Dec. 7, 1937. J. P. HUBBELL 2,101,711

TRANSPORTATION SYSTEM AND APPARATUS

Filed May 23, 1936 3 Sheets-Sheet 1

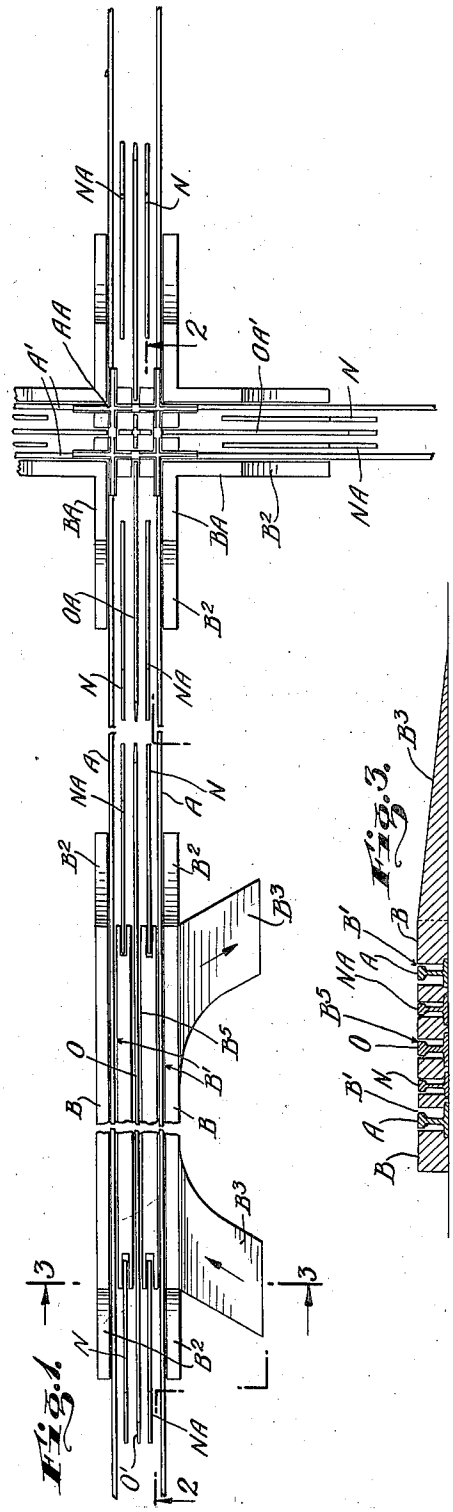


Fig. 1.

Fig. 2.

Fig. 3.

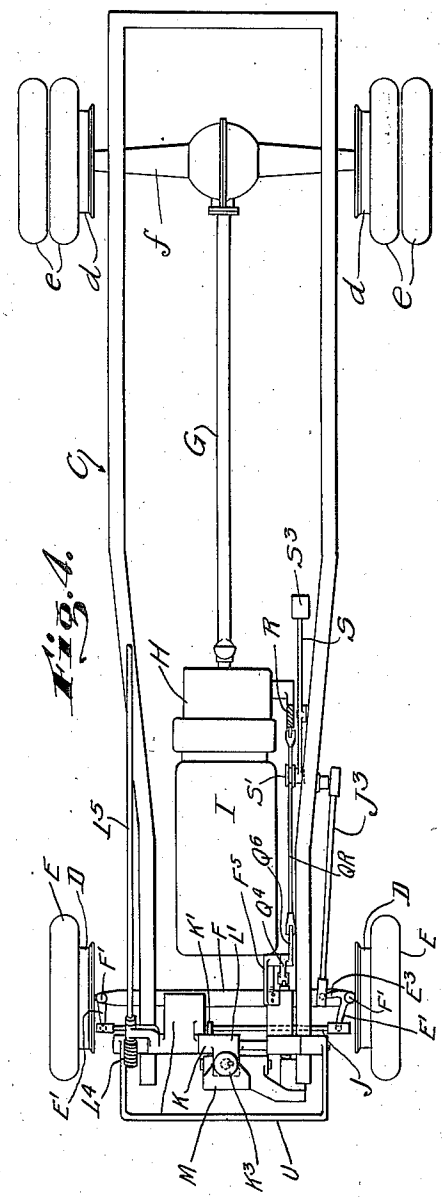


Fig. 4.

