No. 842,840. PATENTED JAN. 29, 1907.

W. N. SPRINGER.

TRACTION ENGINE.

APPLICATION FILED MAR. 8, 1906.

5 SHEETS—SHEET 1.

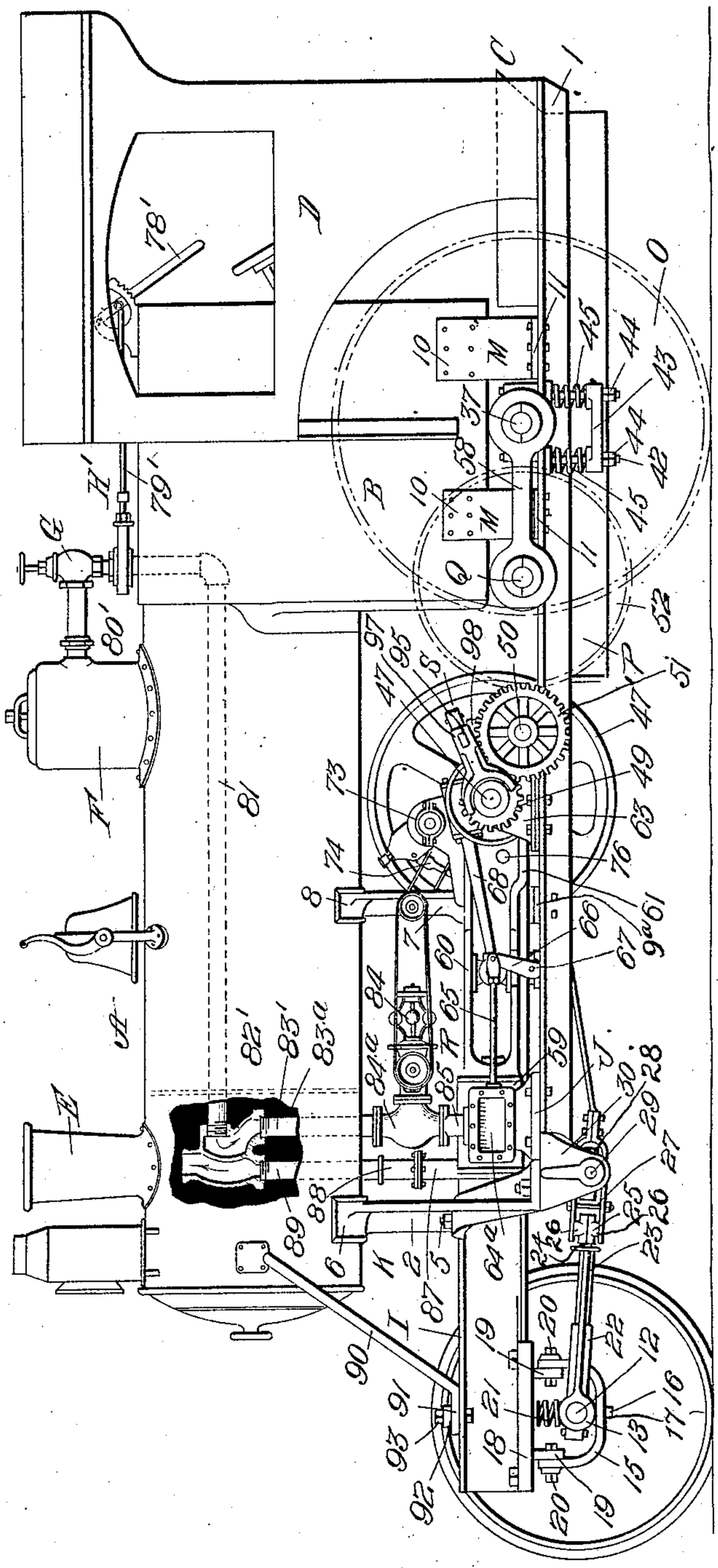

Fig. 1.

