No. 766,802. PATENTED AUG. 9, 1904.

C. W. BAKER.

SYSTEM OF RAILWAY TRANSPORTATION.

APPLICATION FILED NOV. 18, 1903.

NO MODEL. 5 SHEETS—SHEET 1.

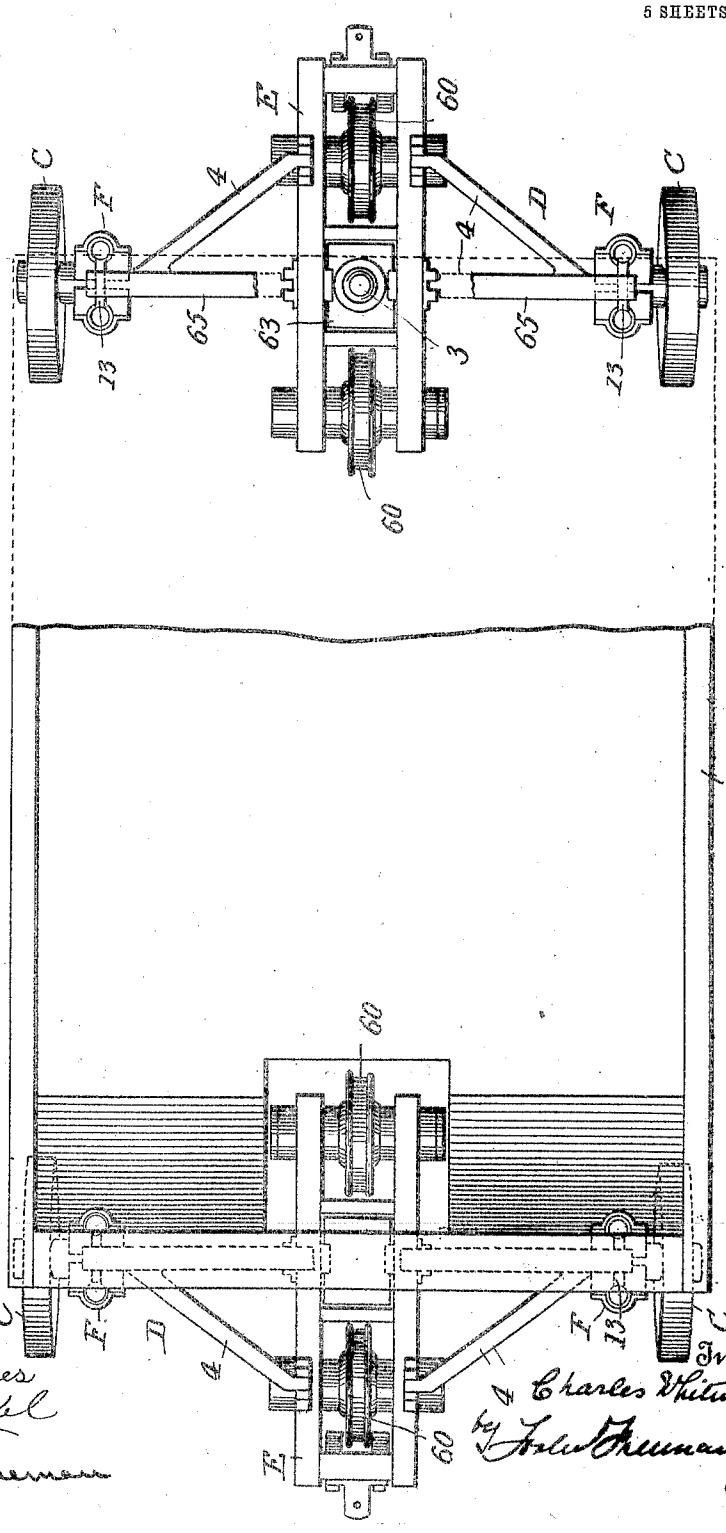


Fig. 1.

Witnesses
J. J. Stitzel
G. W. Freeman

Inventor
Charles Whiting Baker
by Fulwider Freeman & Watson
Attorneys

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C. W. BAKER.

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NO MODEL. 5 SHEETS—SHEET 2.

