No. 842,589. PATENTED JAN. 29, 1907.

W. N. SPRINGER.

TRACTION ENGINE.

APPLICATION FILED DEC. 21, 1904. 5 SHEETS—SHEET 1.

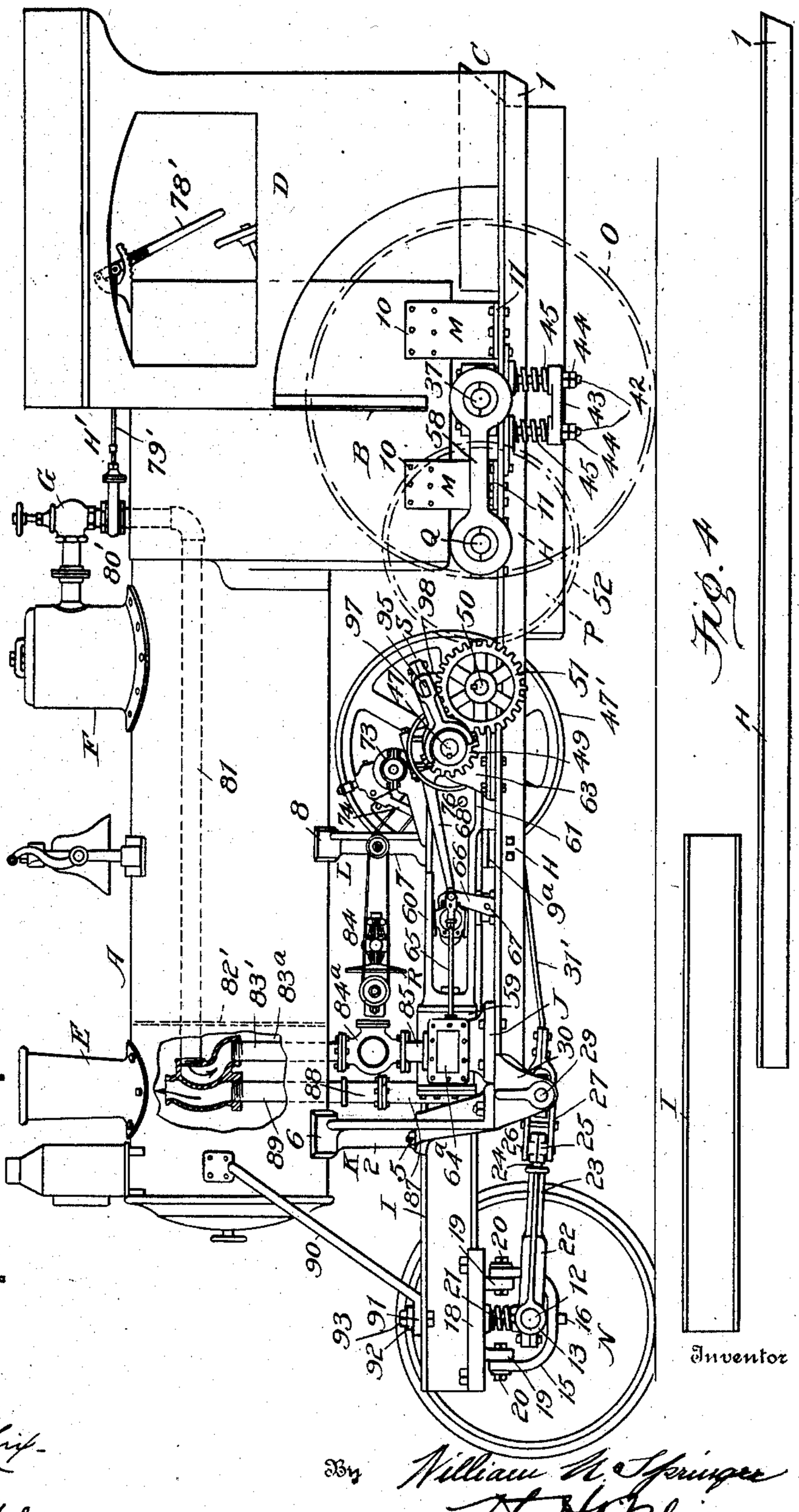

Fig. 1.

Fig. 4.

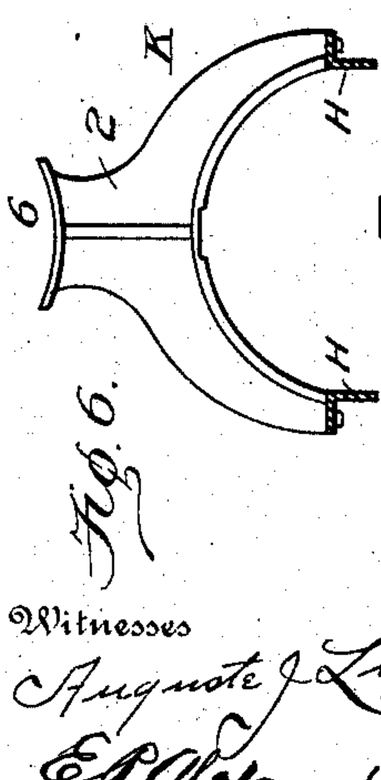

Fig. 6.

