(No Model.)

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H. K. SAMS.

ROAD ENGINE.

No. 397,144. Patented Feb. 5, 1889.

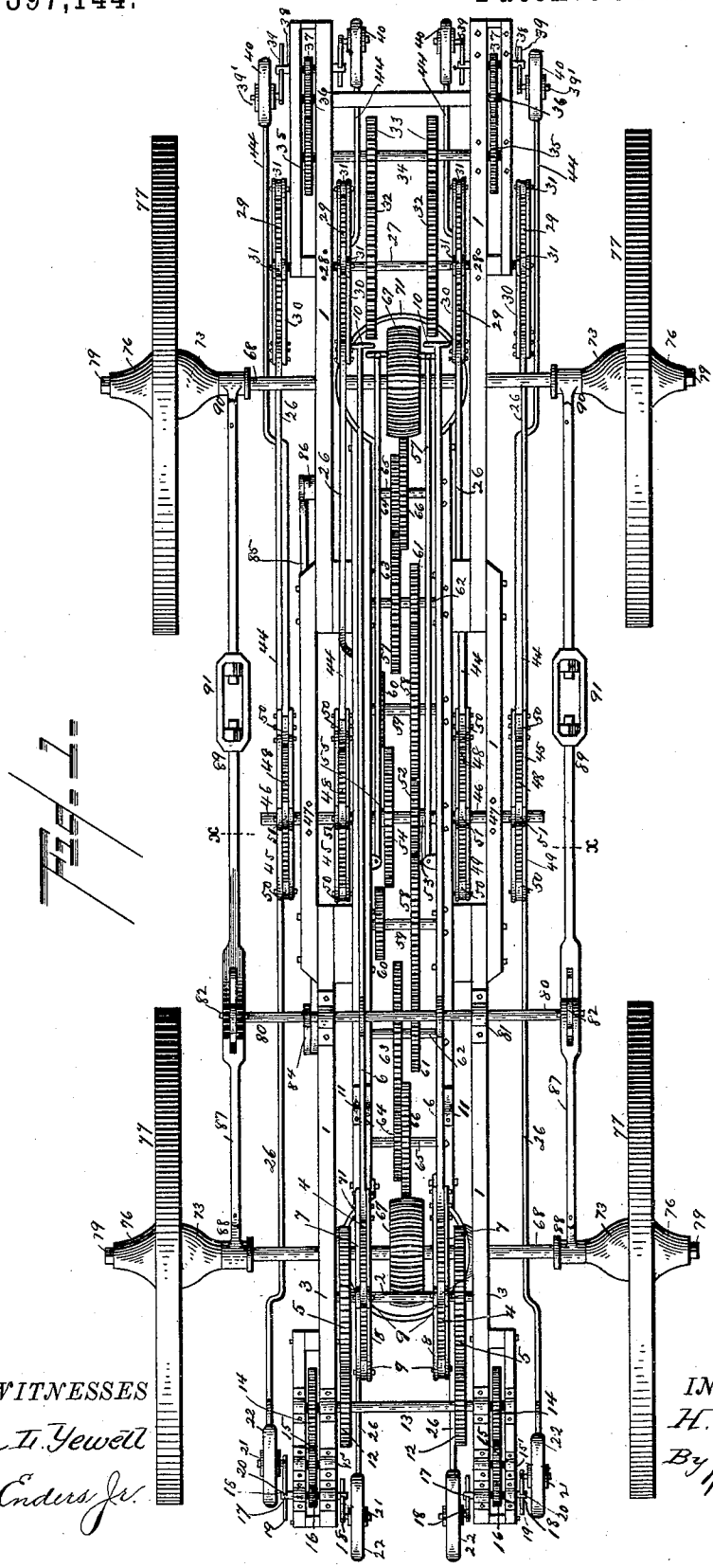


Fig. 1.

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(No Model.)

