No. 620,030.

Patented Feb. 21, 1899.

J. McF. HAMILTON.

TRACTION ENGINE.

(Application filed Sept. 8, 1898.)

(No Model.)

4 Sheets—Sheet 1.

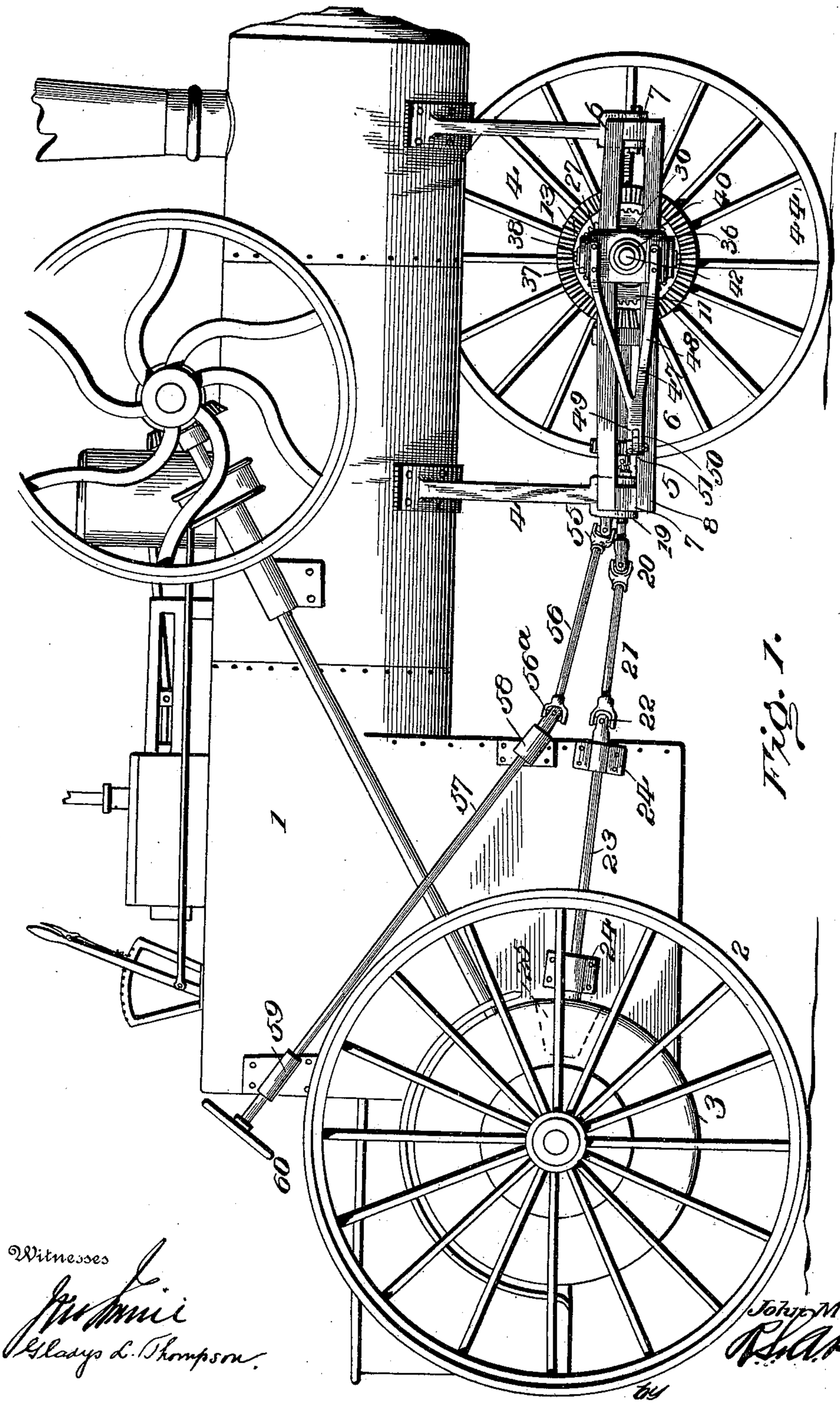

Fig. 1.

Witnesses

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4 Sheets—Sheet 2.