Witnesses

Augustus J. Lief-

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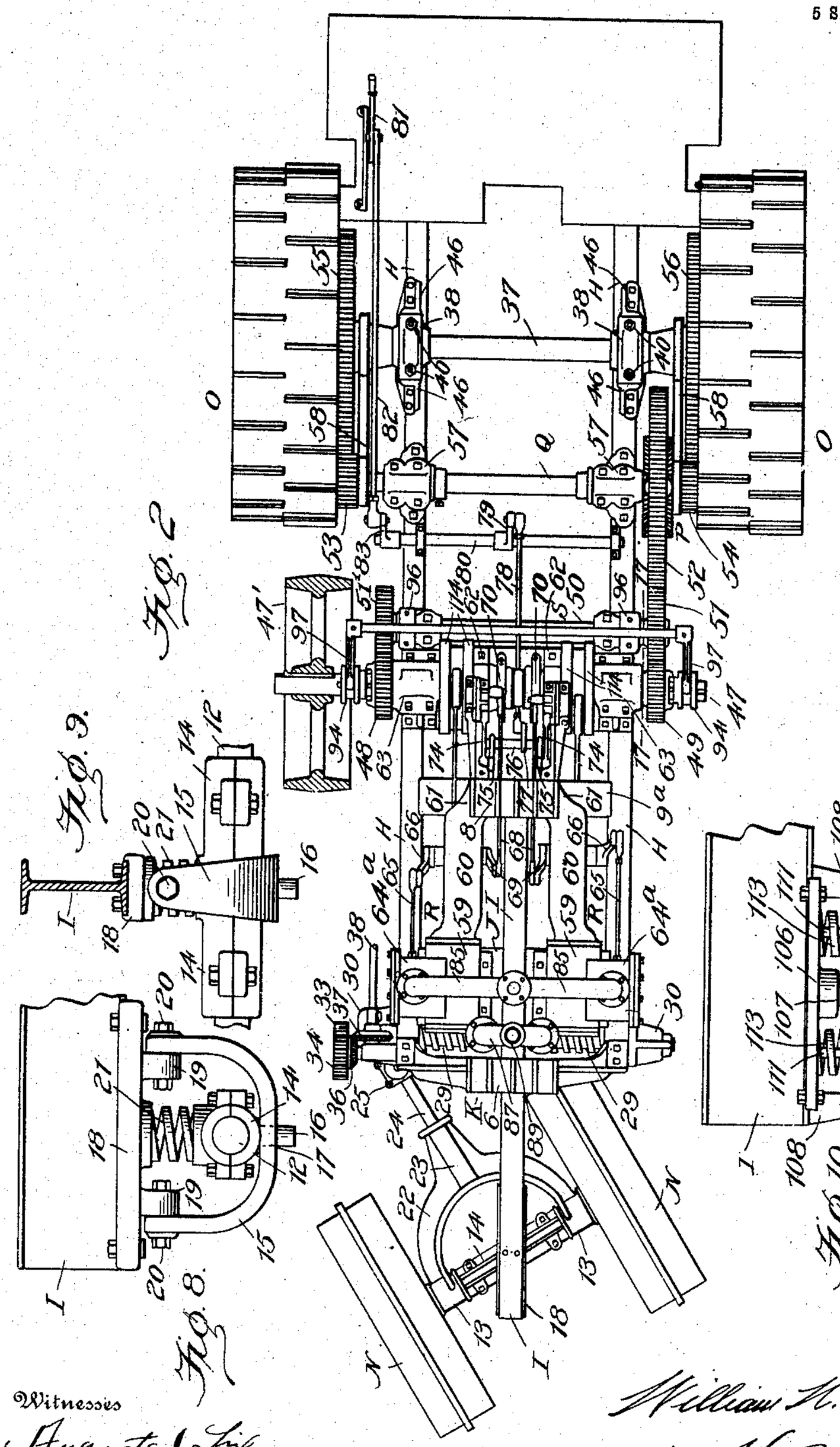

Fig. 2

Fig. 8.

Fig. 9.