INVENTOR
JESSE P. HUBBELL
BY John E. Hubbell
ATTORNEY

Dec. 7, 1937. J. P. HUBBELL 2,101,711

TRANSPORTATION SYSTEM AND APPARATUS

Filed May 23, 1936 3 Sheets-Sheet 2

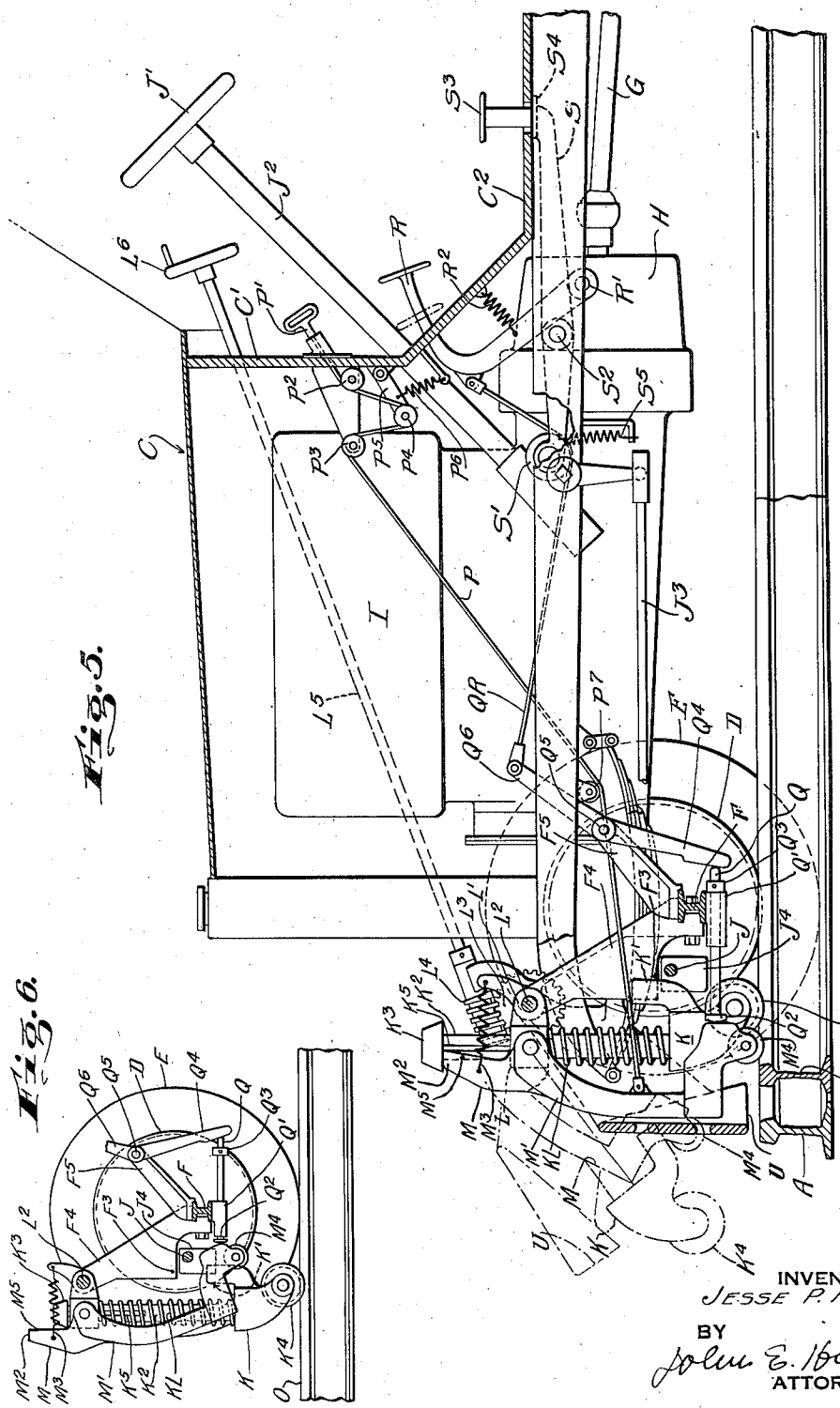


Fig. 5.