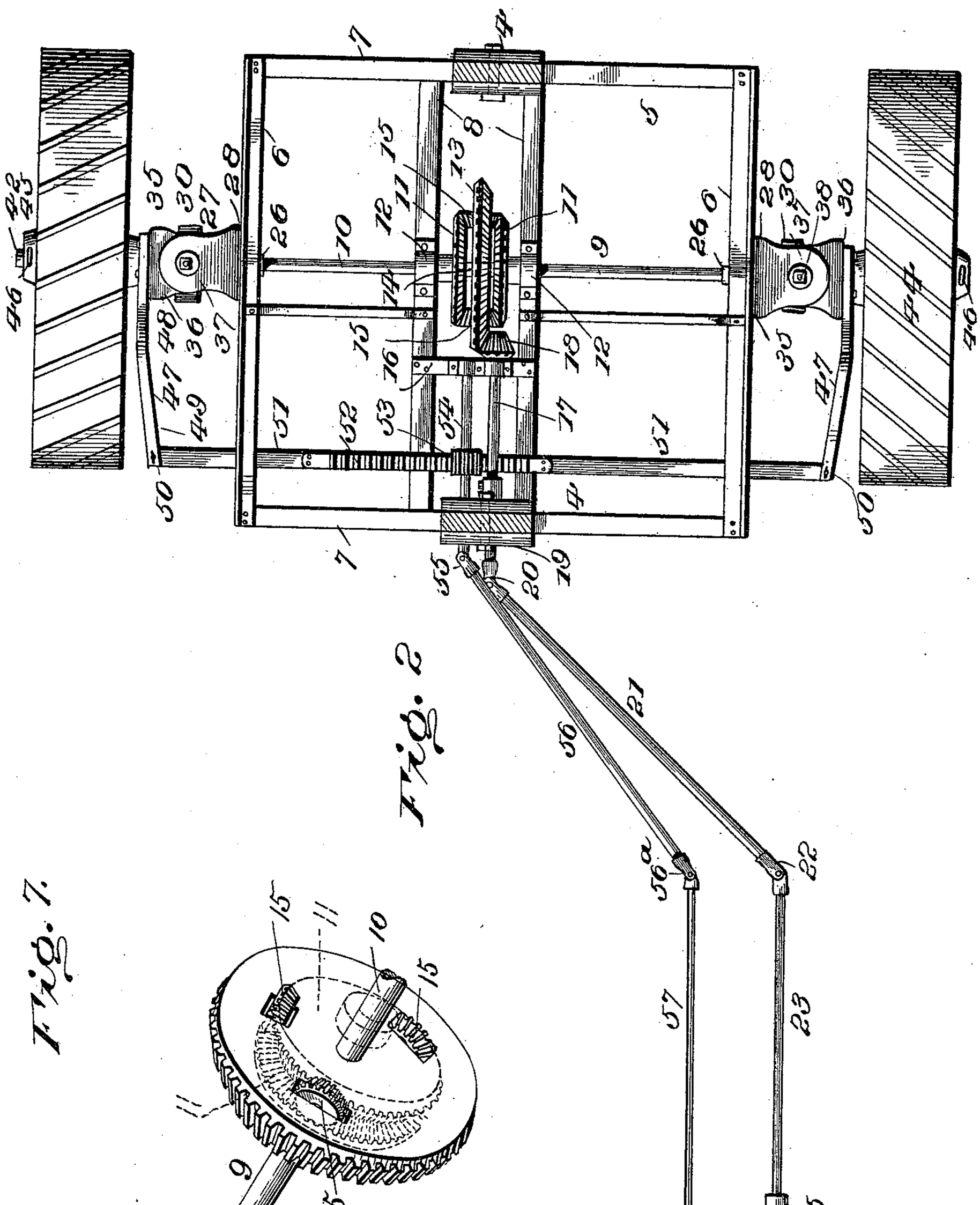

Fig. 2.

Fig. 7.

Witnesses

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No. 620,030. Patented Feb. 21, 1899.

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(No Model.) 4 Sheets—Sheet 3.