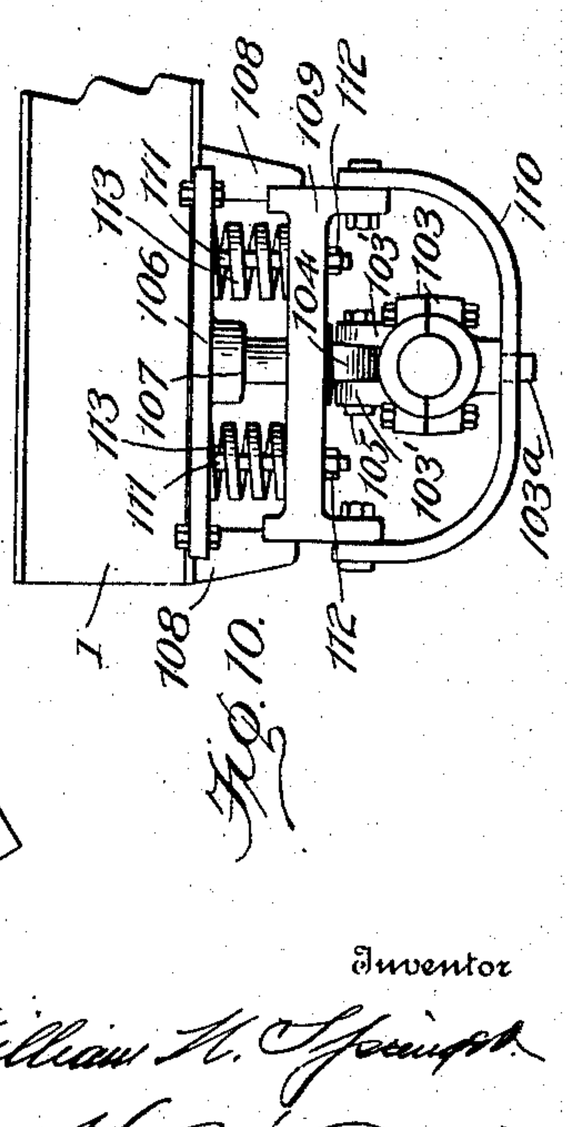

Fig. 10.

Witnesses

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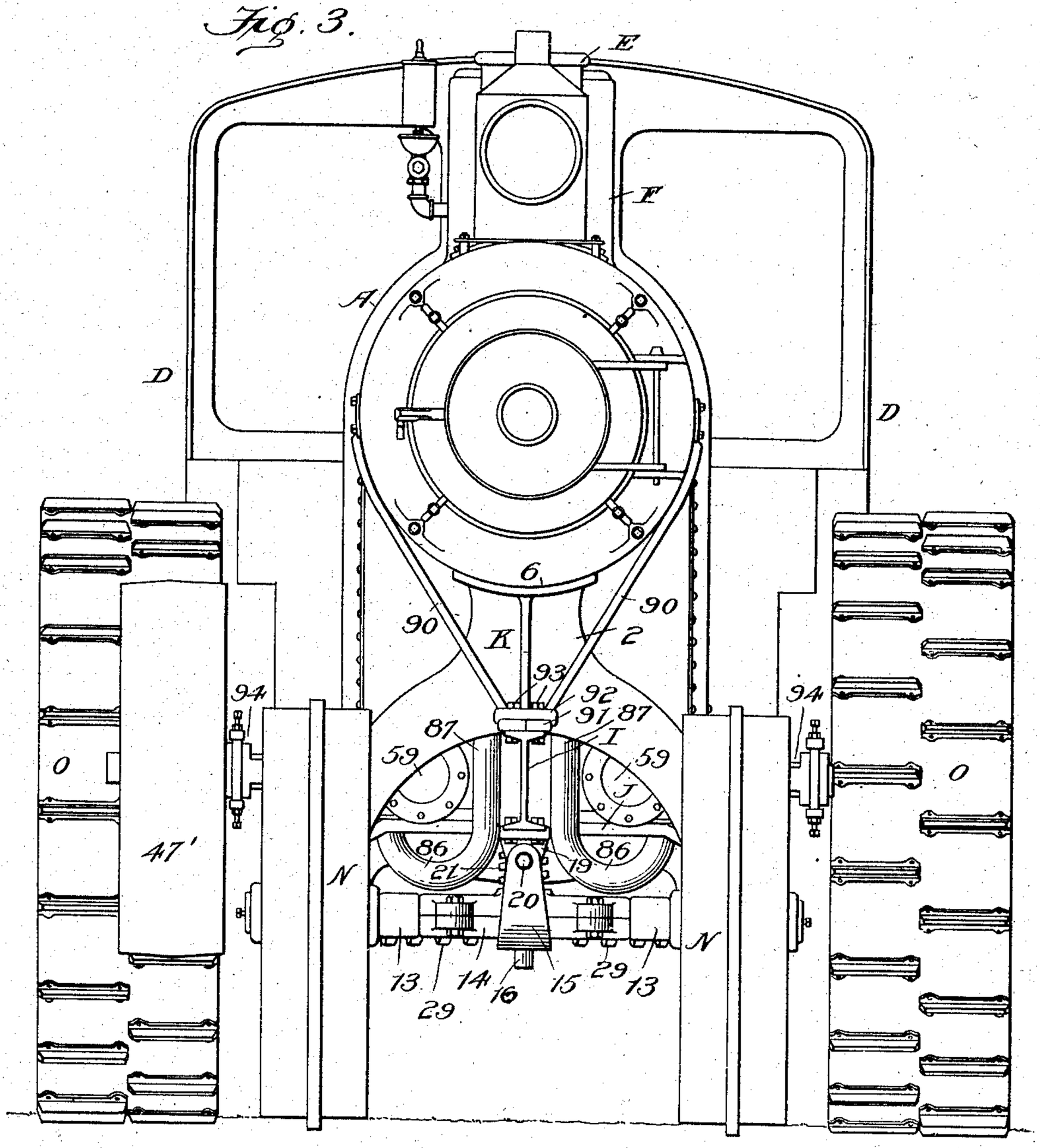
5 SHEETS—SHEET 3.