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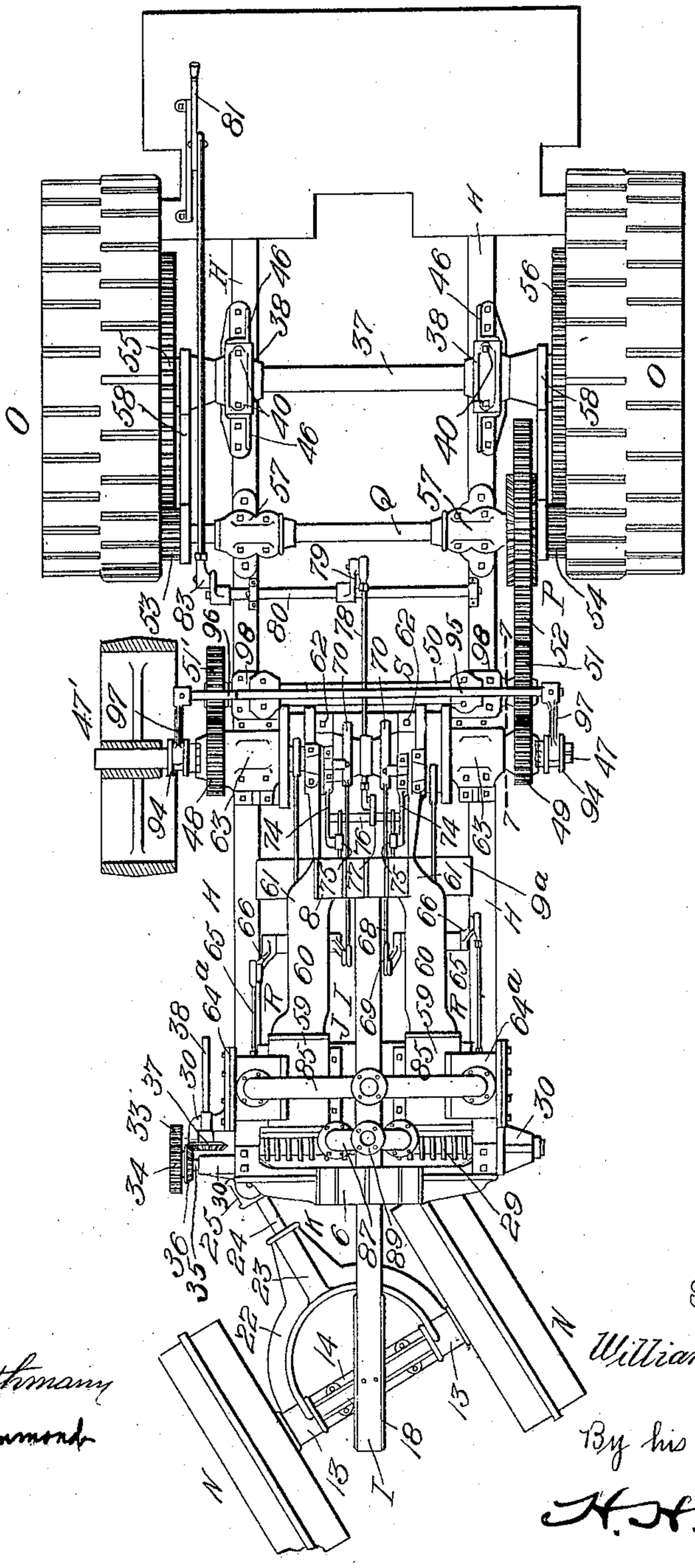

