(No Model.) 3 Sheets—Sheet 1.

F. W. HAVILAND.

VEHICLE DRIVING GEAR.

No. 570,395. Patented Oct. 27, 1896.

Fig 1

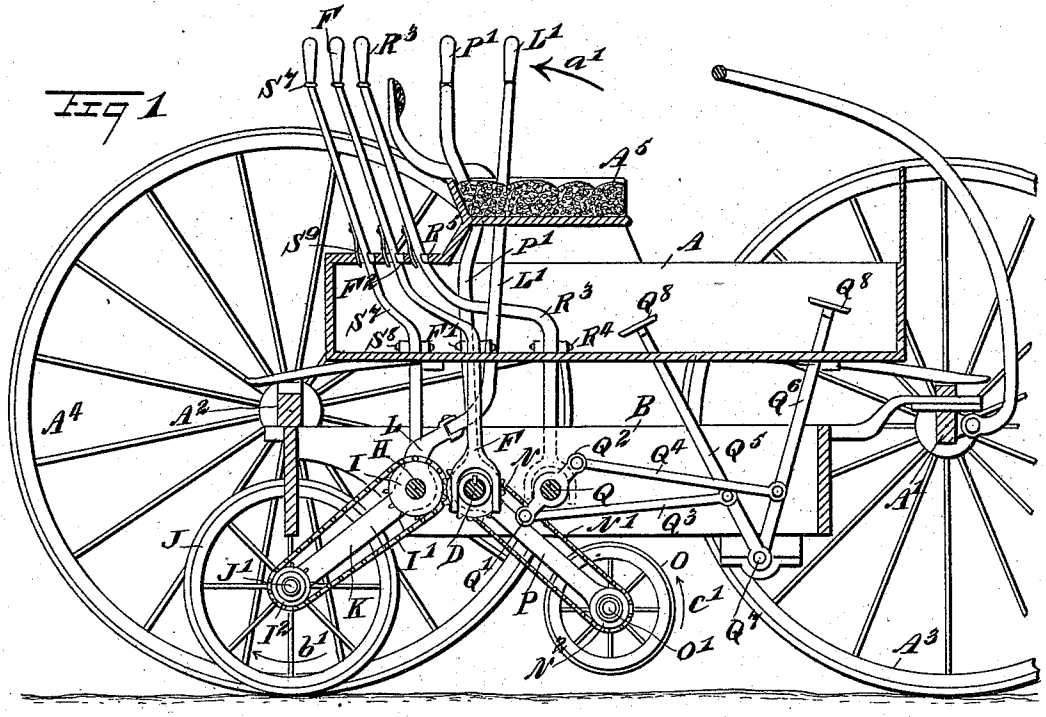

Fig. 2.