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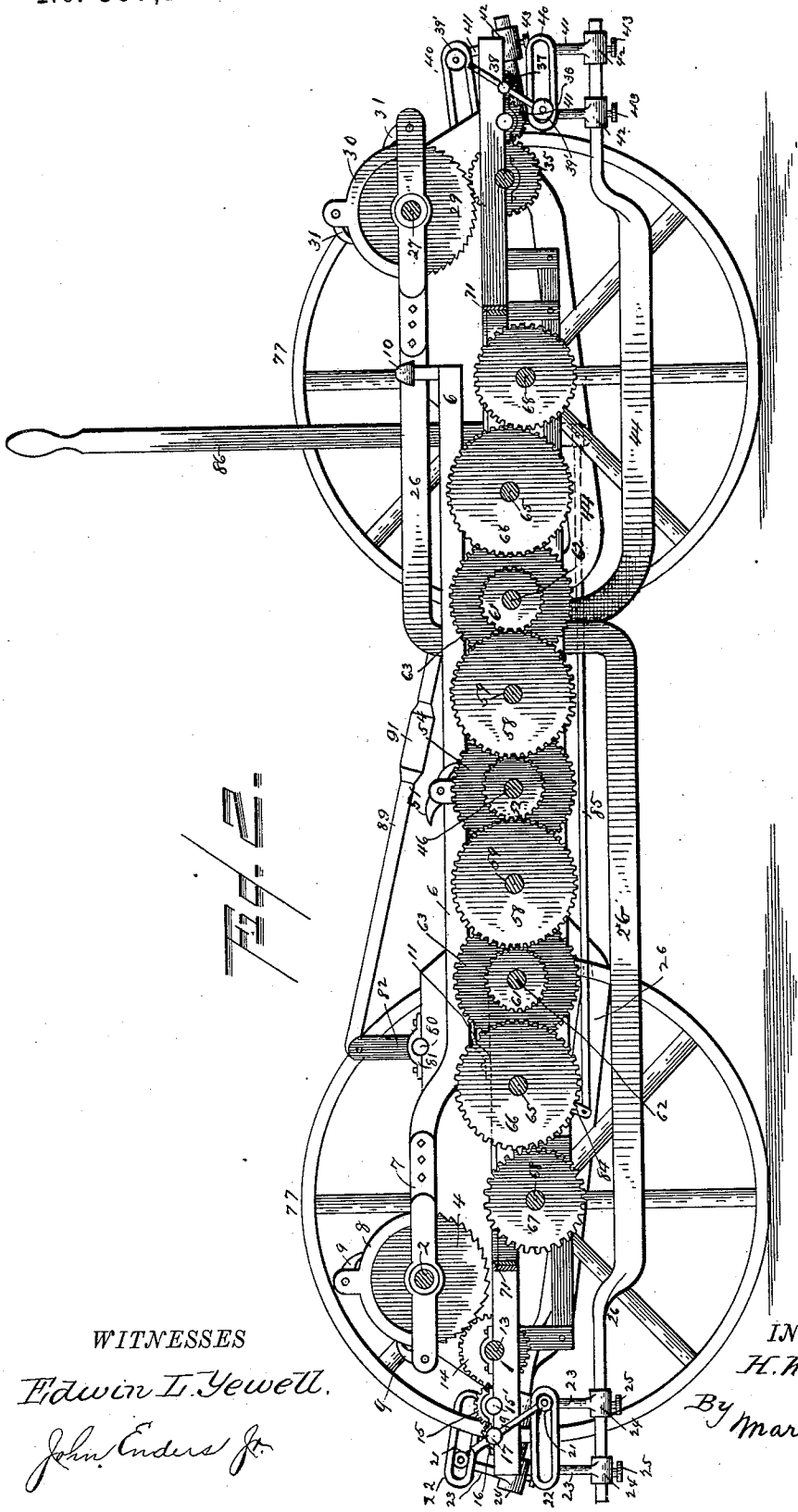


Fig. 2.

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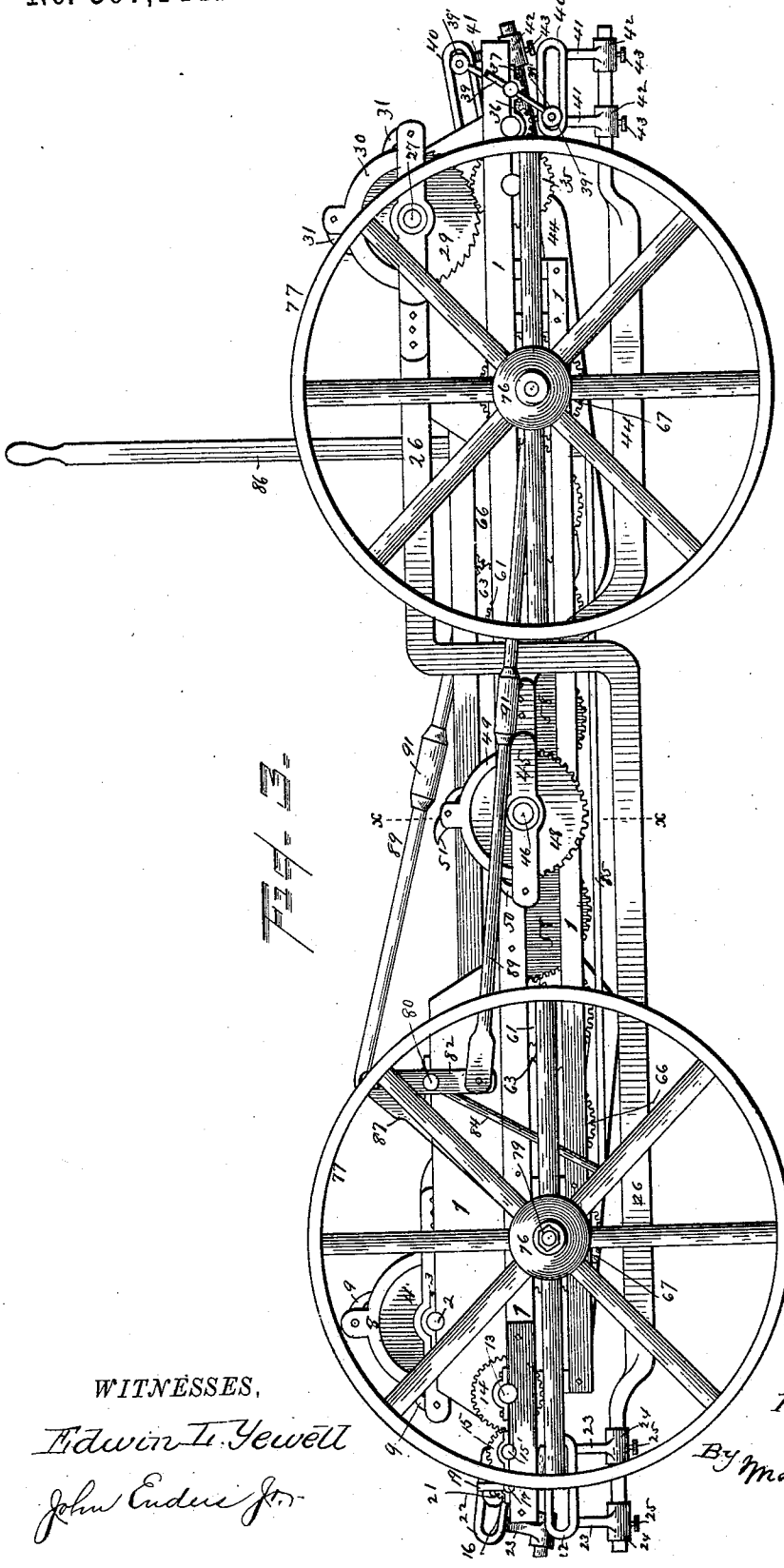