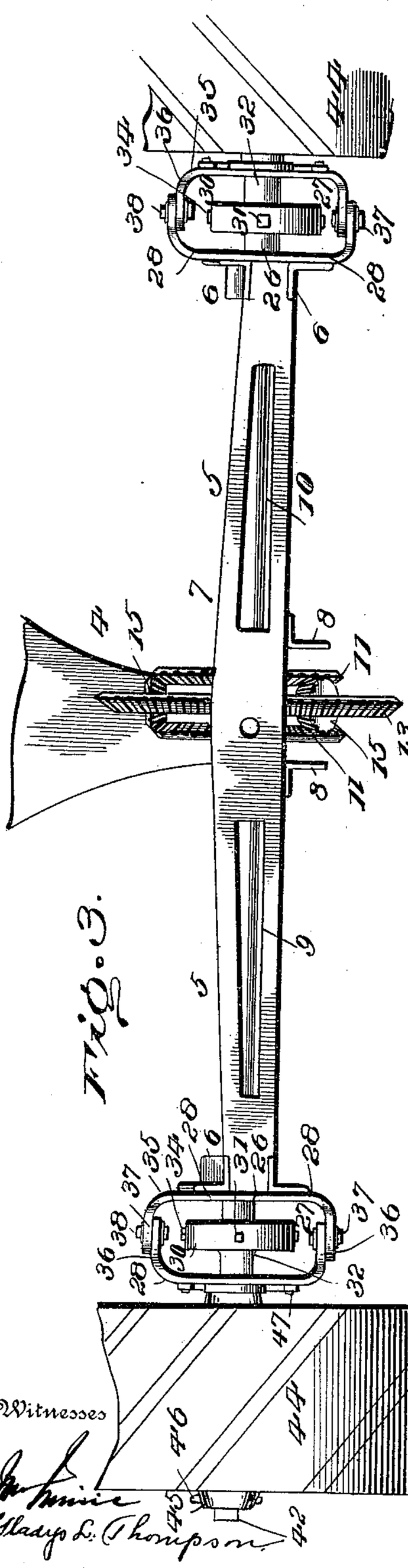

Fig. 3.

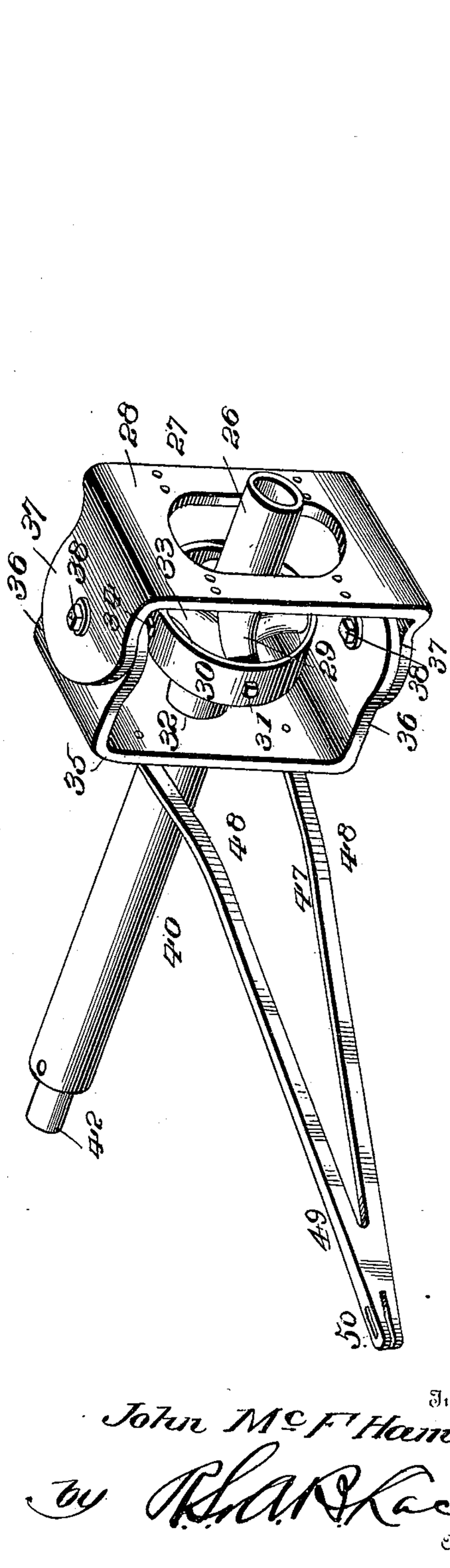

Fig. 4.

Witnesses

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Patented Feb. 21, 1899.

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(Application filed Sept. 8, 1898.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 5.