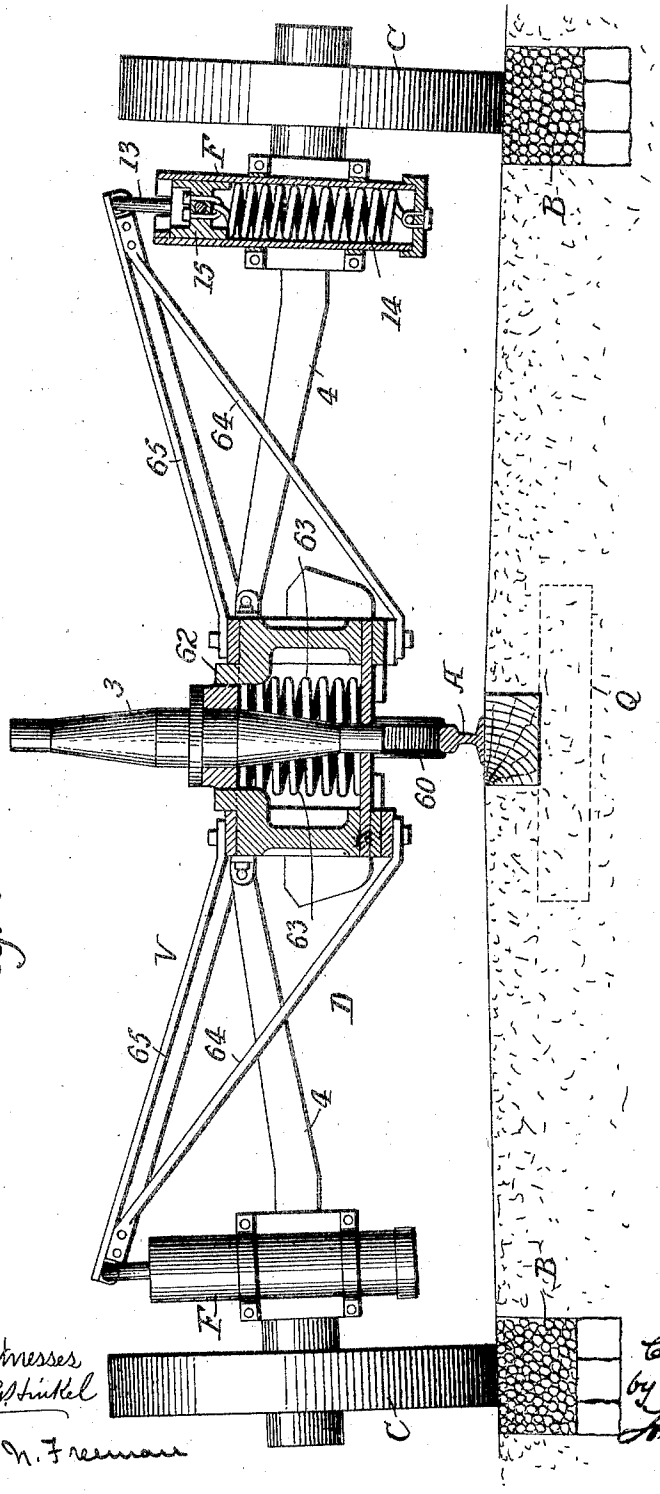


Fig. 2.

Witnesses
J. G. Stinkel
G. N. Freeman

Inventor
Charles Whiting Baker,
by Foster Freeman & Watson
Attorneys

No. 766,802. PATENTED AUG. 9, 1904.

C. W. BAKER.

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APPLICATION FILED NOV. 16, 1903.

NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.