Fig. 5.

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Fig. 4.

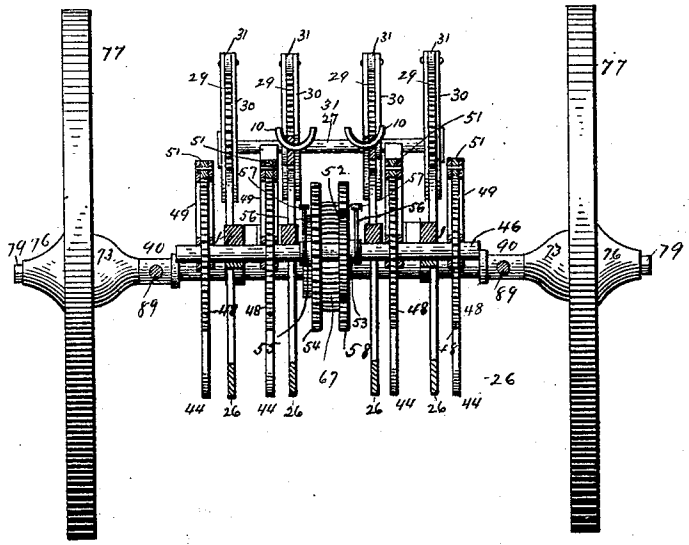
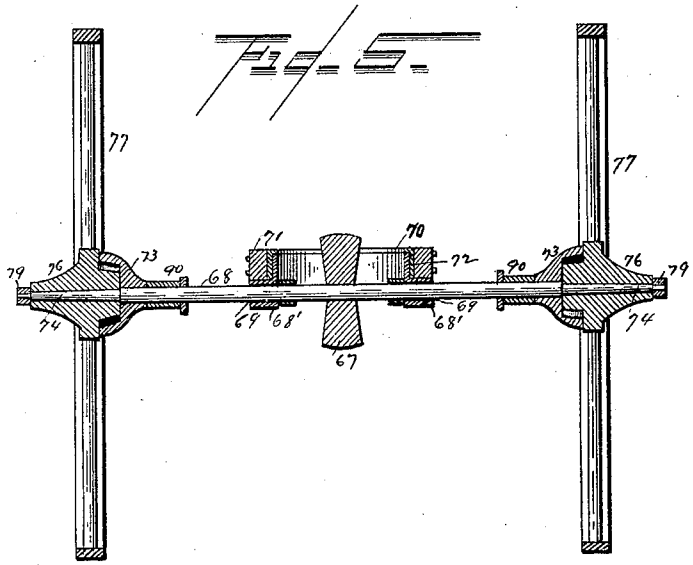


Fig. 5.



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(No Model.) 5 Sheets—Sheet 5.

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Fig. 6.