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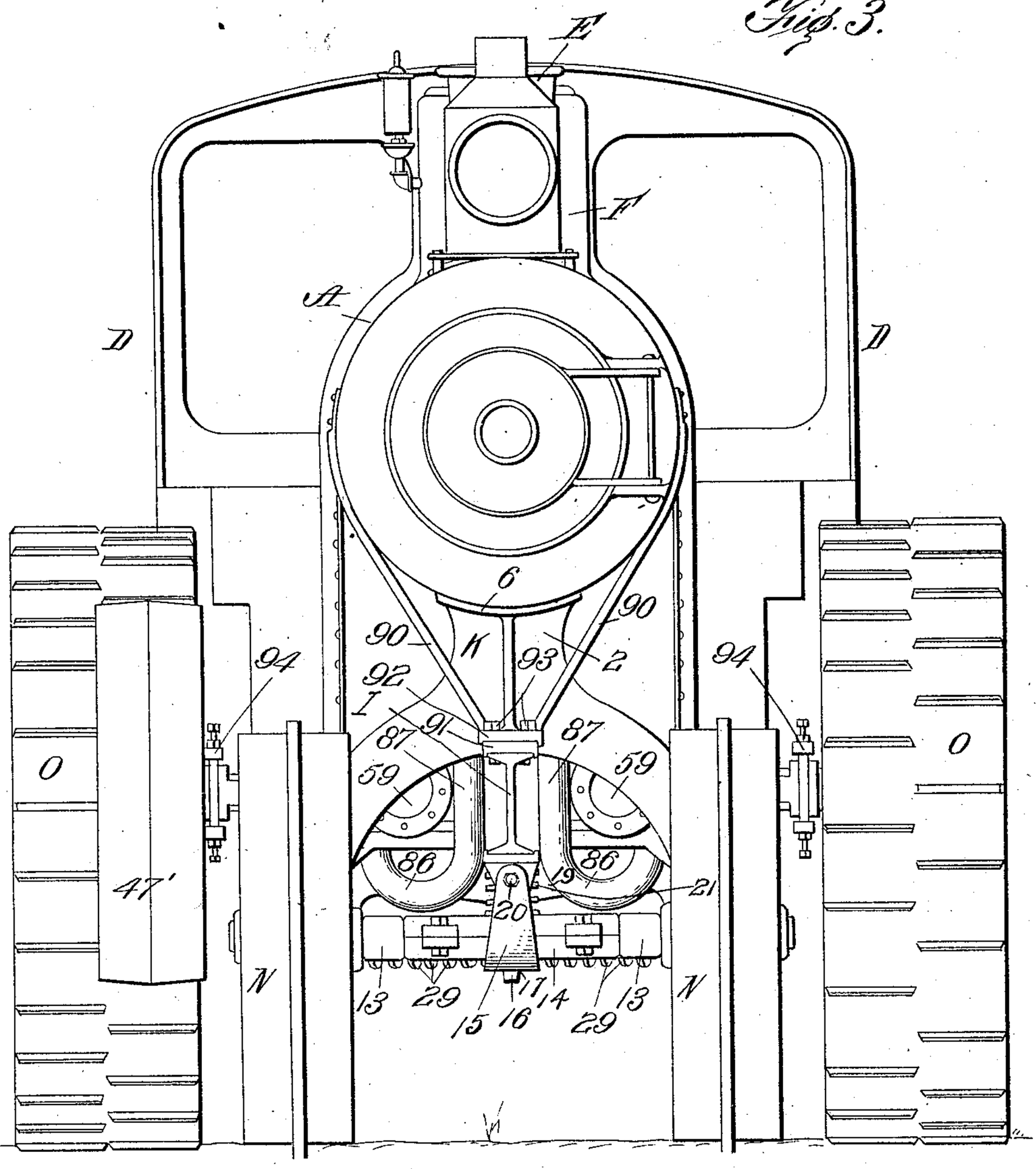
5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