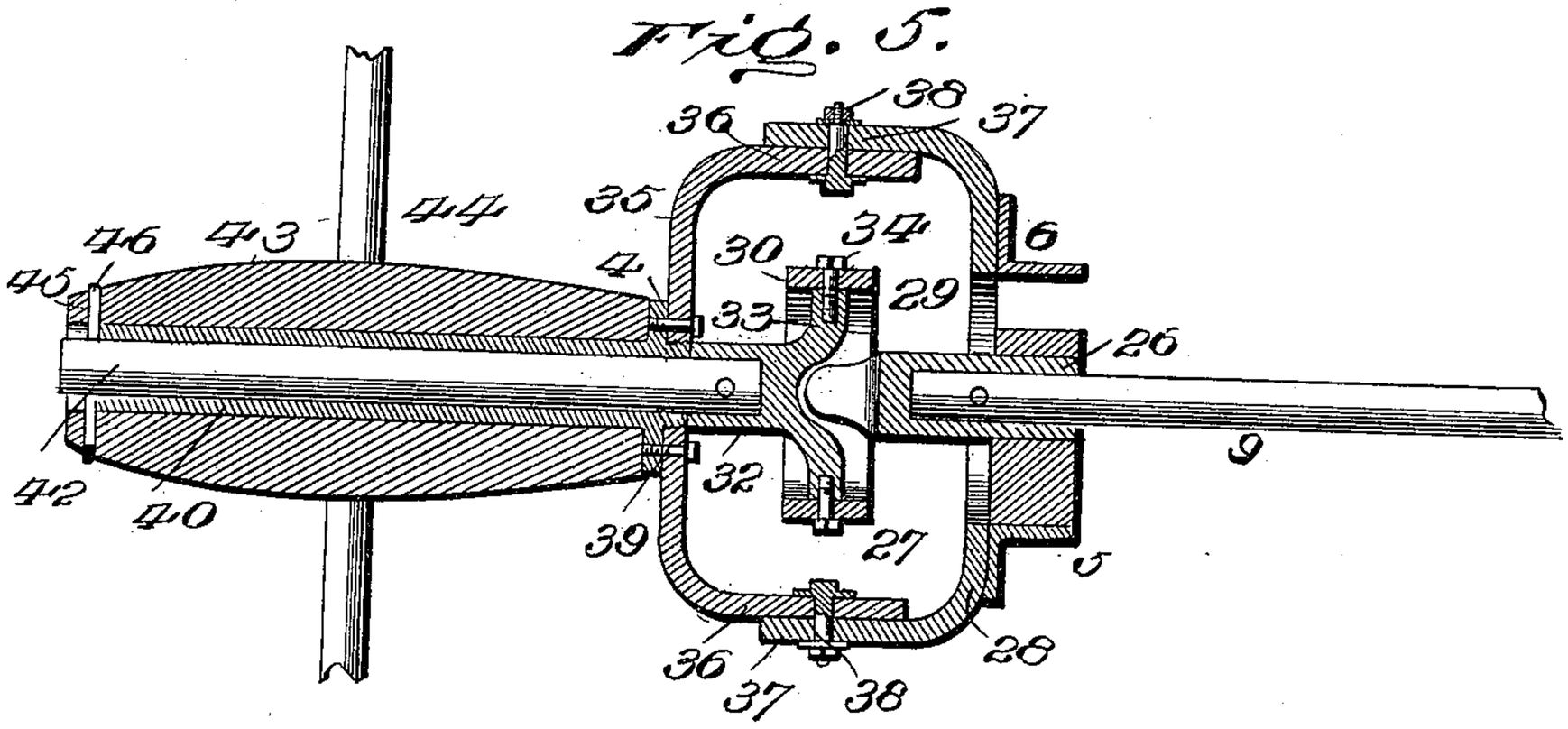


Fig. 6.

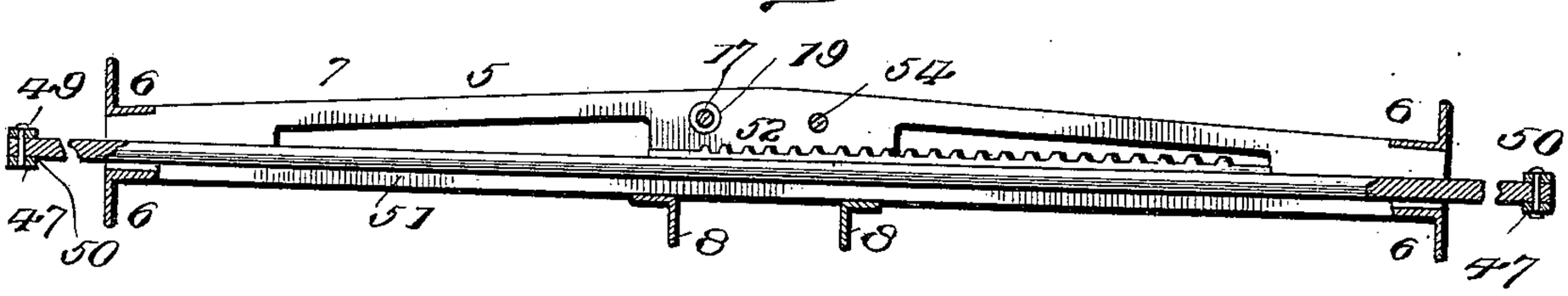
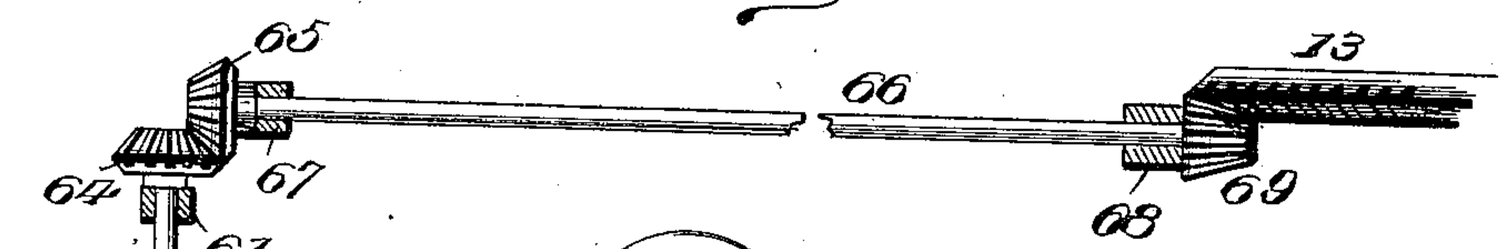