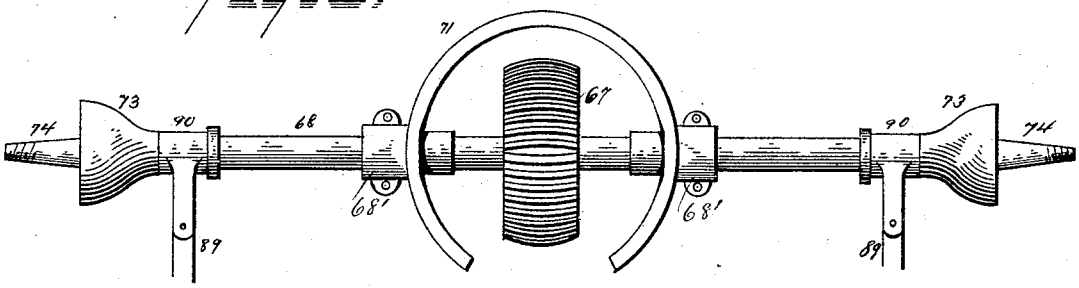


Fig. 7.

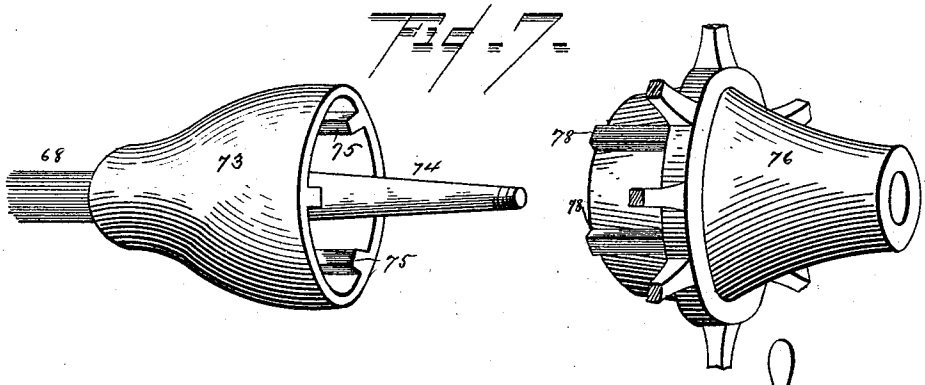
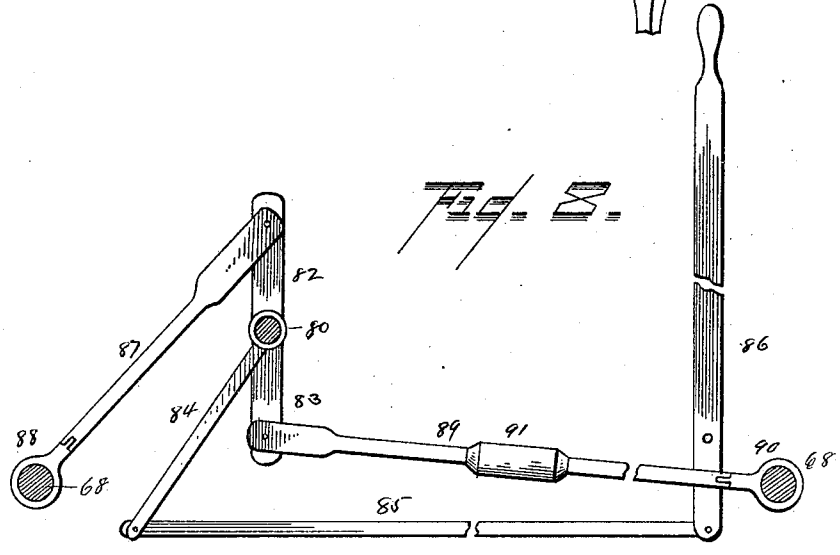


Fig. 8.



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UNITED STATES PATENT OFFICE.

HEZEKIAH K. SAMS, OF JOHNSON CITY, TENNESSEE.

ROAD-ENGINE.

SPECIFICATION forming part of Letters Patent No. 397,144, dated February 5, 1889.

Application filed April 9, 1888. Serial No. 270,056. (No model.)

To all whom it may concern:

Be it known that I, HEZEKIAH K. SAMS, a citizen of the United States, residing at Johnson City, in the county of Washington and State of Tennessee, have invented certain new and useful Improvements in Road Engines or Vehicles; 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.

My invention relates, generally, to road engines or vehicles propelled by any suitable power-generator, but more especially to those which are propelled by foot-power; and it consists in such an engine or vehicle provided with a number of levers connected to and operated by each other through suitable gearing which communicates rotary movement to a central shaft from which the axles are driven; with gear-wheels upon the axles which will admit of said gear-wheels being driven while the vehicle is being turned; with steering mechanism for turning both axles in turning the engine or vehicle; with lugs upon the hubs of the wheels and cups upon the axles which will admit of one wheel remaining stationary temporarily while turning said engine or vehicle, while the other wheel will be revolved by the axle; with improved means for changing the speed of the engine or vehicle; with improved means for reversing the revolutions of the wheels, and with an improved connection between the axles and the engine or vehicle frame which will dispense with the ordinary king-bolt; and it furthermore consists in the improved construction and arrangement or combination of parts of such an engine or vehicle which will hereinafter be fully disclosed in the description, drawings, and claims.