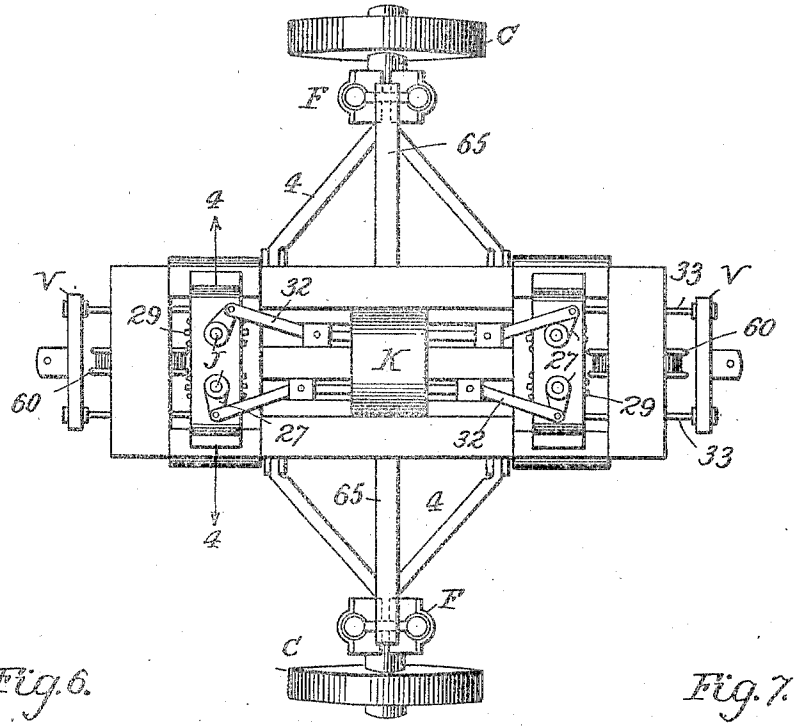


Fig. 6.

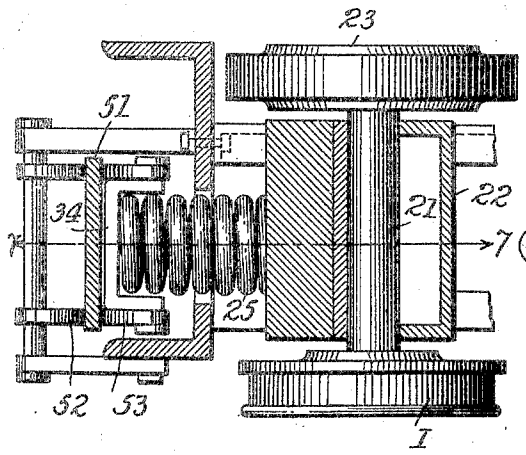
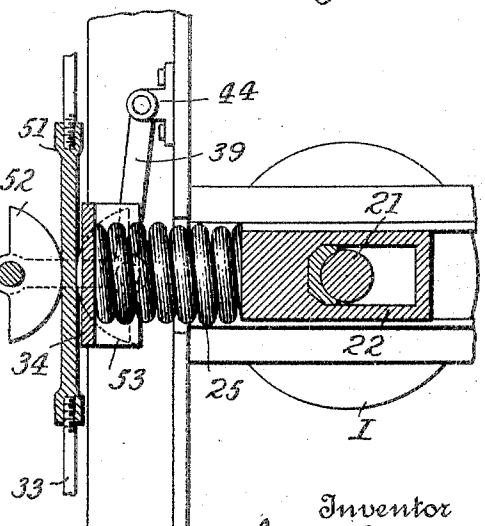


Fig. 7.



Witnesses
J. J. Stinkel
G. H. Freeman

Inventor
Charles Whitney Baker
by Miles Freeman & Watson
Attorneys

No. 766,802. PATENTED AUG. 9, 1904.

C. W. BAKER.

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APPLICATION FILED NOV. 18, 1903.

NO MODEL. 5 SHEETS—SHEET 4.

