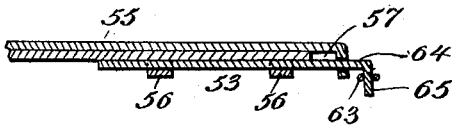


Fig. 6.



Witnesses
Howard D. Orr.
H. J. Berndorf

Frederick W. Bohn, Inventor,
By his Attorneys,
C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

FREDERICK W. BOHN, OF INDEPENDENCE, WISCONSIN, ASSIGNOR OF ONE-HALF TO MATH ELSTAD, OF SAME PLACE.

TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 649,594, dated May 15, 1900.

Application filed November 21, 1899. Serial No. 737,802. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. BOHN, a citizen of the United States, residing at Independence, in the county of Trempealeau and State of Wisconsin, have invented a new and useful Traction-Engine, of which the following is a specification.

My invention relates to improvements in traction-engines; and one object in view is to provide means for raising or lowering the head or front end of the engine-boiler for the purpose of adjusting the apparatus so that the boiler will assume a substantially-horizontal position on uneven ground, such adjusting means including cam devices for exerting a strong lifting effect and also embodying means for locking the parts in their adjusted positions.

A further object of the invention is to provide an improved type of steering-gear operable from a single rod and including an endless chain and a slidable connection between said chain and an axle-arm, said slidable connection serving to compensate for variation in the paths of movement of said chain and the axle-arm.

A further object is to provide an improved type of power-transmission gearing for increasing the propulsive effect of the engine on the traction-wheels and obviating the employment of a brake mechanism.

With these ends in view the invention consists in the novel combination of mechanisms and in the construction and arrangement of the various parts for service, as will be hereinafter fully described and claimed.

In the accompanying drawings I have represented a traction-engine which embodies the several features of my invention in their preferred form, and to these drawings I shall now refer in order to explain more clearly the nature of the invention and the manner in which the same is or may be carried into effect.

Figure 1 is a plan view of my improved traction-engine. Fig. 2 is a side elevation with the traction-wheel on one side removed in order to clearly show certain parts of the engine. Fig. 3 is a sectional plan view taken in the plane indicated by the dotted line 3 3 of Fig. 2 for the illustration of the steering mechanism. Fig. 4 is a vertical section through the front part of the boiler and through the front axle, illustrating the cam-and-worm mechanism for raising or lowering said end of the boiler. Fig. 5 is a detail perspective view of said lifting and adjusting mechanism for the boiler, illustrating the bolster and a part of the pivoted axle, the boiler being indicated by dotted lines. Fig. 6 is a detail sectional view on the line 12 12 of Fig. 3 to show the slidable latch which connects the swinging arm of the pivoted axle with the transversely-movable endless chain, said parts forming elements of a steering mechanism.

The same numerals of reference denote like and corresponding parts in each of the several figures of the drawings.

The boiler 15 of the engine is equipped with a fire-box 16, and under the front or head end of the boiler is arranged the usual pivotal axle 17, that receives the supporting-wheels 18. The stub-axles 19 are secured fast to opposite sides of the fire-box for the reception of the traction-wheels 20, that serve to support the rear end of the engine, said traction-wheels being positively driven and adapted to propel the engine over the road. The stack 21 communicates with the smoke-box at the front end of the boiler, and upon one side of the boiler is fixed the exhaust box or casing 22. The piston-cylinder 23 of the engine is made fast with the exhaust-box, and on one side of the cylinder is an ordinary valve-chest 24, the latter having valved communication with the piston-cylinder and also communicating with the exhaust-box to discharge the exhaust-steam thereto. The steam-dome 25 is connected by a steam-pipe 26 with the valve-chest, and from the exhaust-box leads the exhaust-pipe 27, which discharges the exhaust-steam to the stack. The piston-rod 28 connects in the usual way with the cross-head 29, mounted on the engine-slides 30, which slides are shown as being supported by the exhaust-box. The pitman 31 is connected with the engine cross-head and to a wrist-pin on a crank-disk 32, the latter being made fast with one end of the transverse horizontal engine-shaft 33, which is mounted in suitable bearings 34, herein shown as fastened to the boiler and to the exhaust-box, respectively,

one end of said engine-shaft being equipped with the usual fly-wheel 35. All these parts of the engine are or may be of the usual or any preferred construction known to the art, and the engine is furthermore equipped with appliances or accessories such as are usually employed in structures of this character.