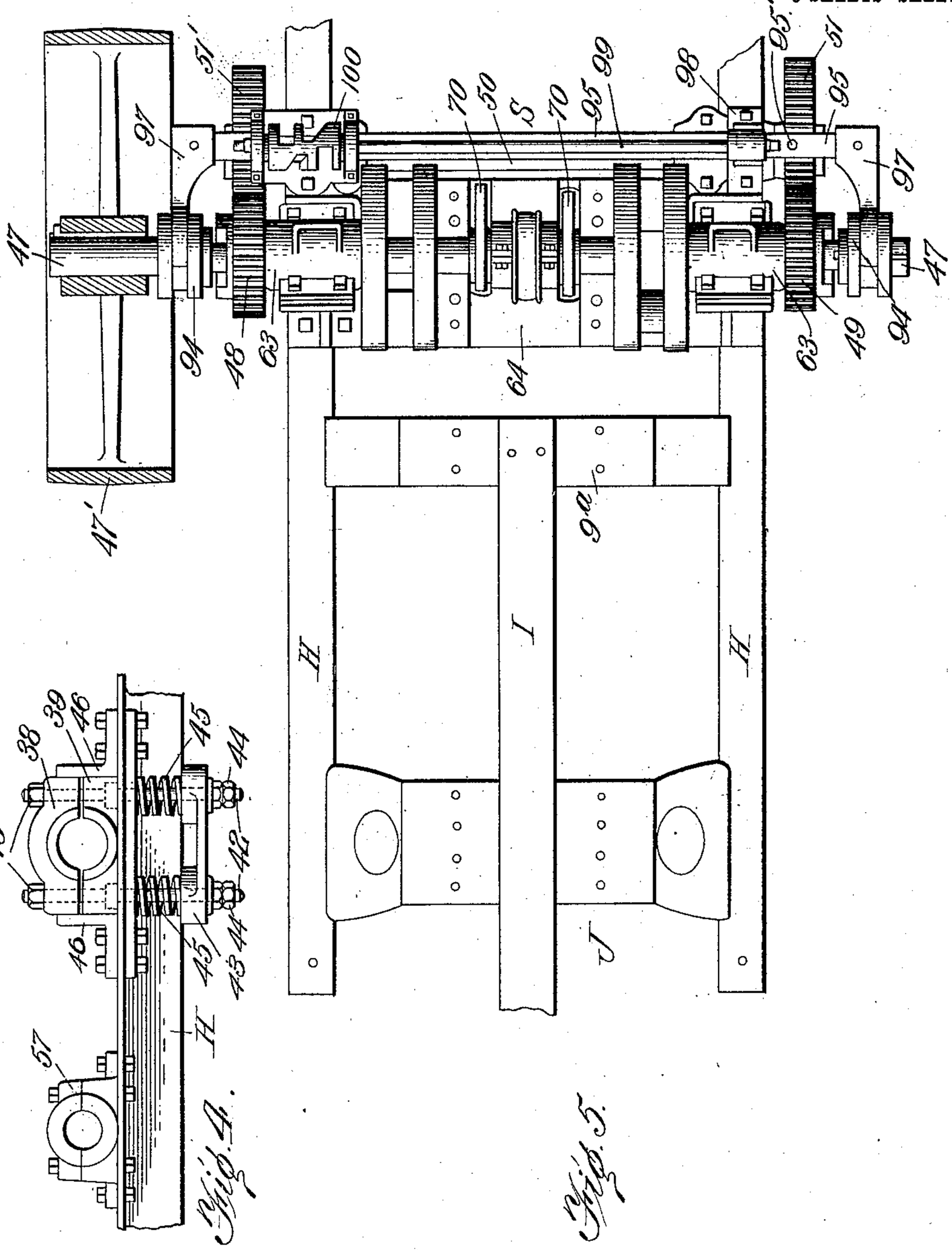

Fig. 5.

Fig. 4.

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5 SHEETS—SHEET 5.