Fig. 4

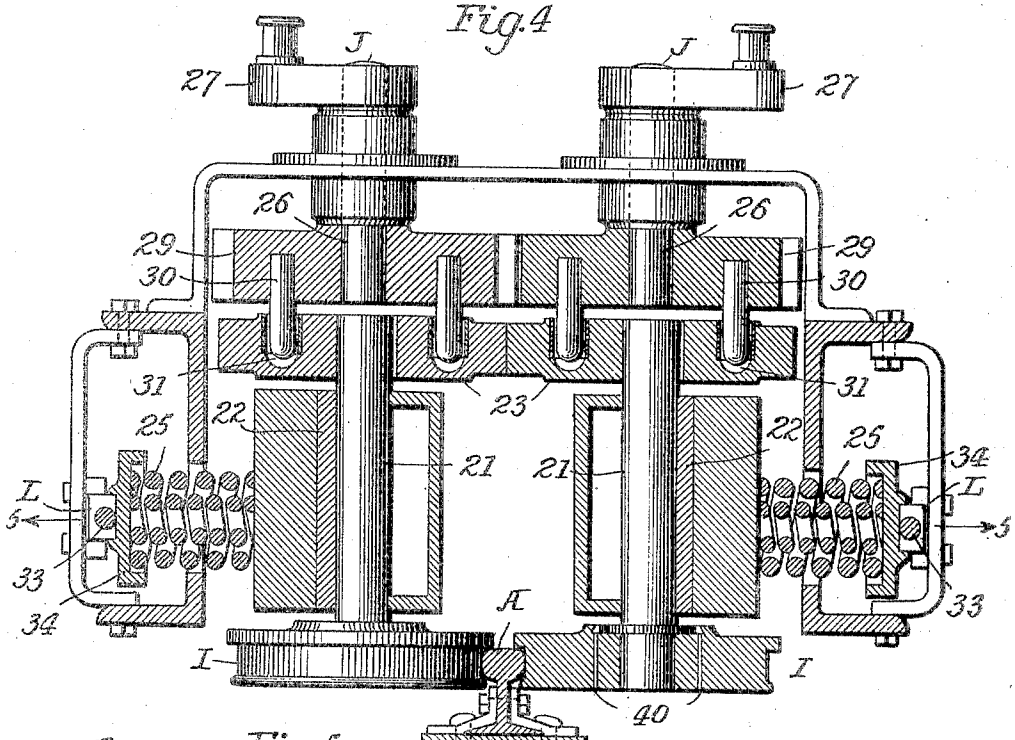
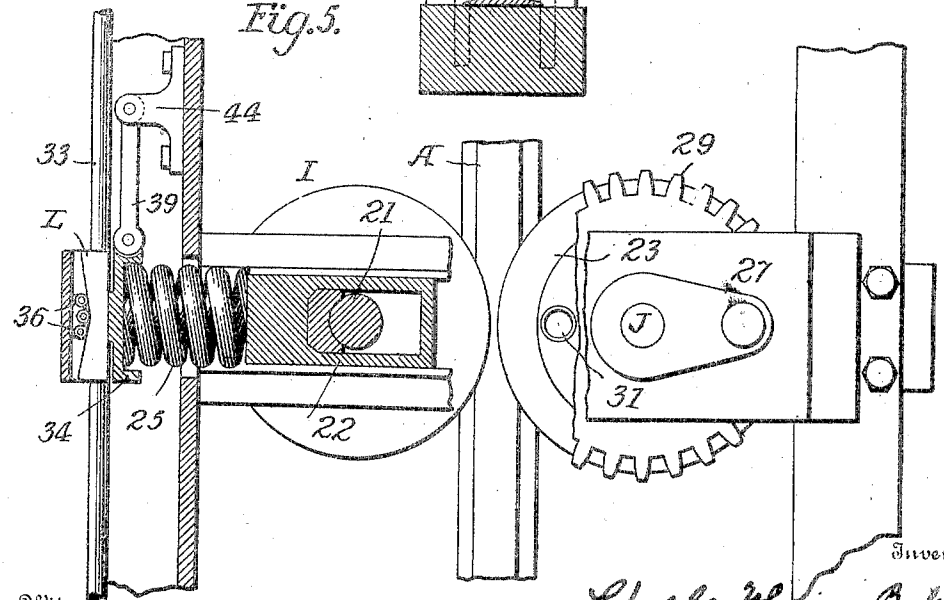


Fig. 5.



Witnesses

J. J. Pinkel

G. N. Freeman

Inventor

Charles Melling Baker

by Baker Freeman & Mason

Attorneys

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C. W. BAKER.

SYSTEM OF RAILWAY TRANSPORTATION.

APPLICATION FILED NOV. 18, 1903.

NO MODEL. 5 SHEETS—SHEET 5.