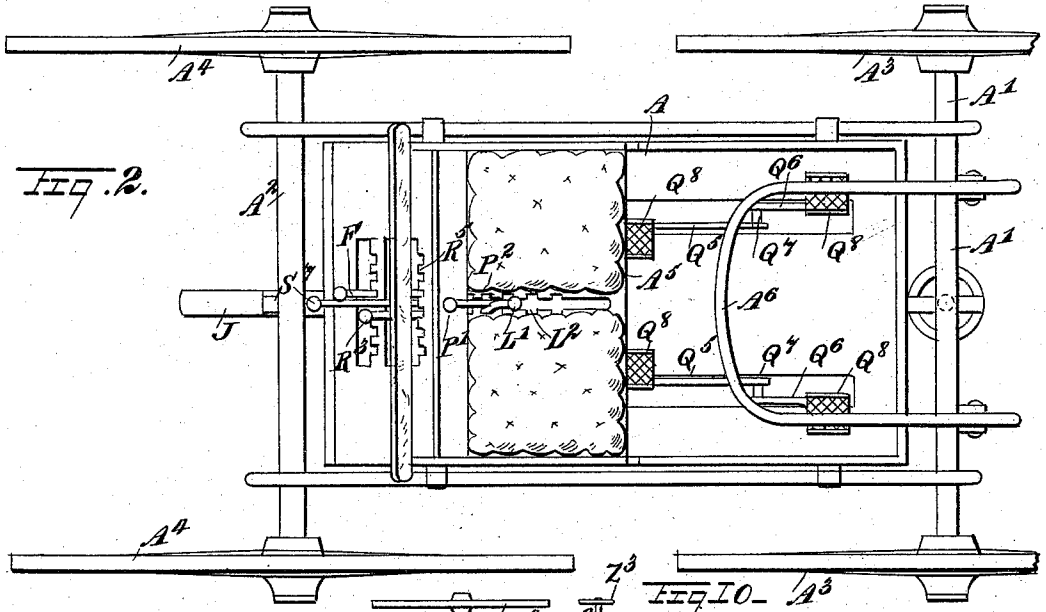

Fig 9

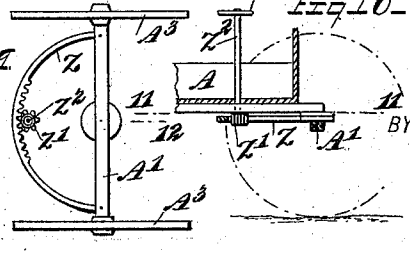

Fig 10

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Fig. 3.

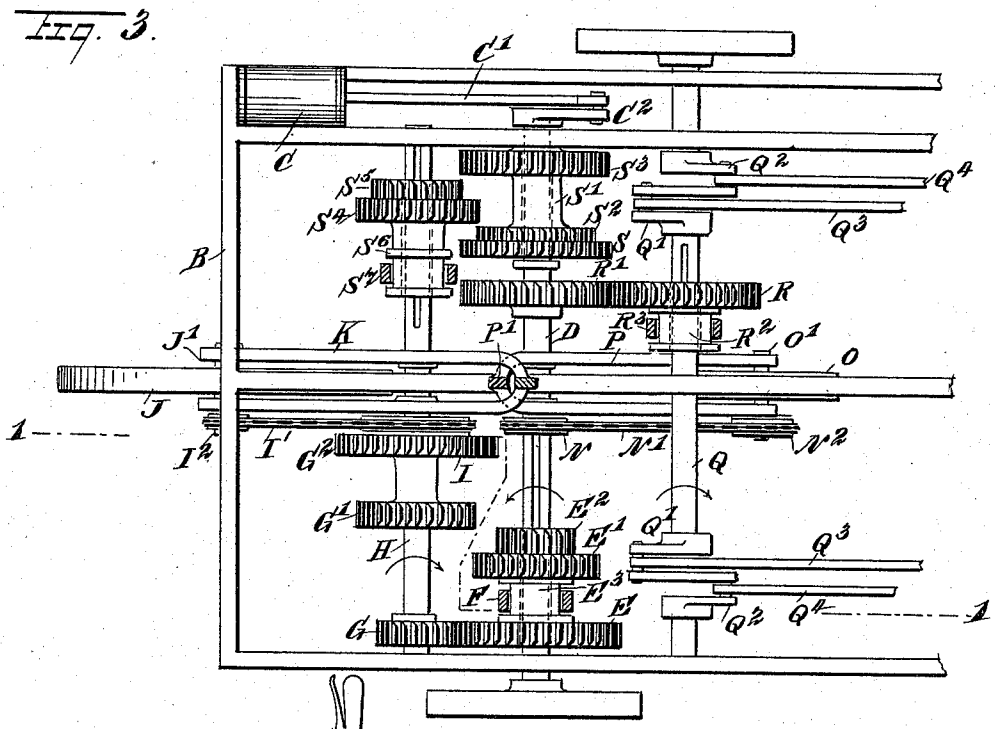

Fig. 4.

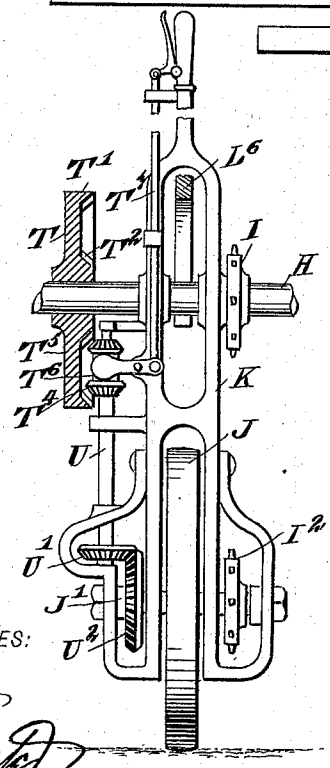

Fig. 5.