Fig. 3.



Witnesses

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5 SHEETS—SHEET 4.

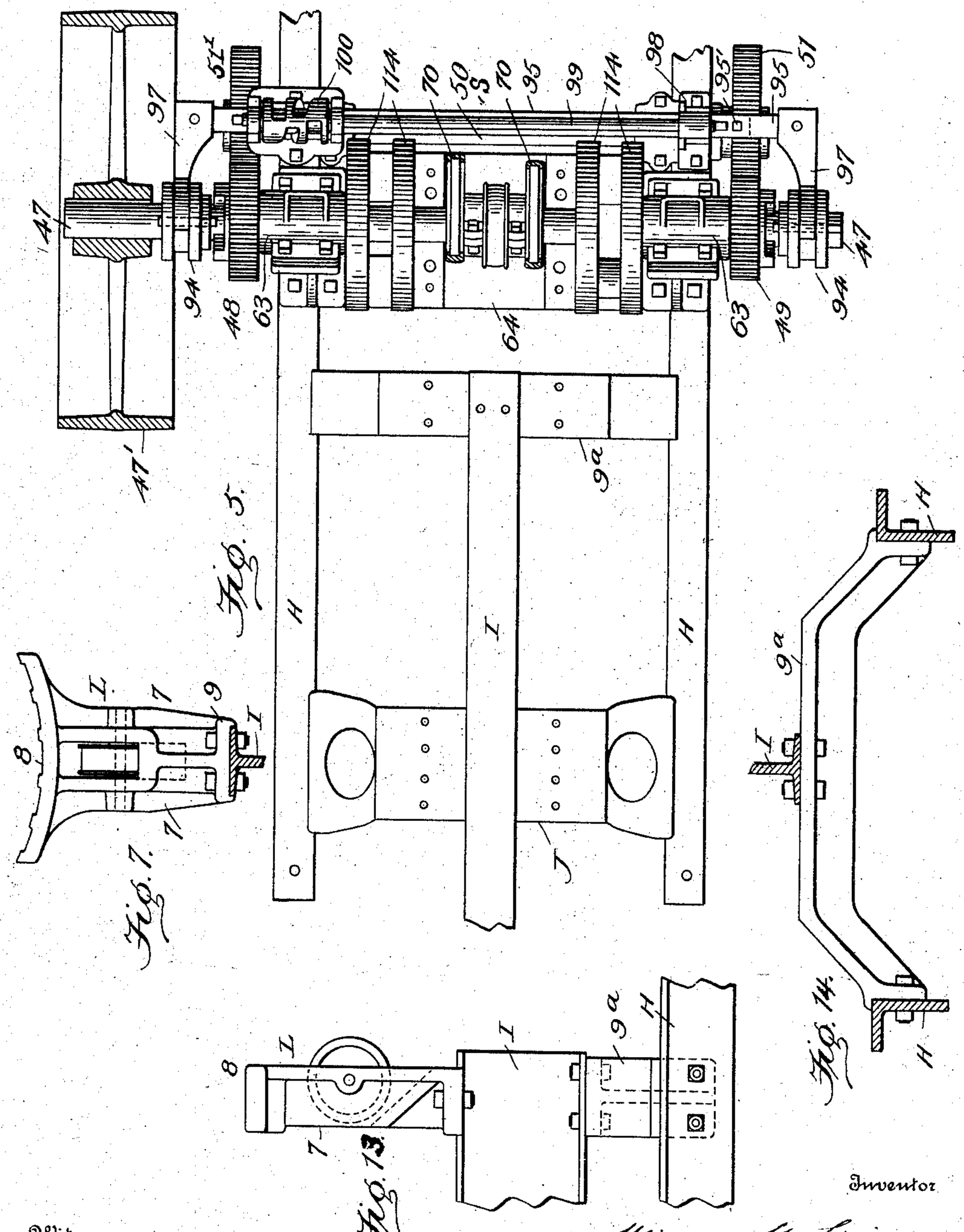

Fig. 5.

Fig. 7.

Fig. 13.

Fig. 14.

Witnesses

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5 SHEETS—SHEET 5.