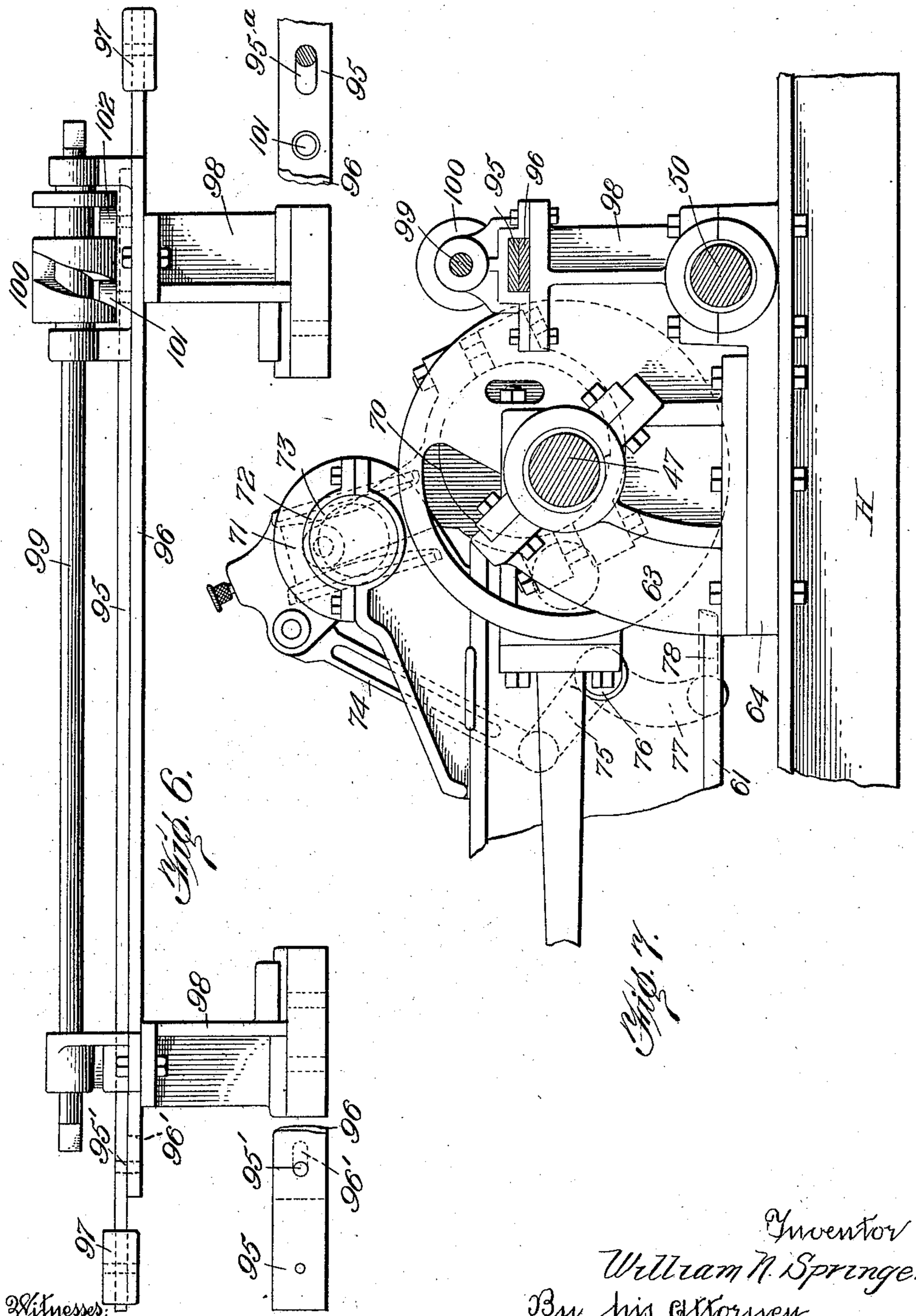

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM N. SPRINGER, OF PEORIA, ILLINOIS, ASSIGNOR TO AVERY MANUFACTURING COMPANY, OF PEORIA, ILLINOIS, A CORPORATION OF ILLINOIS.

TRACTION-ENGINE.

No. 842,840. Specification of Letters Patent. Patented Jan. 29, 1907.

Original application filed December 21, 1904, Serial No. 237,859. Divided and this application filed March 8, 1906. Serial No. 304,854.

To all whom it may concern:

Be it known that I, WILLIAM N. SPRINGER, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Traction-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in traction-engines—that is, engines of the class which are adapted to propel themselves over the ground without requiring tracks—and is a division of my application, Serial No. 237,859, filed December 21, 1904.

One of the objects of the invention is to so construct and relate the various essential parts of a traction-engine that the boiler and the parts immediately adjacent thereto shall be relieved of the weight of the shafting and gearing and relieved of the strains exerted by these parts when power is being transmitted through them.

Another object is to provide a peculiarly-constructed and peculiarly-arranged framework of such nature that it can support the boiler and the fire-box, on the one hand, and the engine parts, the power-shafting, and gearing, on the other hand, in such manner as to have the latter firmly and rigidly held in place independently of the former.

The invention also relates to other matters of improvement which are fully set forth below.

Figure 1 is a side view of a traction-engine embodying my improvements. Fig. 2 is a plan view of the truck part, including the rear driving-wheels, the steering-wheels, the main frame, and the shafting and gearing, the boiler and the cab being removed. Fig. 3 is a front view of the vehicle on a larger scale. Fig. 4 is a side view of a part of the framework and showing also the boxes in which are supported the axle of the main driving-wheels and the intermediate power-transmitting shaft. Fig. 5 is a plan view of a portion of the frame and the crank-shaft with its associated parts and the clutch-shifting device for the two-speed mechanism. Fig. 6 shows a front elevation of the shifting bars for the speed-controlling clutches and the mechanism for operating the same. Fig. 7 is a section on the line 7 7 of Fig. 2.

In the drawings, A indicates the boiler; B, the fire-box; C, the engineer's platform, and D the cab, these parts being of any form of construction now well known or of any preferred style. As shown, they are provided with the usual engine adjuncts, such as smoke-stack E, steam-dome F, globe-valve G, throttle device H, &c.

The boiler, fire-box, and other parts above referred to are supported upon the truck-frame or vehicle-frame entirely independently of the power-generating and power-transmitting devices, the latter being so secured directly to and supported upon the framework as to relieve the boiler of all strain.

The framework of the vehicle or truck consists of two longitudinally-arranged side beams or sills H and a central longitudinal beam I, the latter being preferably in horizontal planes somewhat above the planes of the beams H. The rear ends 1 of the side beams H are at the rear edge of the platform, and the beams extend forward by the side of the fire-box and nearly to the vertical plane of the front end of the boiler. The central longitudinal beam I has its front end considerably in advance of the front end of the boiler and extends backward to a transverse vertical plane considerably behind the front ends of the side beams H. It is firmly connected to the side beams by means of cross-bars, plates, or brackets to be described.

J is a plate or bar secured to the upper flanges of the side beams H and extending across the frame from one beam to the other.

K is a bracket which is formed with a central vertical standard 2 and with outwardly-diverging legs, which have feet or pedestals that are fastened to the upper flanges of the beams H. The central part of this bracket K is secured by bolts 5 to the top flanges of the central beam I. At the upper end of the bracket there is a saddle 6, which lies under and partly surrounds the boiler, furnishing for the latter support at the front end. Under the central portion of the boiler there is another bracket, (indicated as a whole by L.) It has a central vertical upright part 7, with a saddle 8 at the top for the boiler. At the lower part it is secured to or formed with a cross bar or plate 9, which is secured to the upper flange of the longitudinal bar I. This bar is supported at its inner end upon a transversely-arranged cross-bar

9ª, which extends from one side beam H to the other and is rigidly bolted thereto. The rear part of the boiler structure is carried by standards or uprights M, which are bolted to the outer sides of the fire-box, as shown at 10, and have flanges 11, which are bolted to the top flanges of the side beams H. The framework having the parts referred to and carrying the boiler and fire-box is supported upon front wheels N and rear wheels O. The rear wheels are used as drivers, receiving the propelling power from the engines, and the front wheels N are used for steering.