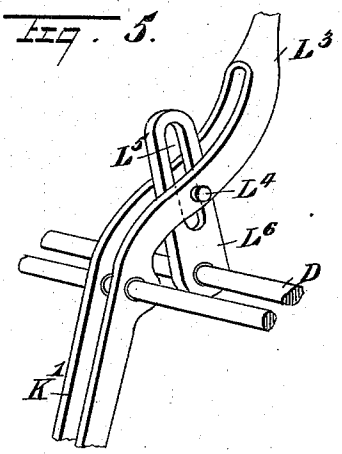

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Fig. 6.

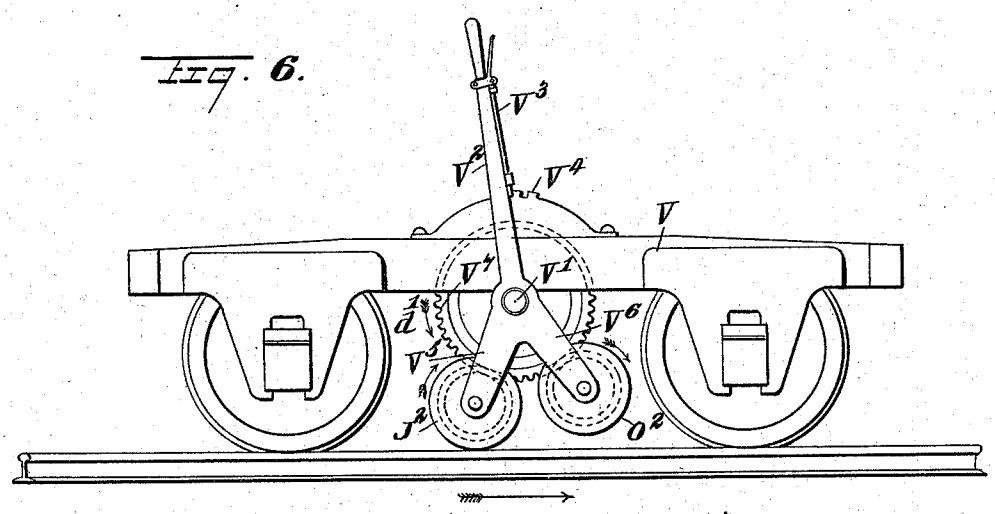


Fig. 7.

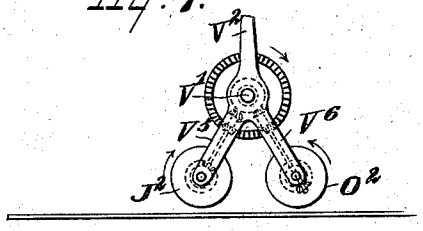
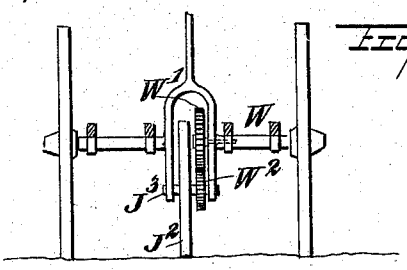


Fig. 8.



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FRANK W. HAVILAND, OF NEW YORK, N. Y.

VEHICLE DRIVING-GEAR.

SPECIFICATION forming part of Letters Patent No. 570,395, dated October 27, 1896.

Application filed September 16, 1895. Serial No. 562,660. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. HAVILAND, of New York city, in the county and State of New York, have invented a new and Improved Vehicle Driving-Gear, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved vehicle driving-gear, arranged to propel the vehicle independently of the running wheels, and at the same time preventing any slip and consequently preventing loss of the power applied.

The invention consists principally of an independent friction-surface applied so as to utilize the weight of the vehicle to increase friction and overcome inertia and resistance.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement on the line 1 1 of Fig. 3. Fig. 2 is a plan view of the same. Fig. 3 is a sectional plan view of the gearing. Fig. 4 is an end elevation of a modified form of the improvement, with part in section. Fig. 5 is a perspective view of a modified form of the shifting arrangement for the propelling-wheels. Fig. 6 is a side elevation of a modified form of the improvement as arranged for railroads. Fig. 7 is a side elevation of a modified form of the driving mechanism. Fig. 8 is an end elevation, with parts in section, of a modified form of the improvement. Fig. 9 is a plan view of a modified form of a steering device as applied, and Fig. 10 is a sectional side elevation of the same.