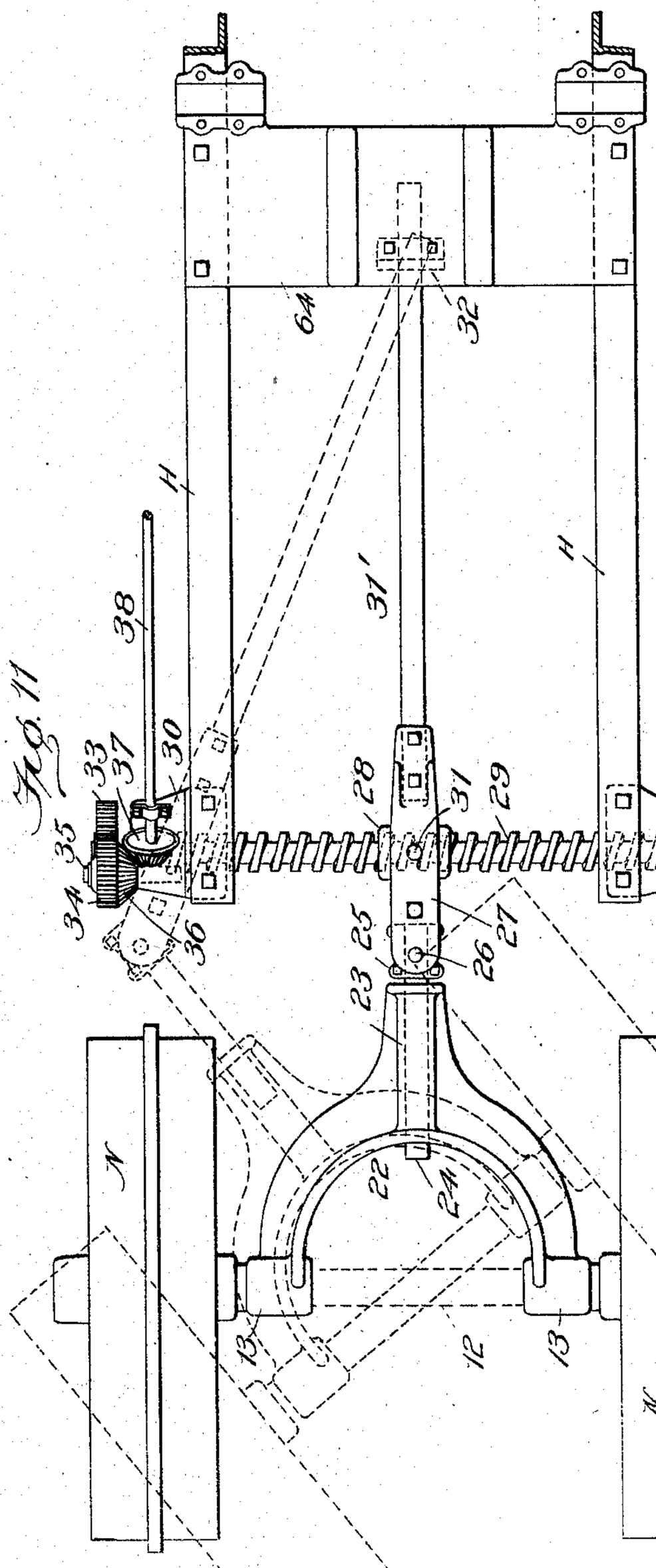

Fig. 11.

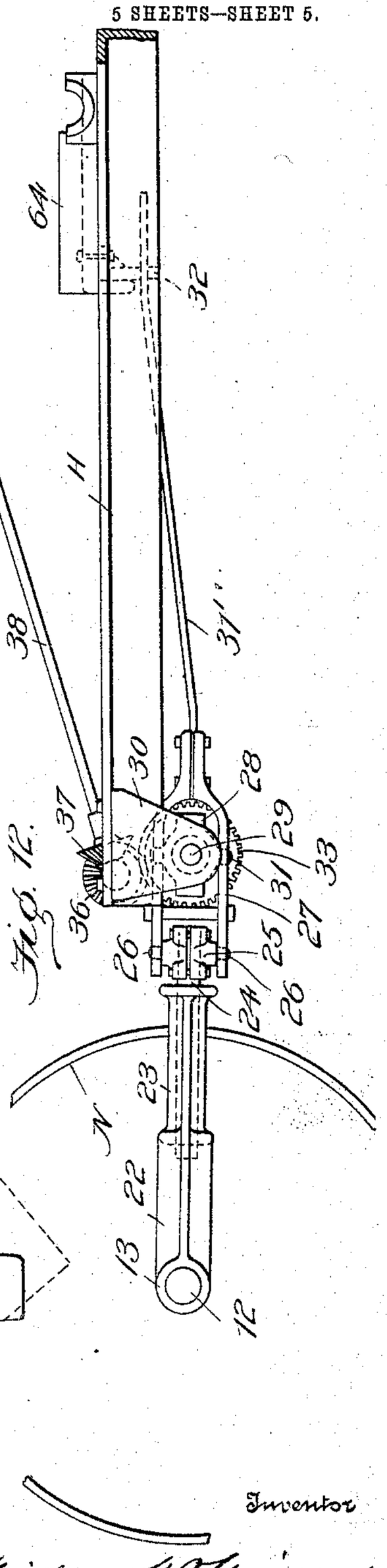

Fig. 12.

Witnesses

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UNITED STATES PATENT OFFICE.

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

TRACTION-ENGINE.

No. 842,589. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed December 21, 1904. Serial No. 237,859.

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.

One of the objects of the invention is to so construct and relate the various essential parts 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.