The objects of my invention are, first, to provide an engine or vehicle which can be propelled by any suitable power-generator, preferably, however, by foot-power, and in which a small amount of power may be so increased by levers and gearing as to overcome great resistance and propel or draw an immense burden; second, to provide an engine or vehicle which may have its wheels revolved by the propelling mechanism equally as well when turning on curves as when propelled in a straight line; third, to provide means for permitting the wheels at one side of the engine or vehicle to revolve slower than the wheels on the other side; fourth, to provide means for changing the speed of the power-generator, of whatever character it may be; fifth, to provide means for reversing the engine or vehicle without reversing the motion of the power-generator; and, sixth, to provide a fifth-wheel connection between the axles of the vehicle and the frame which will admit of the gear-wheels for communicating motion to the axles being placed upon the center of the axles.

In the accompanying drawings, forming a part of this specification, and in which the same reference-numerals indicate the same or corresponding parts, Figure 1 represents a top plan view of my improved road engine or vehicle, the body thereof being removed; Fig. 2, a longitudinal section of the same; Fig. 3, a side elevation thereof; Fig. 4, a transverse section on line $x\,x$ of Fig. 1; Fig. 5, a transverse section along one of the axles and through one pair of the road-wheels and their hubs and cups; Fig. 6, a top plan view of one of the axles, its fifth-wheel and gear-wheel, and other parts; Fig. 7, a perspective detail view of one end of the axle, its cup, and the hub of the wheel, showing the hub removed from the spindle and in position to be again placed upon the same; and Fig. 8 a detail side elevation of part of the steering mechanism.

In the drawings, the numeral 1 indicates the various parts of the engine or vehicle frame, which may be of any suitable construction, according to the character of the vehicle, and upon the same are mounted bearings for the transverse shafts of the propelling mechanism.

A transverse shaft, 2, is journaled in bearings 3 in the forward end of the frame, and has two ratchet-wheels, 4, and two cog-wheels, 5, secured upon it. Two foot-levers, 6, are fulcrumed upon said shaft and provided with bifurcated forward portions, 7, as shown in Figs. 1 and 2, which straddle said ratchet-wheels and are provided with upwardly-projecting semicircular frames 8. Pawls 9 are

pivoted between the forward ends of the bifurcated portions of said levers and between the upper points of said upwardly-projecting semicircular frames and engage the teeth of said ratchet-wheels for turning the same when the rear ends of said levers having the treadles 10 are depressed. Springs 11 are secured to the frame, below the levers 6 and slightly to the rear of the shaft 2, which fulcrum said levers and serve to raise said levers after they have been depressed and the feet removed.

The cog-wheels 5 upon the shaft 2 mesh with smaller cog-wheels, 12, upon a shaft, 13, having cog-wheels 14, which mesh with pinions 15 upon a shaft, 15′, which mesh with still smaller pinions, 16, upon crank-shafts 17, provided with cranks 18, one at each end, the arms 19 of these cranks being, preferably, adjustably secured in transverse perforations 20 in the ends of said crank-shafts. The pins 21 of these cranks are fitted to revolve and play within longitudinally-slotted frames 22, having downwardly-projecting arms 23, formed with sleeves 24, having set-screws 25, by means of which said frames may be adjustably secured upon the forward ends of four levers, 26, which pass rearward under the vehicle-frame for some distance, thence upwardly and rearwardly, and have their rear ends fulcrumed upon a shaft, 27, journaled in bearings 28 at the rear end of the vehicle-frame. (See Figs. 1, 2, and 3.) The rear portions of these levers are also bifurcated and straddle the ratchet-wheels 29 upon the shaft 27, and have upwardly-curved frames 30, and also pawls 31, which are pivoted between the upper portions of said frames and rear ends of the bifurcated portions of said levers and engage the teeth of said ratchet-wheels.

Cog-wheels 32, as shown in Fig. 1, are secured upon the shaft 27, and mesh with pinions 33 upon a shaft, 34, having cog-wheels 35 meshing with pinions 36, which mesh with pinions 37 upon crank-shafts 38. The arms of the cranks 39 are adjustably secured in perforations in the ends of said shaft in a manner similar to that by which the arms of the cranks are secured at the forward end of the frame, and have their pins 39′ sliding in longitudinally-slotted frames 40, which are adjustably secured by arms 41, sleeves 42, and set-screws 43 upon the rear ends of four levers, 44, in the same manner as the levers 26 are secured at the forward end of the engine or vehicle.