The vehicle on which my improvement is applied is provided with the usual body A, mounted on the front and rear axles A′ and A^2, on which are journaled the front and the rear wheels A^3 and A^4, respectively. The frame B is supported from the axles A′ and A^2, below the body A, and on this frame is mounted a motor C, of any approved construction and connected by a pitman C′ and crank-arm C^2 with a shaft D, journaled in suitable bearings in the frame B and extending transversely therein.

On the shaft D are mounted to turn and to slide the graduated gear-wheels E E′ E^2, held on a hub E^3, engaged by a shifting lever F, pivoted at F′ in the bottom of the body A and extending upward to engage one of a series of notches F^2 to hold the said lever in position. The graduated gear-wheels E, E′, and E^2 are adapted to be moved in mesh, by shifting the lever F correspondingly, with correspondingly-graduated gear-wheels G G′ G^2, secured on a transverse shaft H, likewise journaled in suitable bearings in the frame B. On this shaft H is fastened a sprocket-wheel I, over which passes a sprocket-chain I′, also passing over a sprocket-wheel I^2, secured on the axle or shaft J′ of a wheel J, adapted to move with its peripheral surface in contact with the ground on which the vehicle travels.

The shaft J′ is located approximately directly below the rear axle A^2, and the said shaft is journaled in an arm K, mounted to swing loosely from the shaft H as its fulcrum. The arm K is provided with an extension L, pivotally connected with a lever L′, extending upward between the cushions of the seat A^5 to engage one of a series of notches L^2 for locking the said lever in position. Now it will be seen that when the operator seated on the seat A^5 presses the lever L′ rearwardly in the direction of the arrow *a′* he causes a downward swinging of the arm K to move the peripheral surface of the wheel J in contact with the ground, and the impact between the said peripheral surface and the ground is not in proportion to the pressure applied on the lever L′, but depends upon the angle of the arm K being such as to permit the wheel J to cramp under the vehicle, automatically increasing the impact upon the ground by utilizing the weight of the vehicle and so produce friction sufficient to overcome its own inertia or resistance when the wheel J is put in motion.

When the motor C is set in motion, a rotary motion is given to the shaft D, and the motion of the latter is transmitted, by means of the gear-wheels E, E′, or E^2, to the corresponding gear-wheels G, G′, or G^2, so that the shaft H is rotated, and the rotary motion of

the latter is transmitted by the sprocket-wheel I, the chain I′, and sprocket-wheel I^2 to the shaft J′ and wheel J to revolve the latter in the direction of the arrow *b*′. Now, as the wheel J is pressed firmly in contact with the ground, as previously described, and rotates in the direction of the arrow *b*′, it propels the vehicle forward, and all slip in the propelling-wheel J is prevented by the peculiar cramping of the wheel J on the angular arm K, as above described. It is understood that when the operator shifts the lever F the speed of the wheel J will be increased or diminished, with the motor, however, running at a regular uniform speed.

In order to permit of running the vehicle backward, I provide the shaft D with a sprocket-wheel N, over which passes a sprocket-chain N′, also passing over a sprocket-wheel N^2, secured on the outer end of a shaft O′, carrying a wheel O, arranged in front of the wheel J, and likewise adapted to move in contact with the ground at the time the wheel J is raised, and as the said wheel O is adapted to travel in the direction of the arrow *c*′ a rearward motion is given to the vehicle whenever said wheel O is in contact with the ground and is driven from the shaft D, the latter still revolving in the same direction as that in which it revolved before.

The wheel O is journaled in an arm P, mounted to swing loosely on the shaft D as a fulcrum, and the arm P is provided with a lever P′, adapted to be engaged by the lever L by moving the arm K, so that a single forward movement in the inverse direction of the arrow *a*′ causes an upward swinging of the arm K and a lifting of the wheel J out of contact with the ground, and at the same time causes a downward swinging of the arm P to move the wheel O in contact with the ground. The lever P′ is under the control of the operator seated on the seat A^5, and is adapted to engage one of a series of notches P^2 for locking the said lever in place. By the arrangement described the operator can work both levers L′ and P′ independently of one another, and also by the use of the lever L′ he can throw the wheel O in contact with the ground, it only being necessary for the operator to move the lever L′ a sufficient distance in the inverse direction of the arrow *a*′.