Fig. 8.



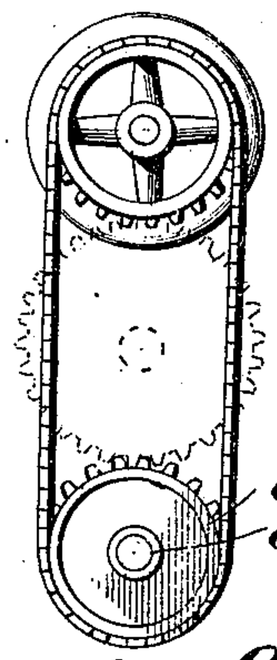


Fig. 9.

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN McFARION HAMILTON, OF DAVIS CITY, IOWA.

TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 620,030, dated February 21, 1899.

Application filed September 8, 1898. Serial No. 690,526. (No model.)

To all whom it may concern:

Be it known that I, JOHN MCFARION HAMILTON, a citizen of the United States, residing at Davis City, in the county of Decatur and State of Iowa, have invented certain new and useful Improvements in Traction-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to traction-engines; and it consists of the construction and arrangement and combination of the several parts, which will be more fully hereinafter described and claimed.

The object of the invention is to locate a part of the pulling action of a traction-engine at the front and more nearly distribute and equalize the strain, wear, and tear on such devices over a greater area and facilitate an expeditious transportation of the engine itself, as well as machinery moved thereby, from one place to another and at the same time maintain a necessary sensitive steering qualification without in the least defeating the intent and purpose of the propelling effort or injuring the driving and interposed mechanisms.

In the accompanying drawings, Figure 1 is a side elevation of a traction-engine, showing the preferred form of the improved devices applied thereto. Fig. 2 is a top plan view of the front truck of a traction-engine, showing the invention in connection therewith. Fig. 3 is a rear end elevation of the device shown by Fig. 2. Fig. 4 is a perspective view of one of the knuckles and parts connected thereto. Fig. 5 is a sectional view of one of the knuckles, a front hub, and parts relatively coacting therewith. Fig. 6 is a sectional elevation of a part of the front-truck frames and the steering-bar. Fig. 7 is a detail perspective view of the compensating gearing. Fig. 8 is a sectional plan view of a modified form of a part of the device. Fig. 9 is an elevation of a part of the modified mechanism.