The front axle is indicated by 12. It passes through boxes 13 and through a sleeve 14. This sleeve at its center is connected to a hanger 15, the sleeve having a strong pivot-pin 16, fitting in an eye or bearing 17 in the hanger. The hanger is pivotally connected to the beam I, there being a plate 18 bolted to the under side of the beam and formed with pivot-lugs 19. Hinge-bolts 20 connect the ends of the hanger and pivot-lugs 19. In order to have a resiliency of connection between the axle 12 and the framework and parts carried thereby, I interpose a spring 21 between the sleeve 14 and the plate 18.

The beam I, together with the frame and the parts supported thereon, can move down and up relatively to the axle under the compression and the expansion of the spring 21, the hanger 15 being allowed to slip in relation to the arm or pin 16, which is made sufficiently long for this purpose. The boxes 13 are formed on or secured to the steering-fork 22, which is arranged horizontally and extends backward to devices by means of which this fork can be moved laterally. The fork has a sleeve 23, in which fits or telescopes a rod 24. This rod at its rear end has block-halves 25 secured thereto, each of these block halves or sections having a trunnion-pivot 26, one projecting upward and the other downward.

27 is a fork, the arms of which are connected to the trunnion-pivots 26.

28 is a nut mounted on a transversely-arranged screw-threaded shaft 29. This shaft is mounted in depending hanger-brackets 30, bolted to the front ends of the longitudinal side beams H. When the shaft 29 is rotated, its thread, which engages with the nut 28, will cause the latter to move transversely of the machine. The fork 27 is pivoted to the nut by trunnion-pivots 31. When the shaft is rotated and the nut is moved longitudinally thereof, it carries the fork with it, and as the latter is connected to the rod 24 the latter is also moved laterally, this causing the fork 22 to swing around the vertical axis at 16 and to move the axle 12 to one line or another inclined to the path of advance of the machine. The pivots at 26 permit freedom of movement of the rod 24 and of the fork relatively to each other. The screw-shaft 29 is rotated by a gear-wheel 33, secured to it, this wheel being driven by a pinion 34 on a shaft 35, mounted on one of the brackets 30.

36 is a bevel-pinion on the shaft 35, meshing with a bevel-pinion 37 at the end of a shaft 38, which extends back to the engineer's cab or to a point where it can be readily rotated by hand. When it is so rotated, it will through the gearing just referred to rotate the screw-shaft 29 and cause the latter to move the nut 28 toward one side or the other of the machine and accomplish the adjusting of the front wheels, so as to steer the machine in the desired direction. The rear wheels or driving-wheels O are mounted on the ends of the axle 37. This axle is supported on the side beams H of the frame and extends from points outside of one across the frame to points outside of the other. It is secured to the frame by a yielding holder.

38 39 are two box-halves which surround the shaft and which are clamped together by bolts 40. These bolts have collars, the extended parts being indicated by 42. 43 is a cross rod or plate near the lower ends of these bolt extensions.

44 and 44 are nuts at the lower ends of the bolts which hold the cross-plate 43 in position and by means of which it can be adjusted vertically.

45 45 are springs, of which there is one around each of the bolts 42, each spring bearing upward against the beam I and bearing downward against the cross-plate 43.

46 46 are guide-brackets bolted to the upper flange of the beam I and lying immediately adjacent to the parts 38 39.

It will be seen that the frame-beams H under the weight of the boiler and other parts resting upon the frame can move downward relatively to the axle, the guide-brackets 46 46 slipping down and up at the ends of the box 38 39 and the springs 45 yielding to the downward movement. When the springs are free to react, they lift the frame and the parts carried thereby.

The engines to be referred to more fully below drive the ground-wheels O through shafting and gearing, as follows: 47 is the crank-shaft, which is provided with gear-wheels 48 49, adapted to be alternately connected to the intermediate shaft 50. This shaft carries at one end a gear-wheel 51, adapted to be driven by the gear-wheel 49 and which in turn drives the outer part or wheel 52 of the compensating gearing (indicated as a whole by P) and having the two driven elements 53 54, these being pinions which respectively engage with the gear-wheels 55 56, one secured to one of the drive-wheels O and one secured to the other. At the other end the shaft 50 carries the gear-

wheel 51′, which meshes with the gear-wheel 48. The compensating gear P is on the counter-shaft Q, which is mounted in bearings at 57 on the frame-bars H.