The forward bifurcated portions, 45, of the levers 44, as shown in Figs. 1 and 3, are fulcrumed upon a central main or drive shaft, 46, journaled in bearings 47 at the middle of the frame, straddle the cog or ratchet wheels 48, and have upwardly-extending curved frames 49. Pawls 50 are pivoted between the outer and inner ends of the bifurcated portions 45, engage the cogs of the cog or ratchet wheels 48 from opposite sides, and are capable of being tilted out of engagement with said wheels; also, double-ended or reversible pawls 51 are pivoted between the frames 49, and are capable of engaging said cog or ratchet wheels with either of their ends.

When the levers 44 are rocked, it will be seen that the wheels 48 and the shaft 46 may be revolved in one direction, when the pawls 50, between the front ends of the bifurcated arms and the rear ends of the upper pawls, 51, are tilted into engagement with said wheels, and that this revolution may be reversed by tilting said forward pawls 50 out of engagement, the rear pawls 50 into engagement, and the front ends of the upper pawls, 51, into engagement.

A small cog-wheel, 52, having a peripherally-grooved hub or sleeve, 53, as shown in Figs. 1 and 4, slides upon and turns with the main shaft 46, and has a groove in its bore which adapts it to be slid upon a key on said shaft, or any equivalent contrivance for allowing it to be slid may be used. A larger cog-wheel, 54, has a similar peripherally-grooved hub or sleeve, 55, which slides upon and turns with said main shaft. Pins or studs 56 project downward into the grooves of these hubs or sleeves from levers 57, which are suitably pivoted upon the frame and extend rearward and terminate near the treadles of the foot-levers 6; hence it will be seen that the cog-wheels 52 and 54 may be slid upon their shaft and into or out of engagement with the cog-wheels or pinions with which they mesh. The smaller cog-wheel, 52, meshes with two cog-wheels, 58, upon two transverse shafts, 59, which are respectively forward and to the rear of the main shaft 46, said shafts 59 having pinions 60 upon them, which are adapted to mesh with the larger cog-wheel, 54, upon said main shaft when the said wheel is slid into engagement with said pinions, and thus the speed of the engine or vehicle may be varied. The cog-wheels 58 also mesh with pinions 61 upon shafts 62, having cog-wheels 63, which mesh with pinions 64 upon shafts 65, having cog-wheels 66, meshing with partly-spherical cog-wheels 67 upon the axles 68. These cog-wheels 67 have their wide peripheries formed of a portion of a sphere, so that they may remain in engagement with the cog-wheels 66 when the axles are turned in turning the engine or vehicle or in passing it around curves.

As shown more plainly in Fig. 5, the axles 68 are journaled in boxes or bearings 68′, having suitable Babbitt metal or similar anti-friction linings, 69, and are secured upon the under sides of fifth-wheels 70, which form the greater parts of circles, and which are cut out at their inner sides, and through which the cog-wheels 66, meshing with the partly-spherical cog-wheels 67, project; also, these fifth-wheels turn within sixth-wheels 71, which also form parts of circles, and which have downwardly-projecting flanges 72 upon their inner edges for confining said fifth-wheels and securing them to the frame. The

sixth-wheels confine the fifth-wheels in place and serve to perform the office of king-bolts; also, the couplings between the frame and the axles are thus in a plane but slightly above the plane of the axles, whereby the entire propelling mechanism is supported comparatively low down between the wheels, and the body of the engine or vehicle, which is supported above said mechanism and upon the frame, is not supported sufficiently high above the axles to cause said body to be top-heavy.

As shown in Figs. 5 and 7, the ends of the axles 68 are provided with cups 73, through which the spindles 74 project, and the inner sides of said cups are formed with three (more or less) lugs or ribs, 75; also, the inner portions of the hubs 76 of the wheels 77 are formed with corresponding ribs or lugs, 78, which project into said cups, the ribs or lugs 78 of the hubs being adapted to bear against the ribs or lugs 75 in the cups. The wheels are retained upon the spindles by nuts 79, or by any other suitable or well-known fastenings.

A rock-shaft, 80, as shown in Figs. 1, 2, 3, and 8, is journaled in bearings 81 toward the forward end of the vehicle-frame, and has at each end an upwardly and a downwardly projecting arm, 82 and 83, and also a downwardly and forwardly projecting arm, 84, near one end, to the end of which is attached the forward end of a connecting-rod, 85, the rear end of the latter being attached to the lower arm of the steering-lever 86; also, rods 87, which are provided with boxes 88 at their forward ends, in which the front axle may turn, are pivoted at their rear ends, respectively, one to the upwardly-projecting arm 82 and the other to the downwardly-projecting arm 83 at the ends of the rock-shaft; also, rods 89 are provided with boxes 90 at their rear ends for the rear axle, and have turn-buckles 91 upon their middles for adjusting their length, and at their forward ends they are pivoted respectively one to the downwardly-projecting arm 83 and the other to the upwardly-projecting arm 82, and thus it will be seen that by tilting the steering-lever 86 and rocking shaft 80 the ends of the axles at one side of the vehicle may be drawn together and the ends at the other side pushed apart, so as to turn the axles and guide the engine or vehicle in a curve, the steering-lever 86, the rock-shaft 80, the arms 82 and 83, and the rods 87 and 89, between the axles and the arms of the rock-shaft, thus serving to variably guide said engine or vehicle while being propelled. This engine or vehicle is capable of carrying, drawing, or propelling heavy loads, with unusual power and rapidity, by the application of very small weight or pressure upon the treadles of the foot-levers, as the initial power is greatly increased or multiplied by the number and arrangement of the levers and the intermediate gearing; also, whenever it is desired to reverse the motion of this engine or vehicle, the pawls engaging the cog-wheels or ratchet-wheels upon the main shaft only require to be reversed, when said shaft will be reversed and the vehicle propelled in the desired direction.