The power for the propulsion of the engine is transmitted from the engine-shaft to the traction-wheels by the following mechanism: A bevel-gear 36 is keyed on a part of the engine-shaft adjacent to the fly or belt wheel thereof so as to have a limited slidable movement on said shaft. A forked end of the shipping-lever 37 is loosely connected with this bevel-gear, said lever being fulcrumed in a suitable way on the boiler and provided at its rear end with a latch 38, the latter adapted to engage with a rack 39. An inclined power-transmitting shaft 40 is journaled on suitable bearings on the right-hand side of the boiler, and this shaft is provided at one end with a bevel gear-pinion 41 and at its opposite end with a worm 42. The bevel-gear 41 is disposed in close relation to the engine-shaft and in the path of the gear 36 thereon, so that the lever 37 may be adjusted to move the gear 36 into intermeshing engagement with the gear 41, thus communicating the motion of the engine-shaft to the transmitting-shaft; but an adjustment of the lever 37 in a direction to throw the gear 36 out of mesh with the bevel-gear 41 throws the traction-wheels out of gear with the engine-shaft, so that the apparatus as a whole may remain in a stationary position, while the engine-shaft may be driven by the engine in the usual way. A horizontal counter-shaft 44 is journaled in suitable bearings on the front side of the fire-box and under the boiler. This counter-shaft is provided with a worm-gear 43, having intermeshing engagement with the worm 42 on the transmitting-shaft. The counter-shaft is furthermore provided with gear-pinions 45, secured to the respective ends thereof, said pinions having intermeshing engagement with spur gear-wheels 46, which are made fast with the hubs of the traction-wheels, whereby the worm-connected transmitting and counter shafts may communicate the motion of the engine-shaft to the traction-wheels for the propulsion of the engine. I attach importance to the employment of the worm-gearing in the power-transmitting mechanism for the reason that this type of gearing increases the propulsive effect on the traction-wheels and serves as a lock for the traction-wheels, so that the apparatus cannot move any faster than it is propelled by the engine, and the employment of a brake is obviated.

A vertical king-bolt 47 serves as the pivotal connection between the front axle and a bolster 48. This bolster is arranged below the head end of the boiler, so as to lie between the latter and the axle, and said bolster is connected slidably with said end of the boiler for the purpose of permitting the latter to be raised or lowered within certain limits and at the same time maintain the bolster and the boiler in proper relation one to the other. This slidable connection is obtained by the employment of guide-rods 49 and the guide-sleeves 50. The guide-rods are secured firmly to the end portions of the bolster, so as to extend upwardly therefrom on opposite sides of the boiler.. The guide-sleeves 50 are provided with attaching-plates 51, which are secured firmly to opposite sides of the boiler, and in these sleeves are loosely fitted the guide-rods, suitable stop-nuts 52 being secured to the upper ends of the guide-rods to limit the upward movement of the sleeves. Between the boiler and the bolster are arranged certain operating parts of an adjusting mechanism to be hereinafter described for the purpose of leveling the boiler.

I will now proceed to describe the steering mechanism which I have invented for the guidance of the engine in its travel over the roads. An arm 53 is forked or bifurcated, as at 54, so that the same may be fastened securely to the pivoted axle on opposite sides of the king-bolt, whereby the arm is disposed in a horizontal position beneath the boiler and is made fast with the front axle, so as to swing in a horizontal plane with the king-bolt as the vertical axis of movement. The rear end of this axle-arm is provided with a guide-lip 55, and on the under side of the arm are the keepers 56, two or more in number, said guide-lip and the rearmost keeper being in spaced relation, so as to permit a horizontal curved guide-bar 57 to fit between the lip and said keeper. The guide-bar is disposed in a horizontal position between the axle and the fire-box, so as to lie concentric with the king-bolt, and said axle-arm rests loosely upon the guide-bar, so as to be supported thereby and to travel freely thereon. The ends of the guide-bar are secured firmly to the hangers 58, which are fastened to opposite sides of the boiler, and these hangers are provided with the shaft-bearings 59. A steering-rod 60 is arranged on the right-hand side of the boiler and in an inclined position the reverse of the transmitting-shaft 40, the lower end of said steering-rod being journaled in a bearing of one hanger 58, while the upper part of the hub is supported by a bearing 59^a. The rear extremity of this steering-rod is provided with a hand-wheel 60^a, which is disposed within convenient reach of the engineer. An idle shaft 61 is disposed on the opposite or left-hand side of the boiler and in parallel relation to the steering-rod 60, said idle shaft being supported at one end in a bearing 59 of the left-hand hanger 58 and the other end of said shaft being journaled in a bearing 61^a, which is fast with the boiler. Sprocket-pinions 62 are made fast with the steering-rod and the idle shaft, respectively, and these sprocket-pinions are in line with each other transversely across the boiler for the recep-