Another object is to so construct and relate the parts of the vehicle to which the steering-wheels are attached that they can be supported with firmness and in such position that they can be readily turned in any way desired, and the power for effecting the adjustment of the steering-wheels can be transmitted to the greatest advantage.

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 shows one of the main side bars, together with the central bar which supports the steering mechanism. Fig. 5 is a plan view of a portion of the frame and the crank-shaft and its associated parts and the clutch-shifting device for the two-speed mechanism. Fig. 6 is a view of the front standard or bracket which supports the boiler upon the main frame. Fig. 7 shows the central bracket. Fig. 8 is a side view of the parts which support the steering-axle. Fig. 9 is a front view of the same, the frame-bar being shown in section. Fig. 10 is a side view of a modification of the parts shown in Figs. 8 and 9. Fig. 11 is a plan view of the front steering-wheels, a portion of the main frame, and the devices for turning the wheel. Fig. 12 is a side view of the parts shown in Fig. 11. Fig. 13 is a side view of the central boiler-supporting bracket and the frame parts associated therewith. Fig. 14 is a front view of the cross-bar for supporting the rear end of the longitudinal bar I and the parts associated therewith.

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 devices 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 mean 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 cen-

tral 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 part 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 9^a, 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.

31′ is a rod or bar rigidly secured to the fork 27 and extending backward and through a guide-loop 32, secured to and depending from one of the cross-bars of the main frame.

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, or at any other 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 represents 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 represents the eccentric-rods connected to crank-arm 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 superposed 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 other 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.

While I have for the sake of illustration shown one manner of shifting the speed-controlling clutches, it will be understood that I do not limit myself to the devices shown in the drawings, as numerous other means will suggest themselves for accomplishing the same results.

In Fig. 10 I have shown a modified mounting for the front axle of the machine. Therein the axle is mounted in the bearing 103, the upper block of which has the ears 103′, between which is fitted the lower end of the swivel-block 104, 105 being a bolt arranged to hold these parts in proper relation to each other. 106 is a plate rigidly secured to the under edge of the beam I and having extending downward therefrom the socket 107, into which the swivel 104 is fitted. 108 108 are downwardly-extending guides, between which is fitted and guided the sliding plate or bar 109. 110 is a yoke having its ends pivotally secured to the opposite ends of the said plate 109. The lower half of the bearing 103 carries the pivot 103ª, which is mounted loosely in the yoke 110. 111 111 are bolts rigidly secured at their upper ends to the bar 106 and extending downwardly through holes in the guide-plate 109 and provided with nuts 112. 113 are springs fitted around said bolts and interposed between the plate 106 and the guide-plate 109. This form of axle-mounting permits of the rising and falling of the axle relative to the frame and tends to relieve the parts of the machine from sudden strains and shocks encountered in the ordinary manipulation of this type of engine.

What I claim is—

1. The combination, with the frame having the longitudinal side beams, of the longitudinally-arranged central beam I, extending from points under the center point of the boiler to points in front of the boiler and in front of the side beams, the boiler-support secured to the central beam I, the engines arranged at the sides of the beam the crank-shaft in rear of the engines, the rear wheels, and the shafting and gearing interposed between the engines and the driving-wheels, substantially as set forth.

2. The combination of the longitudinal side bars H, the boiler above the side bars, the longitudinally-arranged center beam I in horizontal planes above the planes of the side bars, the cross plates or beams, the boiler-supports rigidly connected to the central longitudinal bar I, the engines at the sides of the central longitudinal bar, the front axle below the front end of the central longitudinal bar, the pivotal connecting devices between the axle and the beam I, and means for turning the axle around the pivotal connecting devices for steering the engine, substantially as set forth.

3. The combination of the boiler, the firebox, the engineer's platform, the longitudinal beams H at the sides of the engine, the longitudinally-arranged bar I between and above the beams H, the rear driving ground-wheels, the front steering-wheels, the front axle under the front part of the beam I, power-transmitting devices connected to the axle for steering it, means adapted to be operated by hand for actuating the power-transmitting devices, the engines supported on the side beams H independently of the boiler, the

crank-shaft on the side beams, and the intermediate shafting and gearing between the crank-shaft and the driving ground-wheels, substantially as set forth.

4. The combination of the main frame having longitudinally-arranged beams H at the sides, the central parallel horizontally-arranged beam I between and above the side beams H, the cross plates or bars secured to the side beams and to the central longitudinal beam, the boiler, the fire-box, and the platform all supported on the frame-bars H, the engines, the crank-shaft and the intermediate shafting and gearing all supported on the frame independently of the boiler, the rear driving ground-wheels, the front wheels, the front axle under the front end of the central horizontal beam I, and adapted to swing horizontally around a vertical pivot and to swing vertically around a horizontal pivot, and power-transmitting devices for moving the said axle around the vertical pivot for steering the engine, substantially as set forth.