The shaft D can be driven by an auxiliary power or motor, here represented by foot-power of the operator seated in the seat A^5, and both the motor C and the foot-power may be employed to rotate the said shaft. For this purpose I provide the shaft Q, extending transversely and journaled in suitable bearings in the frame B, the said shaft being provided with sets of crank-arms Q′ and Q^2, standing in opposite directions, as is plainly indicated in Fig. 3. The crank-arms Q′ and Q^2 are pivotally connected by links Q^3 and Q^4, respectively, with foot-levers Q^5 and Q^6, respectively, fulcrumed at Q^7 to the frame B, the said levers extending upward through slots in the bottom of the body A to carry at their upper ends foot-pieces Q^8, adapted to be engaged by the feet of the operator seated on the seat A^5. Now by imparting a forward-and-backward swinging motion to the said levers Q^5 and Q^6 a rotary motion can be imparted to the shaft Q, and this rotary motion is transmitted by a gear-wheel R, fitted to slide on and to turn with a gear-wheel R′, secured on the shaft D. Thus when the shaft Q is rotated the shaft D is likewise rotated to rotate both of the wheels J and O and to propel the vehicle forward or backward, according to which of the two wheels is in contact with the ground.

The gear-wheel R is adapted to be shifted on the shaft Q to move it out of mesh with the gear-wheel R′, and for this purpose I engage the said gear-wheel R on its hub R^2 by a shifting-lever R^3, pivoted at R^4 in the body A and under the control of the operator seated on the seat A^5. The lever R^3 is adapted to be locked in place in one of a series of notches R^5. The gear-wheel R, when shifted transversely by the said lever R^3, can be moved out of engagement with the gear-wheel R′ and in gear with the gear-wheel S, having its hub S′ mounted loosely on the shaft D. On the hub S′ are secured two graduated gear-wheels S^2 and S^3, adapted to be engaged by gear-wheels S^4 and S^5, respectively, secured on a hub S^6, mounted to slide on and to turn with the shaft H, said hub being also engaged by a shifting-lever S^7, fulcrumed at S^8 in the body A and adapted to be locked in place in one of a series of notches S^9. Now it will be seen that when it is desired to transmit the rotary motion imparted to the shaft Q by the auxiliary power or feet of the operator, as previously explained, directly to the shaft H without the use of the shaft D and the motor C then the operator first shifts the lever R^3 to move the gear-wheel R in mesh with the gear-wheel S, and he then shifts the lever S^7 to move either of the gear-wheels S^4 or S^5 in mesh with the corresponding gear-wheel S^2 or S^3. The rotary motion of the shaft Q is now transmitted by the gear-wheel R to the gear-wheel S and by either of the sets of gear-wheels S^2 S^4 or S^3 S^5 to the shaft H, which imparts a rotary motion to the wheel J, as previously explained.

In order to actuate the arm P from the lever L′ at the time the arm K is swung upward, I may employ the device shown in Fig. 5, in which the lever L^3, connected with the arm K′, is provided with a pin L^4, engaging a slot L^5 in an arm L^6, attached to the shaft D, so that the forward movement of the lever L^3 causes a forward swinging of the arm L^6 on the shaft D to swing the arm P downward, so as to move the wheel O in contact with the ground at the time the other wheel, J, is raised off of the ground.

The wheel J may be driven from the shaft H by different means than the sprocket wheels and chains above referred to; for in-

stance, as shown in Fig. 4, in which the shaft H carries a gear-wheel T, formed on its inner surface with two beveled gear-wheels T′ and T^2 of different diameters and adapted to be engaged by beveled gear-wheels T^4 and T^5, held on the same hub T^6, fitted to slide on and to turn with the shaft U, journaled in suitable bearings on the arm K. The hub T^6 is adapted to be shifted on the said shaft U by a suitable hand-lever T^7 to move either of the pinions T^4 or T^5 in contact with its respective gear-wheel T′ or T^2. On the lower end of the shaft U is secured a beveled gear-wheel U′, in mesh with a gear-wheel U^2, secured on a shaft J′, carrying the wheel J. Now by this arrangement a fast or slow movement can be given to the wheel J from the shaft H, the latter rotating at a uniform rate of speed.

As illustrated in Fig. 6, the improvement is applied to a railroad-truck V, provided with a driven shaft V′, on which is fulcrumed the lever V^2, carrying a hand-lever V^3, adapted to engage a segment V^4 to lock the said lever in place. The lower end of the lever V^2 is provided with two arms V^5 and V^6, of which the arm V^5 carries the wheel J^2, and the other arm carries the wheel O^2. Now by shifting the lever V^2 either of the said wheels J^2 or O^2 will be moved in engagement with the rail on which the truck V travels. The wheels J^2 and O^2 are driven by gear-wheels from a gear-wheel V^7, secured on the shaft V′, it being understood, however, that the latter is driven from a motor, which can be reversed, so as to rotate the shaft V′ and gear-wheel V^7 in either direction.