tion of an endless sprocket-chain 63, which is operatively fitted to said sprocket-pinions. This chain extends across and below the boiler, and it is supported by the steering-rod and the idle shaft in close relation to the rear extremity of the swinging axle-arm 53. A latch 64 connects the axle-arm with a link of the chain in a manner to compensate for the difference in the movement of the arm and the chain, which, it will be observed, provides for a movement of the chain in a straight endless path, while the arm swings around the king-bolt as the axis of motion for its free rear end to move in an arc of a circle. The latch 64 is slidably fitted in the keepers 56 and in an opening of the lip 55, so that the latch is free to have a limited longitudinal movement on the swinging axle-arm, and this latch is provided at its rear free end with a stud 65, which fits in one of the links of the sprocket-chain. It will be observed that the latch and the free end of the arm 53 loosely embrace the curved guide-bar 57. As the arm swings in one direction to turn the axle on the king-bolt and to approach one end of the curved bar the latch is drawn outward and rearward, while it remains in engagement with the arm and the chain; but when the arm assumes a position (shown by Fig. 3) in the plane of the longitudinal axis of the boiler the latch is moved inward and forward, whereby the latch connects the axle-arm and the chain under all positions of adjustment of the front axle. The steering-rod 60 may be turned in one direction to propel the chain toward the right, and thus turn the axle-arm and the axle in a corresponding direction; but a reverse adjustment of the steering-rod moves the chain and the parts connected therewith to the left.

I will now proceed to describe the mechanism which is interposed between the bolster 48 and the head end of the boiler for the purpose of raising and lowering said boiler in order that it may assume a substantially-horizontal position when the engine rests on uneven ground. An annular race 66 is made fast in any suitable way with the under side of the boiler, so as to assume a position concentric with the king-bolt 47. This annular raceway serves as a housing for a combined element, which embraces a worm-gear 67 and the lifting-cams 70 71, the parts of said element being made, preferably, of a single piece of metal, although the cams may, if desired, be made separate from the gear and united firmly thereto. The gear 67 has a hub which bears against the under side of the boiler, as shown by Fig. 4, and through this hub passes the supporting-bolt 68, which is provided with nuts 69, that serve to firmly attach the bolt to the boiler and to confine the worm-gear loosely on said bolt. This worm-gear is arranged within the raceway or housing, so as to be protected thereby from accumulations of dirt, &c., and said worm-gear is loosely supported on the front end of the boiler in a manner which permits said gear to turn freely. The cams 70 71 are semicircular in horizontal section, with curved lower edges, and they are disposed on opposite sides of the worm-gear. Said cams depend from the plane of the gear to present their inclined or curved lower edges to the upper face of the bolster, and when the boiler and the gear are lowered this bolster is received in the spaces between the ends of the cams, thus permitting the gear to rest upon the bolster. A partial rotation of the worm-gear causes the cams to turn therewith, so that the lower edges of said cams will ride upon the bolster and exert a lifting effect against the front end of the boiler. The elevation of the boiler depends upon the angular distance traversed by the cams under the rotary impulse of the worm-gear; but by turning the worm-gear in the opposite direction to reverse the cams permits the front end of the boiler to lower itself by the weight or gravity thereof. The housing or race 66 is cut away at one side of the boiler, as at 72, so as to expose a section of the toothed surface on the perimeter of the worm-gear.

73 designates an adjusting-spindle which extends longitudinally of the boiler, preferably at the left-hand side thereof, and it is journaled in suitable bearings 74 on the boiler, said spindle having a hand-wheel 73^a at its rear extremity. The front part of the spindle is provided with a worm 75, which projects through the recess 72 and has intermeshing engagement with the teeth of the worm-gear. By turning this rod in one direction the worm-gear may be rotated for the cams to ride upon the bolster, and thereby elevate the head end of the boiler. I prefer to make each cam a double cam, so that the rod and worm-gear may rotate in one direction for the elevation and lowering of the boiler; but, if desired, the rod may be turned first in one direction and then in another to secure the desired adjustment of the boiler in a vertical plane. The worm-gearing between the cams and the adjusting-spindle is an important feature of my adjusting mechanism for the boiler, as I am enabled thereby to utilize the well-known locking action of this type of gearing. It follows that the cams will be held in their adjusted position by the engagement of the worm-gear with the worm on the adjusting-spindle, so as to sustain the weight of the front part of the boiler, and the locking mechanism for the rod is rendered entirely unnecessary.