5. The combination of the rear driving-wheels, the frame adapted to rise and fall relatively to the said ground-wheels and having the longitudinal side beams H and the central horizontal longitudinally-arranged beam I between and above the beams H, the cross bars or plates connecting the beams H, the bar I being secured to the said cross bars or plates, the standards or brackets supported on the said cross bars or plates and adapted to support the boiler, the engines supported on the frame independently of the boiler, the crank-shaft on the said frame and the shafting and gearing intermediate of the crank-shaft and the rear ground driving-wheels, the front wheels, the front axle arranged to swing horizontally around a vertical hinge which is adapted to swing vertically, and power-transmitting devices adapted to turn the front axle around the vertical hinge for steering the engine, substantially as set forth.

6. The combination of the boiler, the frame, the engine, the rear wheels, the shafting and gearing interposed between the engines and the rear wheels for transmitting power to the latter, the front steering-wheels adapted to be turned to different inclinations to the planes of the driving-wheels, and means for turning the said front wheels, comprising the telescopic rod and sleeve one connected to the front wheels and the other to a carrier movable laterally of the engine, substantially as set forth.

7. In a traction-engine, the combination, with the boiler, the engine, the driving ground-wheels, and the shafting and gearing for transmitting power from the engine to the driving-wheels, of the steering-wheels adapted to be turned to different angles of inclination to the planes of the driving-wheels, and means for turning the steering-wheels to the said inclinations comprising a laterally-movable nut, a threaded shaft for moving the nut, and means connecting the nut to the steering-wheels for turning them comprising a part suitably connected to the steering-wheels and carrying one element of a telescopic connection and a fork pivotally connected to said nut and having pivotally connected to it the other element of said telescopic connection, substantially as set forth.

8. In a traction-engine, the combination, with the boiler, the engine, the driving ground-wheels, and the shafting and gearing interposed between the engine and the ground-wheels, of the steering-wheels adapted to be turned to either of several inclinations to the planes of the driving-wheels, the laterally-movable nut, the threaded shaft, and the telescopically-connected power-transmitting devices interposed between the nut and the steering-wheels, substantially as set forth.

9. In a traction-engine, the combination, with the boiler, the engine, the ground-wheels, and the means for transmitting power from the engine to the ground-wheels, of the steering-wheels adapted to be turned to either of several inclinations to the planes of the ground-wheels the transversely-mounted shaft, the transversely-moving nut actuated by the said shaft, and the telescopically-connected rod and sleeve, one connected to the said nut and the other connected to the said steering-wheels, substantially as set forth.

10. In a traction-engine, the combination, with the boiler, the fire-box, the driving ground-wheels, the engines, and the power-transmitting devices between the engines and the driving-wheels, of the steering-wheels adapted to be moved to either of several inclinations to the planes of the driving-wheels, the telescopically-connected power-transmitting parts for moving the steering-wheels, one of the said parts being connected to a transversely-moving carrier, and means for causing the said carrier to move toward the one side or toward the other side of the engine in order to turn the steering-wheels, substantially as set forth

11. In a traction-engine, the combination of a frame having longitudinal side beams, a longitudinally-arranged central beam having its front end extending forward beyond the front ends of the said side beams, a steering-axle suitably connected to the front end of said central beam, steering-wheels mounted on said steering-axle, engines secured upon said frame, a boiler supported thereon, traction-wheels mounted near the rear end of said frame, and shafting and gearing interposed between the said engines and the said traction-wheels.

12. In a traction-engine, the combination of a frame having longitudinal side beams

and suitable cross bars or plates connecting them together, a longitudinally-arranged central beam secured to said cross bars or plates and having its front end extending forward beyond the front ends of said side beams, steering-wheels suitably connected to the front ends of said central beam, engines secured upon said frame, a boiler supported on the frame, traction-wheels mounted near the rear end of the frame, and shafting and gearing interposed between said engines and said traction-wheels.

13. In a traction-engine, the combination of a frame having longitudinal side beams, a longitudinally-arranged central beam having its front ends extending forward beyond the front ends of said side beams, a steering-axle suitably connected to the front end of said central beam, steering-wheels mounted on said steering-axle, engines arranged at the sides of said central beam, a boiler, a boiler-support for the front end of the boiler resting upon said central beam, traction-wheels near the rear of said framework, and shafting and gearing interposed between said engines and said traction-wheels.

14. In a traction-engine, the combination of a frame having longitudinal side beams, a longitudinally-arranged central beam having its front end extending forward beyond the front ends of said side beams, a steering-axle suitably connected to the front end of said central beam, steering-wheels mounted on said steering-axles, a boiler, supports for the boiler one arranged near the front end thereof and the other arranged near the middle thereof and both resting on said central beam, engines supported on said framework, traction-wheels arranged near the rear end of said framework, and power-transmitting mechanism interposed between said engines and said traction-wheels.

15. In a traction-engine, the combination of a frame having longitudinal side beams, a longitudinally-arranged central beam with its front end extending forward beyond the front ends of said side beams, steering-wheels suitably connected to the front end of said central beam, a boiler, a support for the front end of said boiler comprising a central vertical standard resting at its base upon said central beam and having outwardly-diverging legs with feet resting upon the adjacent side beams near their front ends, engines arranged upon said frame, traction-wheels mounted near the rear end of said frame, and power-transmitting mechanism interposed between said engines and said traction-wheels.