Referring to the drawings, wherein similar numerals are utilized to indicate corresponding parts in the several views, the numeral 1 designates a traction-engine of any preferred form and comprising rear wheels 2, having a gear 3 in connection therewith operated by the engine direct in any selected or well-known manner. The front of the engine is attached to stirrups 4, which extend downwardly and are secured to the front truck 5 (more clearly shown in Fig. 2) and including side sills or beams 6, formed of box-steel and connected at the ends by cross beams or ties 7, to which the opposite ends of a pair of supports 8 are bolted or otherwise fixed. The lower ends of the stirrups embrace the cross beams or ties 7, and the connecting-bolts for said parts at this point fit in enlarged openings or slots in the beams or ties to compensate for shocks or jars of the front wheels and avoid too much stiffness in the connections. The supports 8 are spaced apart and arranged parallel with the sills or beams 6. The parts of the truck as thus specified are subject to change, and the precise arrangement stated is only one form of many that could be used to afford a convenient mode of applying the mechanism hereinafter described and constituting the invention. The front axle in this instance is composed of two parts 9 and 10, which can operate or act independently and bearing in the sills or beams 6 and the supports 8. The said parts of the axle are in alinement, the inner ends standing directly opposite between the supports 8 and having gears 11 keyed therein and provided with inner beveled teeth. On the supports 8 journal-boxes 12 are mounted to receive the inner portions of the parts 9 and 10, and between said gears 11 a main controlling-gear 13 is located and held continuously at equal distance from each of said gears 11 by a central sleeve 14, running loose on suitable projections or bearings at the center of said latter gears. The gear 13 is larger than the gears 11 and has beveled teeth on one side only, and in the same at regular intervals bevel-pinions 15 are freely mounted and are held in mesh with the teeth of the said gears 11. The pinions 15 have a rotation in either direction on bearings arranged triangularly in the body of the gear 13 and by such position equalize the pull and overcome any tendency to jerk or jam owing to irregularities which will be hereinafter stated. In a cross-bar 16, in rear of the gearing just described and secured to the supports 8, a short longitudinally-disposed shaft 17 has

bearing, and on the front end is fixed a bevel-pinion 18, which is in continual mesh with the teeth of the gear 13. A box or sleeve 19 is secured in the rear stirrup 4 and rear cross-beam 7, through which passes the shaft 17, the latter having connected to the rear end thereof by a knuckle 20 the front end of a shaft-coupling section 21, with a knuckle 22 on its rear end attached to the front end of a driving-shaft 23, bearing in a box 24 on the outer front portion of the fire-box of the engine. On the rear end of said driving-shaft a bevel-pinion 25 is made fast and engages the gear 3 of the rear wheels and axle, and as the latter is rotated the motion is transmitted, through the shaft 23, section 21, shaft 17, and pinion 18, to the gear 13.

The outer ends of the parts 9 and 10 of the front axle are fitted in and bolted to sleeves 26 of knuckles 27, said sleeves being journaled in the sills or beams 6 and extending through inner shields 28, bolted fast to the outer sides of said sills. Each knuckle 27 is a duplicate of the other, and the outer end of each sleeve 26 has two divergent arms 29 projecting therefrom and secured to the inner side of a ring 30 by screws or analogous fastenings 31. (See, particularly, Figs. 4 and 5.) Another sleeve 32 projects from the opposite side of the ring and is secured to the latter by arms 33, arranged at an angle to the arms 29 and fastened also by screws or analogous devices 34. By means of the position of the arms 29 and 33, as specified, a compound pivotal connection is formed, and the propelling power is applied to the ring 30 in one plane or direction and transmitted therefrom in another, thereby materially reducing the strain on the coupling established through said ring and obviating any tendency to an interposed resistance to an effective revolution. An outer shield 35 is pivoted at upper and lower inwardly-extending portions 36 to similar embracing outwardly-projecting parts 37 of the shield 28 by bolts 38. The shield 35 is thus free to turn in a horizontal plane within the shield 28, and the sleeve 32 has its outer end abutting against the inner central part of the shield 35 and in line with a screw-threaded opening 39 in the latter. In the said opening 39 the rear end of a skein or thimble 40 is screwed and has a shoulder 41 bolted to the adjacent part of the shield 35 to prevent unscrewing and loosening of the said skein or thimble by the movements of the several contiguous parts. The rear end of a stub-axle 42 is made fast in or coupled to the sleeve 32 and passes outwardly through and beyond the outer end of the skein or thimble 40. On the opposite skeins or thimbles the hubs 43 of front wheels 44 are mounted, and said hubs have outer end projections 45 over the parts of the axles 42, extended beyond the said skeins or thimbles, in which and the said outer ends of the axles key-bolts 46 are inserted to thereby lock these wheels to the stub-axles and cause a uniform rotation of both parts through the connections set forth and by the power applied to the two parts 9 and 10 of the sectional front axle.