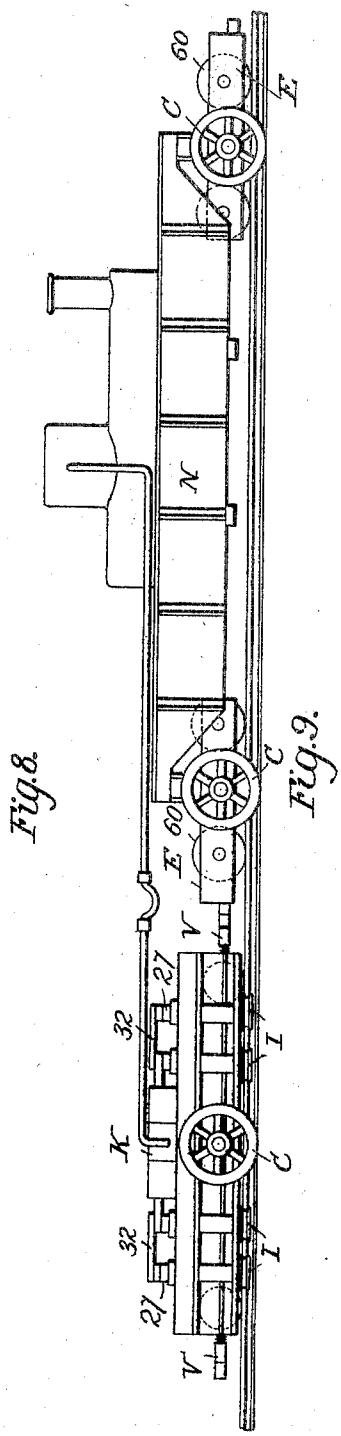


Fig. 8.

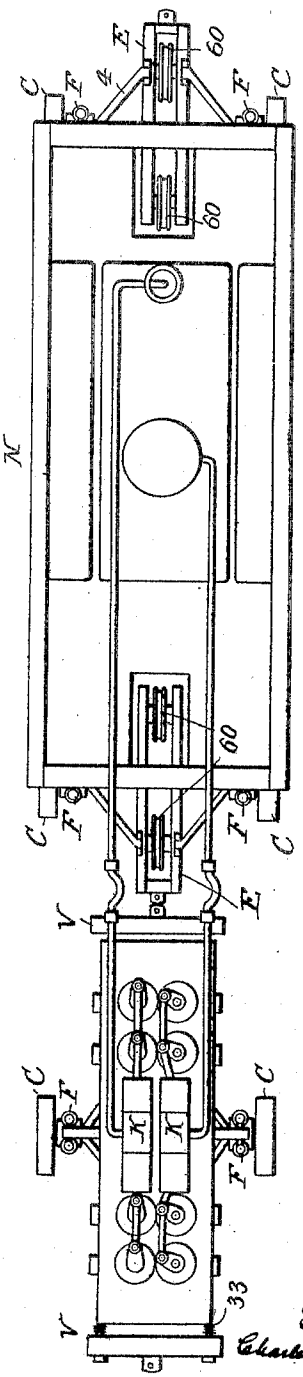


Fig. 9.

Witnesses
J. J. Stinkel
G. N. Freeman.

Inventor
Charles Whiting Baker
by Foster Freeman & Watson
Attorneys

No. 766,802. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

CHARLES WHITING BAKER, OF MONTCLAIR, NEW JERSEY.

SYSTEM OF RAILWAY TRANSPORTATION.

SPECIFICATION forming part of Letters Patent No. 766,802, dated August 9, 1904.

Application filed November 18, 1903. Serial No. 181,682. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WHITING BAKER, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Systems of Railway Transportation, of which the following is a specification.

My invention relates to cars or vehicles for use in connection with a road in which there is a single rail and bearing-faces at each side of and distant from said rail; and it consists of a vehicle having supporting-frames to which at each side are pivoted axles projecting laterally and carrying wheels adapted to the aforesaid bearings, with driving-wheels engaging said rail, together with means for insuring the requisite support of the vehicle upon the frames, the proper driving of the driving-wheels from suitable motors, the securing of the requisite friction of the driving-wheels against the rail, together with other features of improvement fully set forth hereinafter and illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of one form of vehicle embodying my improvements. Fig. 2 is a transverse section of the vehicle through one of the trucks. Fig. 3 is a plan of one of the trucks carrying the motor. Fig. 4 is a part section, enlarged, on the line 4 4, Fig. 3. Fig. 5 is a sectional plan on the line 5 5, Fig. 4. Fig. 6 is a sectional elevation showing a modification of the arrangement illustrated in Figs. 4 and 5. Fig. 7 is a sectional plan of Fig. 6 on the line 7 7. Fig. 8 is a longitudinal elevation showing the improvement in connection with vehicles where the engines are upon one vehicle and the steam-generator upon another, and Fig. 9 is a plan of Fig. 8.

In my improved system I make use of but one line of rails A, which are suitably secured on a stringer, and both the rail and the stringer are secured against longitudinal motion due to the tractive effort of the locomotive, each rail being firmly secured to the stringer at some point in its length and the stringer being fastened at intervals to cross-blocks Q, embedded in the earth.