16. In a traction-engine, the combination of a frame having longitudinal side beams, a longitudinally-arranged central I-beam with its front end extending beyond the front ends of said side beams, steering-wheels suitably connected to the front ends of said central beams, a boiler, a support for the boiler arranged near the center thereof and having a saddle adapted to receive the boiler, and a central vertical standard resting at its base upon said central beam, engines arranged upon said framework, traction-wheels mounted near the rear end of said framework, and power-transmitting mechanism interposed between said engines and said traction-wheels.

17. In a traction-engine, the combination of a frame having longitudinal side beams, a longitudinally-arranged central beam having its front end extending forward beyond the front ends of said side beam, steering-wheels suitably connected to the front ends of said central beam, a boiler, a support for the front end of said boiler comprising a central vertical standard resting at its base upon said central beam and having outwardly-diverging legs with feet resting upon the adjacent side beams near their front ends, a support for the central part of said boiler having a saddle adapted to receive the boiler and a central vertical standard resting at its base upon said central beam, engines arranged upon said frame, traction-wheels mounted near the rear end of said frame, and power-transmitting mechanism interposed between said engines and said traction-wheels.

18. In a traction-engine, the combination of a framework, a hanger pivotally connected to the front end of said framework to swing about a horizontal axis, a steering-axle pivotally connected to said hanger to swing about a vertical axis, a spring interposed between said axle and the adjacent part of the framework to which the said hanger is connected, steering-wheels carried by said axle, a boiler and an engine arranged on said framework, traction-wheels mounted near the rear end of said framework, power-transmitting mechanism interposed between said engine and said traction-wheels, and means for turning the said steering-axle around the said vertical axis.

19. In a traction-engine, the combination of a framework, a U-shaped hanger having its ends pivotally connected to the front end of said framework to swing about a horizontal axis, a steering-axle resting near its center upon said hanger and pivotally connected thereto to swing about a vertical axis, a spring interposed between said axle and the adjacent part of the framework to which the said hanger is connected, steering-wheels carried by said axle, a boiler and an engine arranged on said framework, traction-wheels mounted near the rear end of said framework, power-transmitting mechanism interposed between said engine and said traction-wheels, and means for turning said steering-axle around the said vertical axis.

20. In a traction-engine, the combination

of a framework, a U-shaped hanger having its ends pivotally connected to the front end of said framework to swing about a horizontal axis, a sleeve resting upon said hanger and pivotally connected thereto to swing about a vertical axis, a spring interposed between said sleeve and the adjacent part of the framework to which the said hanger is connected, a steering-axle carried by said sleeve, steering-wheels mounted on said axle, a boiler and an engine arranged on said framework, traction-wheels mounted near the rear end of said framework, power-transmitting mechanism interposed between said engine and said traction-wheels, and means for turning the said steering-axle around the vertical axis of said sleeve.

21. In a traction-engine, the combination with a frame, a boiler and an engine secured thereon, traction-wheels mounted near the rear end thereof, and power-transmitting mechanism interposed between said engine and said traction-wheels, of a vertically rising and falling plate arranged beneath the front end of said framework, springs interposed between said plate and said framework, a swivel-block connected to said plate to swing about a vertical axis, a U-shaped hanger having its ends pivotally connected to said vertically-movable block to swing about a horizontal axis, a steering-axle pivotally connected to said swivel-block to swing about the same horizontal axis, and pivotally connected to said hanger to swing about the vertical axis of said swivel-block, steering-wheels carried by said steering-axle, and means for turning the said axle around the said vertical axis.

22. In a traction-engine, the combination with a frame, a boiler and an engine secured thereon, traction-wheels mounted near the rear end thereof, and power-transmitting mechanism interposed between said engine and said traction-wheels, of a vertically rising and falling plate arranged beneath the front end of said framework and guided in its movements by guides extending downwardly from said framework, springs interposed between said plate and said framework, a swivel-block connected to said plate to swing about a vertical axis and having its upper end guided by the walls of a socket depending from said framework, a U-shaped hanger having its ends pivotally connected to said vertically-movable block to swing about a horizontal axis, a steering-wheel pivotally connected to said swivel-block to swing about the same horizontal axis, and pivotally connected to said hanger to swing about the vertical axis of said swivel-block, steering-wheels carried by said steering-axle, and means for turning said axle around said vertical axis.

23. In a traction-engine, the combination with a frame, a boiler and an engine secured thereon, traction-wheels mounted near the rear end thereof, and power-transmitting mechanism interposed between said engine and said traction-wheels, of a vertically rising and falling plate arranged beneath the front end of said framework, springs interposed between said plate and said framework, a steering-axle connected to said plate to swing both around a vertical axis and around a horizontal axis, and means for turning said axle around said vertical axis.

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

WILLIAM N. SPRINGER.

Witnesses:

GEO. KLEIN,

LEE W. HAZARD.