As previously described, the shields 35 are pivotally attached to the shields 28, and to move the former shields yoke-levers 47 are employed, which are slightly bent inwardly at the rear to permit shortening of the rear parts and prevent too much lateral projection. Each lever 47 consists of a pair of arms 48, connected to the upper and lower outer portions of the shield 35, respectively, and converging equally toward the rear and merging into a bar 49, having a rear horizontally-slotted end 50. The attachment of the arms 48 to the upper and lower portions of the shields 35 distributes the shifting force equally thereon and avoids irregular wear of the pivots 38, as well as giving a greater purchase to more effectively overcome the resistance offered by the front wheels through their weight and tractive engagement to being turned for steering purposes. Near the rear cross-beam 7 and transversely movable in suitable guides is a steering-bar 51, projecting outwardly through and a suitable distance beyond the sills or beams 6, and the terminations are pivotally mounted in the rear slotted ends 50 of the levers 47. On the upper side of a portion of the bar 51 a rack 52 is secured, and meshing therewith is a pinion 53, keyed to a shaft 54, arranged parallel with the shaft 17 and having its front end engaging a suitable bearing on the bar 16. The pinion 53 is slightly longer than the width of the rack-bar to accommodate any forward or backward movement of the latter, owing to the vibration of the truck, and to always insure a proper mesh between the said pinion and the rack. The rear part of the shaft 54 extends through the rear stirrup 4 and adjacent beam 7, and through the medium of a knuckle 55 is attached thereto a coupling-rod 56, which has at its rear end a knuckle 56^a, serving as a movable connection with the front end of a steering-rod 57. This steering-rod turns in a bearing 58 on the front outer end of the fire-box of the engine, adjacent the journal or bearing 24 and also in an upper bearing 59. The rod and the bearings are obliquely positioned to bring the rear portion or end of said rod within convenient reaching distance of the operator or engineer and has thereon a suitable hand-wheel 60.

The application of the invention as thus far described has been to a traction-engine wherein the driving power is transmitted directly to the rear wheels and axles by rigid devices, and to illustrate the applicability of a part of the improvement at least to engines having yielding or flexible power-transmitting devices, such as chain belts, modifications are shown in Figs. 8 and 9 for this purpose. In these modified forms the drive-shaft 23 and its pinion 25, knuckles 22 and 20, and coupling-section 21 are dispensed with, and on the front end of the fire-box

two bearings 61 are fixed to rotatably receive a transverse shaft 62, having a sprocket-wheel 63 on its outer end and a bevel-pinion 64 on its inner end. The pinion 64 is relatively engaged by a pinion 65 on the rear end of a longitudinal shaft 66, movable in bearings 67 and 68 and having on the front end a bevel-pinion 69, similar to the pinion heretofore set forth and meshing with the gear 13. A chain belt runs from the sprocket 63 to the main driving mechanism, and the improved devices are thus equally well adapted to the class of engines employing driving chain belts, or a sprocket-wheel might be included as part of the gear 3 and connection made therefrom through a chain belt to the sprocket 63. All the knuckles set forth are to be duplicates in structural features of those described in connection with the parts 9 and 10 of the front axle and the stub-axle.

To obtain a full comprehension of the operation of the several attachments and devices heretofore enumerated, it must be primarily understood that when the engine is being propelled the rear axle and its wheels are continually operating and tending to induce locomotion irrespective of any fluctuation that may exist in the front axle constructed as set forth and that the front axle and relative devices serve only as an auxiliary to the main driving devices for the purpose of locating a part of the pulling action at the front and avoiding the concentration of the strain solely at the rear. The power transmitted to the shaft 17 through the medium of the mechanism set forth will rotate the gear 13 by means of the pinion 18 and move said gear in a forward plane. The pinions 15 are carried around with the gear 13, and this movement of said pinions propels the gears 11 and rotates the parts 9 and 10 of the front axle in the same directions under normal conditions. This motion is communicated to the stub-axles 42 through the sleeves 32, rings 30, and sleeves 26 of the knuckles 27, and the front wheels 44 are thereby propelled by power and not alone by the pushing effort of the rear wheels, as has been the usual operation. While the said front wheels exert a material influence on the transit of the engine, their effectiveness is not as competent as the rear wheels and are subject to obstructions that have to be overcome, owing to the steering qualifications thereof and reduced diameter as compared to that of said rear wheels. Consequently compensatory gearing must of necessity be used, and while in movement forwardly said front wheels will strike or be affected by variations in the surface of the road traversed—such as depressions, slight rises, sand, mud-holes, and stones—and either one or both be thereby temporarily obstructed and have to be overbalanced by the tractive force of the rear wheels tending to drive ahead and also by transmitted power to the two-part front axle in so far as it will be permitted to act. If the gearing between the inner opposing portions of the parts 9 and 10 of the front axle were rigid or had no yielding devices in connection therewith, the result would be a fracture or breakage of said gearing; but as the pinions 15 are free to run loose any chuck or stalling of the front wheels will be immediately taken up by said pinions, which will slip around in a direction opposite to that maintained for free propulsion and ease up the resistance until the said front wheels are again free and in normal condition to act as propulsive mediums, when the said pinions will run regularly and produce this desired effect. Again, in steering the engine the front wheels when shifted for this purpose will alternately form pivots on one side and move with less speed and the outer wheel in each instance travels faster. The gearing set forth also compensates for this variation, and though a resistance is offered by the pivot-wheel it is partially, at least, counteracted by what power is expended on and transmitted through the part of the front axle on which the said pivot-wheel is mounted, and this, added to the direct pushing power at the rear, materially facilitates the propulsion of the engine and increases its sensitiveness or quick responsive action in steering.