To keep the cars balanced over the central rail, I provide the road-bed with or extend it to form longitudinal side bearings B B, each of which consists, preferably, of a line of macadam or a narrow strip of road-bed of such a character as not to be softened by water, thereby to preserve its hard bearing-surface, upon which may travel the side balancing-wheels C C of each of the car-trucks D, which support the body N of the car.

Each truck has a frame E, which has supporting-wheels 60 60 bearing on the rails A and is pivoted to the body N of the car by means of a center pin 3, passing through a center plate 62, resting on springs 63, supported by the frame, and each side wheel C turns upon a journal of the axle 4, pivoted at its inner end near the top of the frame. A part of the frame is a bolster V, which consists, as shown, of bars 65, extending laterally from the top of the frame, and braces 64, extending from the bottom of the frame, the bars 64 65 converging at the outer ends, which are higher than the inner ends. The center of gravity of the whole car is very low to reduce the strain on the balancing-wheels C.

The axle-sections 4 4 extend midway from the frame of the truck, so that they will take a proper radial position in passing around curves, so as to prevent side strains. By hinging the axles to the frame the latter may rock or rise and fall upon its springs hereinafter described, and the balancing-wheels may rise and fall over inequalities without seriously affecting the relative proportions of the load carried by the center wheels and the balancing-wheels.

There are suitable springs 14 between the outer ends of the axles and the overhanging part of the bolster, which springs have a large range of motion and are similar to those used in the construction of vehicles to run on common roads. Thus the bulk of the load is carried by the wheels which run on the central rail, and only enough of the load is transmitted to the side wheels to keep the cars steady.

In the construction shown each outer end of the bolster at each side is connected by a link 13 with caps 15 15, bearing on the springs 14 14 in boxes F F, secured to the axle.

The ends of the spring 14 are secured to the

bottom of the box F and to the spring-cap 15, thus enabling the spring to act by extension as well as by compression and securing a tension connection between the axle and car-body. Thus when the car-body tips the weight of the balancing-wheels and their attached parts on the lifted side of the vehicle, as well as the reaction of the compressed springs on the descending side, operate to restore the car to a level position. It will be evident also that a plurality of springs instead of a single spring may be used in the box F.

It will be seen that the center pin permits the requisite movement of the truck independently of the body in traveling on curves; but the body cannot sway independently of the truck, although it can move vertically on the balancing-springs.

It will be seen that as the axles are pivoted to the truck-frame above the center of vibration of the latter (at the top of the rail A) any rocking of the frame will tend to slide the wheels C outwardly on the faces of the bearings B and the frictional resistance to this action will be effective to check swaying to any detrimental extent. The resistance is increased by the friction of the spring-caps 15 15 sliding in the boxes F as the link 13 assumes an angle to the vertical and thrusts the caps against the sides of the boxes. The axles should not, however, be pivoted so high up that the friction will prevent the springs 14 from restoring the car to a level position.

The construction may be varied in any manner to any extent that may be found desirable, care being taken to keep the center of gravity of the car low and to avoid narrowing the gage of the balancing-wheels to such an extent that inequalities in the surface on which they travel shall produce too great an effect upon the car.

While the means for propelling the car may vary, I prefer to make use of oppositely-arranged gripping driving-wheels I I, each grooved to engage one side of the rail-head and preferably of small diameter, so as to drive directly from the crank-shafts of high-speed engines without the intervention of gears. These crank-shafts J J are vertical and preferably in connected sections that will permit the upper portions to move with the frame, while the lower portions remain in position vertically in respect to the rail. Any suitable connection may be employed; but, as best shown in Fig. 4, the lower section 21 of each shaft turns in a box 22 and carries a disk 23, which bears against the corresponding disk of the other shaft, so as to maintain the two shafts practically parallel vertically, while the driving-wheels are forced against the rail by springs 25 bearing against the boxes 22.

The upper shaft-sections 26 carry the cranks 27 and are provided with gears 29, which engage each other, and with pins 30, which play somewhat freely in recesses 31 of the disks 23. This telescopic arrangement permits the driving-wheels 29 29 to remain in position while the truck-frame moves up and down on its springs and insures that the upper section of the crank-shafts shall turn truly in their bearings in fixed position on the frame, while the lower sections may be carried slightly out of alinement in consequence of wear of the wheel-treads and of the rail, movement around curves, &c., but without creating any friction.