Changes within the scope of the appended claims may be made in the form and proportion of some of the parts, while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described the invention, what I claim is—

1. In a traction-engine, means for raising and lowering one end of the boiler compris-

ing a worm-gear having a lifting-cam movable therewith, a surface upon which the cam is adapted to ride, and a worm meshing with the worm-gear, substantially as described.

2. In a traction-engine, means for raising and lowering one end of the boiler comprising a bolster, a worm-gear mounted on the boiler and provided with lifting-cams engaging with the bolster, and a worm meshing with the worm-gear, substantially as described.

3. In a traction-engine, the combination with a boiler, of a bolster connected slidably therewith, and lifting mechanism between the boiler and bolster, said mechanism comprising lifting-cams rotatably mounted upon the boiler and slidably engaged with the bolster, and means for rotating the cams, substantially as described.

4. In a traction-engine, the combination with a boiler, of a bolster connected with the boiler to restrain the latter from displacement on the bolster and to permit a limited movement of the boiler relative to the bolster, lifting-cams between the bolster and said boiler, and means for moving the cams with relation to the bolster, substantially as described.

5. In a traction-engine, the combination with a boiler, and a bolster, of a worm-gear supported by the boiler, lifting devices actuated by the worm-gear to move the boiler relatively to the bolster, and a worm meshing with said worm-gear, substantially as described.

6. In a traction-engine, the combination with a boiler, and a bolster, of a worm-gear provided with cams arranged to ride upon the bolster, and a spindle having a worm meshing with said gear, substantially as described.

7. In a traction-engine, the combination with a boiler, and a bolster, of a worm-gear, cams spaced on said gear to receive said bolster in one position of the gear, and a worm meshing with said gear, substantially as described.

8. In a traction-engine, the combination with a boiler, and a bolster, of a worm-gear provided with depending cams, a bolt fast with the boiler and having the worm-gear mounted loosely thereon, and a worm-spindle meshing with said gear, substantially as described.

9. In a traction-engine, the combination with a boiler, and a bolster, of a housing fast with the boiler, a worm-gear provided with cams and mounted on the boiler within said housing, a spindle, and a worm meshing with the gear, substantially as described.

10. In a traction-engine, the combination with a boiler, and a bolster, of guide-rods fast with one of said parts, sleeves fast with the other part and fitted slidably on said rods, a worm-gear supported by the boiler and having cams arranged to ride upon the bolster, and a worm meshing with said gear, substantially as described.

11. In a traction-engine, the combination with an axle, and a steering-rod, of an arm movable with said axle, a chain actuated by the rod, and a compensating connection between said arm and the chain, substantially as described.

12. In a traction-engine, the combination with a pivoted axle, and a steering-rod, of a swinging arm fast with the axle, an endless chain driven by the steering-rod, and a slidable element confined on the swinging arm and connected with said chain, substantially as described.

13. In a traction-engine, the combination with a pivoted axle, and a steering-rod, of a fixed arm or bar, a swinging arm fast with the axle and supported slidably by the fixed bar, an endless chain actuated by the steering-rod, and a slidable latch connected with the chain and confined on the swinging arm, substantially as described.

14. In a traction-engine, the combination with a pivoted axle, of a steering-rod and an idle shaft disposed on opposite sides of the boiler and having the sprocket-pinions, a chain adapted to said pinions, a swinging arm fast with the axle, and a sliding element connected to the chain and confined on the swinging arm, substantially as described.

15. In a traction-engine, the combination with an engine-shaft, and traction-wheels, of a horizontal transverse shaft geared to said traction-wheels, a gear upon the engine-shaft, a transmitting-shaft operatively engaged with the gear on the engine-shaft, a worm-gear on the transverse shaft, a worm fast with the transmitting-shaft and intermeshing with the gear on said transverse shaft, and a clutch upon the engine-shaft for engaging and disengaging the gear on the shaft to cause it to rotate with the shaft at times, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

FREDERICK W. BOHN.

Witnesses:
GEO. A. MARKHAM,
ANDREW PAGON.