Fig. 6.

INVENTOR
JESSE P. HUBBELL

BY
John E. Hubbell
ATTORNEY

Dec. 7, 1937. J. P. HUBBELL 2,101,711

TRANSPORTATION SYSTEM AND APPARATUS

Filed May 23, 1936 3 Sheets-Sheet 3

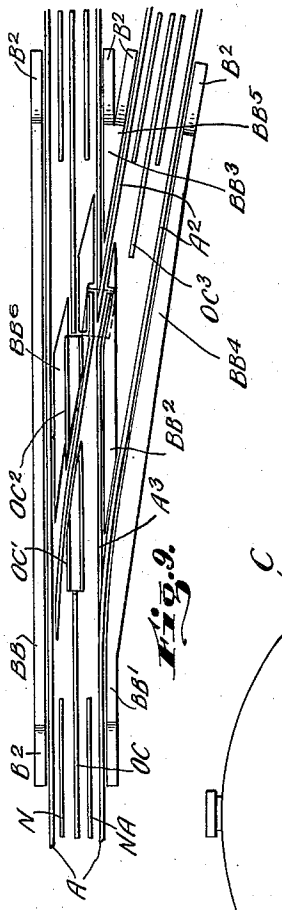


Fig. 9.

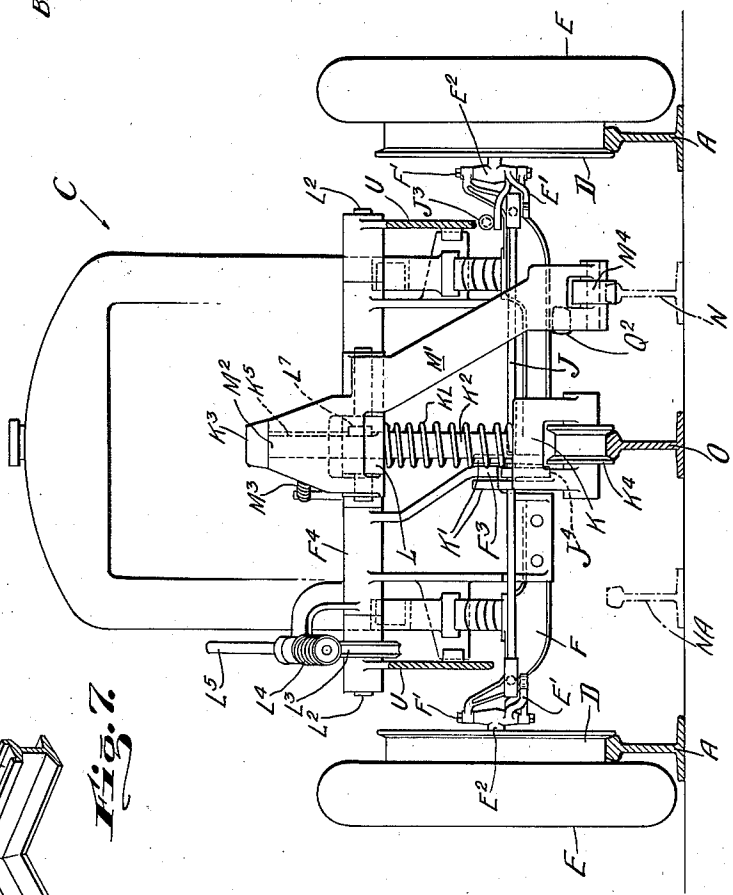


Fig. 7.

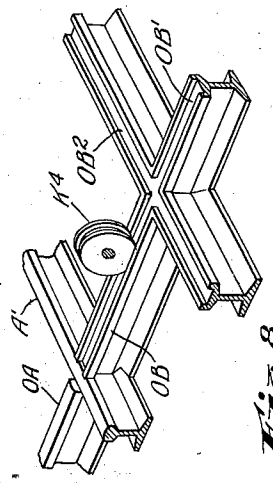


Fig. 8.