By the employment of four levers in each of the two sets of levers, which are rocked by the cranks at the opposite ends of the engine or vehicle the shafts, which are revolved by the pawls of said levers engaging the cog or ratchet wheels upon said shafts, will be continually revolved, as one or more levers of the respective sets will be revolving the shaft or shafts by their pawls engaging the wheels, while the remaining lever or levers are being rocked to bring their pawls again into position to take fresh hold upon the teeth of the wheels, and thus there will be no dead-centers in the propelling devices, a part of the power being at all times applied in revolving the drive or main shaft.

When only a moderate speed is desired for the engine or vehicle, with a proportionate power, the smaller cog-wheel upon the drive-shaft is thrown into engagement with its appropriate cog-wheels, and then the larger cog-wheel is thrown out of engagement with its pinions; also, whenever it is desired to have greater speed, increasing the same at the expense of power, this may be done by throwing the smaller cog-wheel upon said drive-shaft out of engagement with its large cog-wheels, and then throwing the larger cog-wheels upon said drive-shaft into engagement with the small pinions or cog-wheels with which it is adapted to mesh, and thus the speed of the vehicle or engine may be increased without increasing the speed of the initial power applied to the foot-levers.

Any power may be employed for propelling this engine or vehicle—as, for instance, it may be run by steam, when it would only be necessary to mount the steam-cylinders upon the frame and connect their pistons to cranks attached to the rear ends of the foot-levers; but the preferred power-generator, as shown in the drawings and hereinbefore described, is one which is suitable for the employment of foot-power.

Having thus fully described the construction, arrangement or combination, and operation of the several parts of my invention and its advantages, what I claim as new is—

1. In a road engine or vehicle, the combination of the frame, the wheels, and the axles, with the main or drive shaft provided with one or more central cog-wheels, and also with cog or ratchet wheels, a train of gearing connecting said main shaft and axles, levers fulcrumed upon said main shaft and provided with pawls for engaging said cog or ratchet wheels, cranks pivotally connected for vibrating the ends of said levers, and mechanism for imparting rotary motion to said cranks, substantially as described.

2. In a road engine or vehicle, the combination of the frame, the wheels, and the axles, with a drive-shaft provided with cog or ratchet wheels, gearing for transmitting the motion

of said shaft to said axles, levers fulcrumed upon said drive-shaft and provided with pawls for engaging said cog or ratchet wheels, and with slotted frames at their rear ends, crank mechanism for vibrating said frames, a shaft provided with cog or ratchet wheels, gearing between the same and said crank mechanism, levers fulcrumed upon said shaft and provided with pawls for engaging said cog or ratchet wheels and with slotted frames at their front ends, crank mechanism for vibrating said frames and levers, a shaft provided with cog-wheels, and also with cog or ratchet wheels gearing intermediate of the same and said crank mechanism, and levers fulcrumed upon said shaft and operated from their rear ends, substantially as described.

3. In a road engine or vehicle, the combination, with the frame, the axles, and their wheels, of a drive-shaft provided with four cog or ratchet wheels, gearing for communicating the revolutions of said shaft to said axles, levers fulcrumed upon said drive-shaft and provided with pawls for engaging said cog-wheels or ratchet-wheels and with longitudinally-slotted frames at their rear ends, shafts provided with cranks upon their ends, having pins which revolve and play within the slots of the said frames, a shaft having four cog or ratchet wheels, gearing between the same and said crank-shafts, levers fulcrumed upon said shaft and provided with pawls for engaging said cog or ratchet wheels, and with longitudinally-slotted frames at their front ends, crank-shafts provided with pins which revolve and play within the slots of said frames, a shaft provided with cog-wheels, intermediate gearing between the same and said crank-shafts, said shaft being also provided with two cog or ratchet wheels, and two foot-levers provided with treadles upon their rear ends, and which are fulcrumed upon said shaft, and with pawls engaging said cog or ratchet wheels, substantially as described.