The cylinders K are centrally arranged upon the engine-truck, each with a piston and piston-rods extending through both heads of the cylinders, each end connected by a connecting-rod 32 with one of the cranks 27, and the gears 29 are so arranged that the cranks of one engine are at such an angle to those of the other that both engines shall not be on a dead-center at the same time, the driving-wheels on opposite sides of the rail being driven by different engines. It will be seen that by this arrangement the four driving-shafts are directly propelled by the use of but two steam-cylinders, and the four, or more shafts may be driven with the cylinders arranged centrally of the truck. By the use of parallel rods, as in Fig. 9, additional driving-shafts may be operated.

As the driving-axles are vertical, surplus oil used for lubrication of their journals might flow down onto the upper face of the driving-wheels and may thence be carried by centrifugal force over onto the peripheries of the wheels I, thereby interfering with their frictional hold upon the rail. To prevent this, I dish the top face of each driver-wheel and make drainage-holes 40, Fig. 4, from the bottom of this recess to permit the oil to drop through to the ground.

As the cranks and connecting-rods of the locomotive move in a horizontal plane, it will be evident that the revolving parts must be accurately balanced to prevent a swaying motion being imparted to the locomotive. I therefore depart from the usual practice in locomotive construction and counterbalance the revolving parts alone, leaving the reciprocating parts unbalanced. I also in some instances may connect the two sides at (approximately) one hundred and eighty degrees, as shown in Fig. 3, instead of ninety degrees, as usual, whereby the movement of the parts on one side exactly balances the movements of those on the other. By making the connection of the two sides at slightly less than one hundred and eighty degrees difficulty in starting when the engines are on a dead-center will be reduced without materially reducing the balancing effect.

In order that the gripping of the driving-wheel may vary automatically with the traction or retardation exerted by the locomotive, I make use of double-acting wedges L, Figs. 4 and 5, each carried by a rod 33, connected

to the draw-bar V, Fig. 3, said wedges bearing against caps 34, which bear upon the outer ends of the springs 25, the inclined faces of the wedges bearing against rollers 36, carried by the frame, and to permit the requisite in-and-out movement of each cap 34 it is connected by a link 39 to a bracket 44 of the frame. It will be seen that in proportion as the strain upon the draw-bar increases, either pulling or pushing, each wedge L will force inward the cap 34, exert an increased pressure upon the spring 25, and cause the adjacent driving-wheel to bear with a greater pressure upon the rail. It becomes important to secure increased traction in this case because of the use of driving-wheels of smaller diameter and higher rotative speed.

Instead of the sliding-wedge device just described I may employ to accomplish the same end the apparatus shown in Figs. 6 and 7, in which a plate 51, forming part of the draft-rod 33, works between two cams 52 53, one journaled to the frame and the other to the spring-cap 34. The form of the cam-surfaces is such that as the draw-bar works either way from a central position the plate and the spring-cap are forced inward and the spring is compressed.

It will of course be evident that any desired motor-power may be employed for operating the engines, as steam or compressed air or explosive gases, or that an electric motor may be substituted for one using gases under pressure.

Without limiting myself to the precise construction and arrangement of parts shown, I claim as my invention—

1. A vehicle for operating on roads having a single rail and parallel side bearings, comprising a frame, axles pivoted thereto and extending laterally therefrom, wheels at the ends of the axles, and spring-supports for the frame adjacent to the wheels, substantially as set forth.

2. The combination in a vehicle for single-rail roads, of a frame, axles pivoted thereto and extending laterally therefrom, wheels at the ends of the axles, and springs supported by the axles adjacent to the wheels and supporting the frame, substantially as set forth.

3. The combination in a vehicle for single-rail roads, of a frame, a vehicle-body supported by the frame, and axles pivoted to and extending from the frame and provided with wheels at their ends, substantially as set forth.

4. The combination in a vehicle adapted to single-rail roads and provided with a frame and center and side wheels, of axles supporting the side wheels, pivoted to the frame to insure a lateral motion of the side wheels on the rocking of the frame, substantially as set forth.

5. The combination in a vehicle adapted to single-rail roads and provided with a frame and center and side wheels, of axles supporting the side wheels pivoted to the frame to insure a lateral motion of the side wheels on the rocking of the frame, and springs arranged between the axles and frame to act to restore the latter after it has tilted, substantially as set forth.