When the gear-wheel V^7 travels in the direction of the arrow *d′*, then the wheel J^2 is driven in the right direction for propelling the truck V forward at the time the said wheel J^2 is in engagement with the rail. When it is desired to move the truck V in the inverse direction, or backward, then the lever V^2 is shifted to the right to swing the wheel J^2 out of engagement with the rail and the other wheel, O^2, into engagement with the rail. The shaft V′ is now driven in the inverse direction of the arrow *d′* to cause the wheel O^2 to move the truck V backward. The shaft V′ can, however, be driven by a movement which is non-reversing, and in this case (see Fig. 7) a gearing is employed similar to the one shown and described relative to Fig. 4, so that further description is not deemed necessary.

In Fig. 8 the arm K and lever L are shown as part of one of the axles W of the vehicle, and for imparting a rotary motion to the wheel J. In this case the axle supports a loose gear-wheel W′, in mesh with a gear-wheel W^2, secured on the shaft J^3 for the wheel J^2, it being understood that the gear-wheel W is also in mesh with a corresponding gear on shaft H.

The teeth of the gears on shafts H, D, and Q are beveled at the ends to form clutch-gears and to facilitate sliding in and out of mesh.

The steering device shown is more especially designed for vehicles carrying heavy loads, and this device is provided with a segmental gear-wheel Z, secured at its ends to the shaft-clips of the front axle and in mesh with a pinion Z′, held on a vertically-disposed shaft Z^2, carrying on its upper end a hand-wheel Z^3, under the control of the operator. Now by turning the hand-wheel Z^3 the pinion Z′ revolves the segmental gear-wheel Z, and the front axle is consequently turned to the right or left to cause the vehicle to travel in the same direction.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a vehicle, the combination with the running-gear, of pivoted propelling devices adapted to be swung alternately into contact with the ground or track, and means for simultaneously swinging one propelling device out of contact with the ground or track when the other is swung into contact, substantially as shown and described.

2. In a vehicle, the combination with the running-gear, of swinging wheels adapted to alternately engage the ground or track, means for operating said wheels when in engagement with the ground or track, and means for simultaneously swinging one wheel out of contact with the ground when the other is swung into contact, substantially as described.

3. In a vehicle, the combination with the running-gear, of two pivoted arms, a propelling device carried by each arm and adapted to engage the ground, means for operating the propelling devices, and a lever for operating each arm, said levers having an interlocking engagement, substantially as and for the purpose set forth.

4. In a vehicle drive-gear, the combination with a shaft, and means for operating said shaft, of a second shaft, means for operating the said shaft, an arm hung on the second shaft, a wheel journaled in the free end of the said arm, means for driving the wheel from the said second shaft, and a lever for swinging the said arm to raise or lower the wheel, substantially as described.

5. In a vehicle driving-gear, the combination with a shaft, and means for operating the shaft, of a second shaft, means for operating the said shaft, an arm hung from the second shaft, an arm hung from the first shaft, wheels mounted in the free ends of the said arms, means for operating the said wheels, and levers for swinging the said arms, said levers having an interlocking engagement, substantially as described.

6. In a vehicle driving-gear, the combination with a shaft, and means for operating the shaft, of a second shaft, means for operat-

ing the said shaft, an arm hung on the second shaft, a wheel mounted in the free end of the arm, means for operating the wheel from the second shaft, an arm hung on the first shaft, a wheel mounted in the free end of the arm, means for operating the wheel from the first shaft, and levers for operating the said arms, substantially as described.

7. A vehicle driving-gear, comprising a driven shaft, an arm fulcrumed loosely on the shaft, a wheel journaled on the free end of the said arm and driven from the said shaft, a lever for imparting a swinging motion to said arm to move said wheel into or out of engagement with the ground, and means, substantially as described, for imparting a varying speed to said shaft, as set forth.

8. In a vehicle driving-gear, the combination with a shaft, graduated gears fitted to slide on the shaft, and means for operating said shaft, of a second shaft provided with graduated gears, an arm pivoted on said second shaft, a wheel mounted in the free end of the arm, means for operating the wheel from the said second shaft, a lever for sliding the graduated gears, and a lever for swinging the said arm, substantially as described.

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