4. In a road engine or vehicle, the combination of the foot-levers 6, the crank-shafts 38, and intermediate gearing between said crank-shafts and foot-levers, with the drive-shaft 46, provided with the cog-wheels 48, and the levers 44, pivoted upon said drive-shaft and provided at their front ends with bifurcated portions 45, having semicircular frames 49, pawls 50 in the ends of said bifurcated portions, and pawls 51 in the upper portions of said semicircular frames, and at their rear ends with longitudinally-slotted frames 40, which are connected to and vibrated by said crank-shafts, substantially as described.

5. In a road engine or vehicle, the combination of the crank-shafts 38, the arms 39, adjustably secured in perforations in the ends thereof and provided with crank-pins 39′, the vibratory levers 44, the longitudinally-slotted frames 40, mounted upon said crank-pins and provided with the downwardly-projecting arms 41, having sleeves 42, fitted upon the ends of said levers and adjustable thereon by the set-screws 43, substantially as and for the purpose described.

6. The combination of the frame provided with the sixth-wheel forming part of a circle which is open at the inner side and having a downwardly-projecting flange upon its inner edge, a correspondingly-shaped fifth-wheel fitted within said flanged sixth-wheel and provided with boxes or bearings upon its under side, the wheel-axle journaled in said boxes or bearings, and having a gear-wheel upon its middle, and gearing projecting through the open sides of said fifth and sixth wheels, substantially as described.

7. The combination of the frame provided with the sixth-wheel forming part of a circle which is open at the inner side and having a downwardly-projecting flange upon its inner edge, a cog-wheel and its shaft journaled in bearings in said frame, means for driving said cog-wheel, which partly projects through the open side of said sixth-wheel, a fifth-wheel fitted within said flanged sixth-wheel and having a shape corresponding thereto and provided with boxes or bearings upon its under side, and a wheel-axle journaled in said boxes or bearings and provided with a partly-spherical cog-wheel which meshes with said cog-wheel which is journaled in the frame, substantially as described.

8. The combination of the frame and the wheel-axle journaled in bearings on the under side of said frame and provided with cups at its ends and with spindles projecting through said cups, which are provided with lugs or ribs upon their inner sides, with the wheels journaled upon said spindles and provided with hubs, also having lugs or ribs upon their inner parts which project and fit into said cups, and are adapted to permit their lugs or ribs to bear against those within said cups, substantially as and for the purpose described.

9. The combination of the frame 1, the pivoted axles 68, adapted to turn in one plane beneath said frame, the rock-shaft 80, provided at its ends with the upwardly and downwardly projecting arms 82 and 83, and with the arm 84 near one end, the downwardly and forwardly extending rods 87, having boxes 88 at their forward ends for the front axle and having their rear ends respectively pivoted to one of said upwardly-projecting arms 82 at one end of said rock-shaft and to one of said downwardly-projecting arms 83 at the other end of said shaft, the two rearwardly-extending rods 89, provided with turn-buckles 91 for adjusting their length, and with boxes 90 at their rear ends for the rear axle, and respectively pivoted at their forward ends, one to the upwardly-projecting arm 82 at one end of said rock-shaft and the other to the downwardly-projecting arm 83 at the other end of said shaft, the steering-lever 86, and the connecting-rod 85, pivoted thereto and to said arm 84, substantially as and for the purpose described.

10. A road engine or vehicle provided with the two pivoted axles 68, having cog-wheels 67 at their centers, which have the shape of parts of spheres, the main or drive shaft 46, provided with four cog or ratchet wheels, 48, and cog-wheels 52 and 54, intermediate gear or cog wheels between said cog-wheels upon the drive-shaft and said partly-spherical cog-wheels upon the axles, the levers 44, fulcrumed upon said drive-shaft and provided with pawls 50 and 51, pivoted between their bifurcated ends 45 and between their curved frames 49, and with the longitudinally-slotted frames 40 at their rear ends, the crank-shafts 38, having pins 39′, playing and revolving in said longitudinally-slotted frames, the shaft 27, provided with four ratchet-wheels, 29, and with cog-wheels 32, gearing for communicating motion thereto from said crank-shafts, the levers 26, provided at their rear portions with bifurcated ends 30, which straddle said ratchet-wheels, are fulcrumed upon said shaft 27, and have pawls 31, engaging with said ratchet-wheels, said pawls being pivoted between the ends of said levers and between frames 30, curving upward from their bifurcated ends, said levers 26 being provided at their forward ends with longitudinally-slotted frames 22, the crank-shafts 18, having their pins 21 moving in said frames 22, the shaft 2, having two cog or ratchet wheels, 4, and cog-gears 5, intermediate gearing between said cog-gears and said crank-shafts, the two foot-levers 6, having treadles 10 upon their rear ends, the springs 11 for raising them, said levers being fulcrumed at their forward parts upon said shaft 2 and provided with bifurcated ends 7, which straddle said cog or ratchet wheels, and are provided with pawls 9 for moving said cog or ratchet wheels, substantially as described.

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

HEZEKIAH K. SAMS.

Witnesses:
WILEY M. CHRISTIAN,
TENNESSEE H. H. LUSK.