6. The combination in a vehicle for single-rail roads, of a frame, a body supported thereby, axles pivoted to the frame and provided with wheels at their ends, driving-wheels clamping the rail between them and supported by shafts turning in bearings in the frame, and a motor for driving the shafts, substantially as set forth.

7. The combination with the frame, pivoted axles, and wheels, of driving-wheels I, shafts therefor, engines, shafts operated thereby, and flexible connections between the engine-shafts and the shafts of the driving-wheels, substantially as set forth.

8. The combination with a vehicle having driving-wheels I, I adapted to clamp a rail between them, shafts, and movable bearings 22 for said shafts, of crank-shafts, gears engaging with each other carried by the crank-shafts, disks carried by the shafts of the driving-wheels, and pins projecting from each gear into openings in the disks, said openings larger than the pins, substantially as set forth.

9. The combination with a vehicle provided with driving-wheels for engaging a single rail, of crank-shafts and connections for operating the driving-wheels, the cranks of the opposite shafts approximately at one hundred and eighty degrees to each other, substantially as set forth.

10. The combination with a vehicle, driving-wheels adapted to engage a central rail mounted upon shafts, an engine and connections for rotating said shafts, of movable bearings supporting the shafts, a draw-bar at the end of the vehicle, rods extending parallel to the sides of the vehicle and connected with said draw-bar, and devices whereby the bearings are forced inward on the longitudinal movement of the said rods in either direction, substantially as set forth.

11. The combination with a vehicle having driving-wheels mounted on vertical shafts turning in sliding bearings, of outside caps 34, springs between the caps and the bearings, rods extending past said caps and connected to draw-bars at the ends of the vehicle, and devices whereby the caps are forced inward on the movement of the rods in either direction, substantially as set forth.

12. In a single-rail-railway car having side balancing wheels and axles, the combination of compression-springs interposed between said axles and the car-body and tension connections between the same, whereby the weight of the said wheels is utilized for balancing the car, substantially as described.

13. In a single-rail-railway car, the combination of a truck-frame, a car-body, and a

center pin connecting the truck-frame and the body to prevent any swaying movement of one independently of the other, substantially as described.

14. A vehicle for single-rail railways having a truck-frame, side balancing wheels and springs, guides adjacent to said springs, caps bearing on the springs and sliding in contact with said guides, and a link connection between the truck-frame and said caps whereby a graduated braking pressure of said caps against said guides is secured, substantially as described.

15. A locomotive for a single-rail railway having two or more pairs of driving-wheels adapted to grip the rail and motor-cylinders set midway between said pairs of wheels and transmitting motion to them by piston-rods passing out of both ends of the cylinders, substantially as set forth.

16. In a single-rail-railway locomotive having driving-wheels adapted to grip the rail, the combination of boxes upon the driving-wheel shafts, springs adapted to press upon said boxes and disks upon said shafts bearing against each other, substantially as set forth.

17. In a locomotive having driving-wheels gripping a central rail, means for securing a spring-pressure upon the boxes of the gripping-drivers, and means for automatically varying said spring-pressure in proportion to the tractive force exerted, substantially as set forth.

18. In a locomotive having driving-wheels gripping the sides of a single rail, annular grooves in the face of said drivers and oil-drains therefrom, substantially as described.

19. In a steam-locomotive having driving-wheels gripping the sides of a central rail and spring-supported upon carrying-wheels, a telescopic coupling between driving-shafts and crank-shafts, substantially as described.

20. The combination of shaft-sections carrying wheels for gripping a rail, a supporting-frame for the said shaft-sections movable vertically independently thereof and carrying other shaft-sections, and telescopic connections between said shaft-sections, substantially as set forth.

21. A locomotive for single-rail railways having a truck carrying gripping driving-wheels and engines for driving the same, a separate truck or vehicle carrying the steam-generator and flexible pipe connections between, substantially as set forth.

22. In a single-rail-railway system having locomotives provided with driving-wheels gripping the sides of the rail, the combination of the single line of rails, a supporting-line of stringers, anticreeping-fastenings between the two and anchor-blocks beneath said stringers, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES WHITING BAKER.

Witnesses:
CHAS. S. HILL,
C. W. REINHARDT.