In order to maintain proper driving relationship between the counter-shaft and the ground-wheels and avoid disadvantages that would result from the vertical play of the framework in relation to the rear axle, I employ radius-bars 58, each having a hinge or pivotal engagement at one end with the counter-shaft and at the other end with the rear axle These radius-bars may be arranged immediately inside of the main driving-gears 53 55 on one side and 54 56 on the other side at any suitable lines.

The engines are indicated by R R. Each has the cylinder 59, the guide 60, and the extension-plate 61, which extends forward to the crank-shaft 47. Each cylinder is bolted to the above cross plate or bar J. The rear parts of the extension-plates 61 are cast with or secured to bearing-stands 62, in which the crank-shaft is mounted.

The outer bearings of the crank-shaft are indicated at 63. These and the bearings at 62 are secured to a cross-plate 64, which extends from one side beam H to the other.

64ª are the valve-chests, and 65 are the valve-rods. These are pivoted to the arms 66 of rock-shafts 67, which are mounted in bearings on the under side of the guides 60.

68 are the eccentric-rods connected to crank-arms 69 on the rock-shaft 67, these eccentric-rods being connected to eccentrics 70.

The engines can be reversed in any well-known manner. For illustration I have shown a valve-gear of the well-known link type, with sliding blocks for controlling the eccentrics. These blocks are indicated at 71, they being mounted in guides 72, which are pivotally supported, as indicated at 73, about the axes of which pivots they are free to be swung by link mechanism comprising the links 74, pivotally connected at their upper ends to the said swinging guides and at their lower ends to the upper ends of the lever-arms 75, which arms are rigidly secured to a transversely-arranged shaft 76, mounted in suitable bearings on the engine-frame. 77 is an arm rigidly secured to the said shaft. 78 is a pitman pivotally connected at its forward end to the rear lower end of said arm 77 and at its rear end to a lever-arm 79, rigidly secured to a cross-shaft 80, mounted in bearings on the frame-bars H.

81 is a reversing-lever mounted on the platform of the engine or at points accessible to the engineer and connected to the rock-shaft 80 by a link-rod 82 and a crank 83.

The throttle-lever is indicated at 78′, it being connected by a link 79′ with a throttle-valve at 80′, which may be of any usual or preferred construction. The steam is carried from the globe-valve G through a horizontal duct, (indicated by 81′.) This passes through the water and steam chamber in the boiler and then through the end wall at 82′ of the chamber and is connected to the vertical duct 83′, which passes downward through the chamber at 83ª to the governor-valve chamber 84ª. The valve in this chamber is controlled by the governor devices 84. From the valve-chamber the steam passes through the ducts 85 to the steam-chests 64ª. The exhaust-steam is taken through exhaust-ducts having the curved parts 86 and the vertical parts 87, which are united at 88 to the vertical duct 89, which extends upward to points immediately below the smoke-stack E, through which latter the exhaust is driven for increasing the draft when it is desired.

The upper part of the front end of the boiler is laterally braced by means of stay-rods 90, which are formed with feet 91, that are fastened to the beam I by a clamp-plate 92 and bolts 93.

The wheels 48 and 49 on the crank-shaft are loose, one at one end of the shaft and the other at the other end. 94 94 are clutches feathered to the shaft 47 and adapted to slide thereon, the wheels 48 and 49 having clutch-faces, with which, respectively, the clutches 94 can engage.

47′ is a belt-wheel secured to the shaft 47 and adapted to transmit power from the engines to whatever machine is to be driven by it. It also serves as a momentum or fly wheel to assist the engine when it is being used to propel the machine along the ground.

The mechanism for shifting the clutches to throw into operation either set of speed-gear is indicated as an entirety by S. Preferably it consists of the transversely-arranged superpoesd sliding bars 95 96, each of which carries at its outer end a clutch-fork 97, which is adapted to engage with the collar of the adjacent movable clutch-jaw. The lower one of these two bars is supported near either end upon uprights 98, which are rigidly secured to the side bars H of the frame. 95′ is a downwardly-extending pin arranged to fit into a slot 96′ in the adjacent end of the bar 96.

99 is a transversely-arranged rod or shaft carrying at one end a double-grooved cam 100.