To operate the steering devices, the hand-wheel 60 is turned either to the right or left by the operator or engineer, in accordance with the desired direction of movement. The movement of said hand-wheel revolves the steering-rod 57, and this in turn, through the knuckles 56[a], coupling-rod 56, and knuckles 55, similarly rotates the shaft 54 and the pinion 53. This pinion moves the steering-bar 51 through the rack 52 and draws inwardly on one lever 47 and pushes the other outwardly. The shield 35, connected to the lever 47, having its rear end drawn inwardly, is likewise moved toward the rear, and the adjacent wheel is shifted to bring the rear portion thereof nearer the body of the engine, and the opposite shield 35 is adjusted in a reverse direction to bring the front portion of its wheel nearer the said body, and thereby cause the engine to be turned in the direction sought. The arms 29 or 33 of the rings 30 will assume the proper angle of adjustment and still efficiently transmit the driving power coming thereto from the parts 9 and 10 of the axle, and, further, the compound pivot connection through said arms with the rings avoids the necessity of acquiring an exact or definite position of the said rings 30 before moving the shields 35 and the parts and wheels operated thereby. The wheels 44 can be easily and rapidly straightened after adjustment for steering purposes by a movement of the controlling apparatus reversely to that previously made.

The operation set forth has considered the forward movement of the engine only; but a reverse action can be easily derived, as will

be readily understood and so often necessary in placing or moving machinery and for other purposes.

While the preferred forms of the devices have been shown, it will be understood that changes in the proportions, dimensions, and mechanical details might be resorted to without in the least departing from the nature or spirit of the invention.

Having thus described the invention, what is claimed as new is—

1. In a traction-engine, the combination of front and rear driving-axles, the front axle being in separate parts and the inner ends thereof spaced apart from each other, stub-axles pivotally connected to the outer ends of the said front axle by knuckles consisting of arms at right angles to each other and attached to the opposite parts and to the inner portions of transverse rings, two-part pivotally-connected shields over the knuckles, converging levers extending rearwardly from the outer surfaces of the outer members of the knuckles, a steering-bar having its opposite ends connected to the rear ends of said levers and provided with a rack, compensating gearing in part connected to and interposed between the inner ends of said front axle, means for operating said gearing from the rear, and mechanism for operating the said steering-bar.

2. In a traction-engine, the combination of front and rear driving-axles, the front axle being in two separate parts, a compensating gearing interposed between the inner ends of said two-part front axle, sleeves fast to the outer ends of said front axle and having divergent arms, a ring to which said arms are attached, other sleeves projecting outwardly from said ring and having divergent arms at an angle to the arms of the aforesaid sleeves and also attached to said ring, and independent means for operating the compensating gearing and said stub-axles.

3. In a traction-engine, the combination of front and rear driving-axles, the front axle being in two separate parts, a compensating gearing between the inner ends of said front axle, stub-axles pivotally connected to the outer ends of said front axles, skeins fitted over the stub-axles, wheels having hubs bearing on said skeins, and pins extending through the outer ends of the wheel-hubs and said stub-axles.

4. In a traction-engine, the combination of front and rear driving-axles, the front axle being in two separate parts, a compensating gearing between the inner ends of said front axle, sleeves connected to the outer ends of said front axle and having divergent arms, bearings for said sleeves, rings to which said arms are attached, outer sleeves having arms also connected to said rings, pairs of shields mounted over the said rings, the outer ones being pivotally movable on the inner ones and having the outer ends of the latter sleeves connected thereto, shouldered skeins also secured to the outer shields, stub-axles attached to the outer sleeves and fitted in said skeins, wheels having hubs bearing on the skeins and the outer ends secured to the stub-axles, means for shifting the stub-axles and pivoted parts movable therewith, and mechanism for actuating the compensating gearing.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN McFARION HAMILTON.

Witnesses:

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J. M. STUTEVILLE.