101 is a roller pivotally connected to the bar 95 and arranged to engage with the walls of one of the cam-grooves in the cam 100. The shifting bar 95 has a slot at 95ª through which projects a stud or pivot rigidly secured to the bar 96 and carrying at its upper end a roller 102, which is arranged to engage with the walls of the second cam-groove in the cam 100. These cam-grooves are so arranged in relation to each other and to the rollers which they control as to cause the shifting of the bars 95 96 in either direction, according to which the shaft 99 is rotated. It will thus

be seen that when the said shaft 99 is turned in one direction the bar 95 will be projected in such manner as to disengage the movable clutch element controlled by it from its adjacent clutch element; and the bar 96 will be shifted so as to cause the clutch element controlled by it to operatively engage with the adjacent clutch element. The bars 95 96 are capable of movement relative to each other, and the grooves in the cam, which may be sections of helices, are so correlated as to cause both of the bars 95 96 to hold the clutch elements controlled by them, respectively, in inoperative position in certain positions of adjustment of the rod 99, thus providing for the running of the engines free and independent of the traction-gearing either for the purpose of getting up speed or for the purpose of transmitting power through the belt-wheel and the belt for any desired purpose.

The outer ends of the bar 99 are squared to receive a wrench or any suitable device for engaging with them in order to turn the said rod. When desired, suitable mechanism can be arranged between the rod 99 and the engineer's platform, by means of which it is possible to control the rotation of the said rod without the necessity of the operator leaving the engineer's cab.

What I claim is—

1. In a traction-engine, the combination with a frame, steering-wheels, a motor, and traction-wheels, of a two-speed transmission-gearing interposed between the said motor and the traction-wheels, clutches for connecting up the gears, shifting rods, one for each of said clutches, and means for simultaneously actuating said rods to cause them to operate the movable elements of said clutches.

2. In a traction-engine, the combination with a frame, steering-wheels, a motor, and traction-wheels, of a two-speed transmission-gearing interposed between the said motor and the traction-wheels, clutches for connecting up the gears, shifting rods, one for each of said clutches, and means for simultaneously shifting said rods in one direction or the other to operate the movable elements of said clutches.

3. In a road-engine, the combination with a frame, steering-wheels, a motor, and driving-wheels, of a two-speed transmission-gearing interposed between the motor and said driving-wheels, the clutches for connecting up each set of gears, shifting rods for operating each of said clutches, and cams for controlling the said rods.

4. In a road-engine, the combination with a frame, steering-wheels, a motor, and driving-wheels, of a two-speed transmission-gearing interposed between the motor and said driving-wheels, clutches for connecting up each set of gears, shifting rods for controlling said clutches each movable independently of the other, cams associated with said rods for shifting them, and means for operating said cams simultaneously.

5. In a road-engine, the combination with a frame, steering-wheels, a motor, and driving-wheels, of a two-speed transmission-gearing interposed between the motor and said driving-wheels, clutches for connecting up each set of gears, shifting bars, each adapted to control one of the said clutches, a worm, projections on said rods adapted to be engaged by said worm, and means for actuating the worm.

6. In a road-engine, the combination with a frame, steering-wheels, a motor, and driving-wheels, of a two-speed transmission-gearing interposed between the motor and said driving-wheels, clutches for connecting up each set of gears, shifting bars, each arranged to control one of said clutches, and means associated with said bars for moving them in the same direction to cause the disengagement of one clutch and the engagement of the other and for moving one bar relatively to the other in order to shift each movable clutch element into operative position.

7. In a traction-engine, the combination with a frame, steering-wheels, an engine on said frame, and traction-wheels, of a shaft between the crank-shaft of the engine and the axis of the traction-wheels, a two-speed transmission-gearing interposed between said counter-shaft and said crank-shaft and arranged to drive the counter-shaft at different speeds, the gears for each speed on the crank-shaft being loosely mounted thereon, clutches, each adapted to connect one of said loose gears to said crank-shaft, shifting bars each connected to the movable element of one of said clutches, means for moving said bars to cause the engagement of one of said clutches and the disengagement of the other one, and power-transmitting devices connecting the said counter-shaft with the said traction-wheels.

8. In a traction-engine, the combination with steering-wheels, a rear axle, and traction-wheels mounted on said rear axle, of a frame supported by said wheels and yieldingly mounted on said rear axle, an engine secured to the frame, shafting and gearing including a counter-shaft interposed between said engine and said traction-wheels, and radius-bars connecting said counter-shaft and rear axle, each radius-bar having the axis of its pivotal connection with the counter-shaft coincident with the axis of the said counter-shaft.

9. In a motor-vehicle, the combination of a suitable frame, steering-wheels connected to the frame at one end thereof, a non-rotary rear axle extending transversely across the frame at one end thereof and yieldably connected to said frame, a motor suitably secured to the

frame, traction-wheels loosely mounted on either end of said rear axle, shafting and gearing including a counter-shaft interposed between said motor and said traction-wheels, and radius-bars connecting said counter-shaft near either end thereof to the adjacent end of said rear axle, each of said radius-bars having its rear end loosely mounted upon said rear axle and free to turn about the axis of said axle independently of the frame.

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

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R. A. WHEELER.