INVENTOR
JESSE P. HUBBELL
BY John E. Hubbell
ATTORNEY

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UNITED STATES PATENT OFFICE

2,101,711

TRANSPORTATION SYSTEM AND APPARATUS

Jesse P. Hubbell, Fanwood, N. J.

Application May 23, 1936, Serial No. 81,405

15 Claims. (Cl. 105—215)

The general object of the present invention, considered in its more general aspects, is to provide an improved transportation system characterized by the provisions made whereby a motor vehicle adapted for operation in the usual manner on streets, highways and other trackless roadways, may also be operated on the track rails of an ordinary or standard type railway, provided primarily to support and guide the movements of railway locomotives and cars of standard design. A more specific object of the invention is to provide a transportation system, characterized as above described, requiring no real modification or changes, as distinguished from the addition of apparatus parts, in the motor vehicle or in the railway, or interference with the movement of railway locomotives and cars over the railway track rails, or with the ordinary use of the motor vehicle on a trackless roadway.

Further specific objects of the present invention are to provide such motor vehicle and railway apparatus additions as are required for the use of the present invention, which are relatively simple and inexpensive, and which are adapted to cooperate effectively to the attainment of certain desirable operating characteristics. To the motor vehicle itself are added flanged wheels adapted to run on the railway track rails, and smaller in diameter than the unflanged wheels with which the vehicle is provided for use when running over a trackless roadway. For the movement of the motor vehicle onto and off the track rails from and to a trackless roadway intersecting or alongside the railway track rails, and the movement of the motor vehicle over railway switch points and other railway track intersections, hump means are added to the railway structure, alongside the track rails, for engagement by the unflanged wheels of the vehicle and the elevation of the flanged wheels of the vehicle above the level at which the last mentioned wheels operatively engage the track rails. In accordance with the present invention also, the vehicle and the railway are provided with parts cooperating with one another, and the usual vehicle steering mechanism to control the direction of vehicle movement when on a hump, and to render said mechanism incapable of manual adjustment, during vehicular movements along other portions of the railway. Preferably also the vehicle is provided with means for releasing and reengaging the clutch mechanism normally connecting the driving motor of the vehicle to its driving wheels, as the vehicle moves respectively from the track rails onto a hump, and from a hump onto the track rails. In the preferred form of the present invention, the motor vehicle may move continuously along a portion or section of the railway including a hump, and in such case the means provided for releasing, controlling and relocking the vehicle steering mechanism and for releasing and reengaging the driving clutch as the vehicle moves over a hump, act automatically, and require no attention by the vehicle driver.

The present invention derives especial utility and merit because of existing conditions affecting the use of ordinary railways in the transportation of passengers and freight, and particularly the latter. The term "freight", as I use it, generically includes packages and goods commonly referred to as express matter or parcels. The speed and ease with which freight may be collected and delivered by the use of motor trucks, coupled with the reloading, or transshipment, delay and labor necessarily involved in the transfer of freight and express between motor trucks and railway cars, has led, in recent years, to the motor truck transportation of a large amount of freight between points of collection and delivery separated by distances so great as to be economically undesirable.

Such diversion of traffic from the railways is economically undesirable, from the standpoint of the railways and from the standpoint of the general public, since it overloads the highways and since it precludes full use of existing railway track structure and equipment, and necessarily results in freight rates higher than would otherwise be required for the transportation of the freight actually carried by the railways.

The present invention permits of all of the present advantages of motor truck collection and delivery of freight and express parcels coupled with an economic use of the existing railway track structure and rights of way, and a corresponding and desirable reduction in highway traffic. Furthermore, the movement of a loaded motor vehicle over track rails requires less motor power and motor fuel consumption than its movement over a highway, and reduces the wear and tear on the motor vehicle. While the commercial advantages possible with the present invention are especially great in the case of freight, general advantages of the invention are obtainable in the motor bus transportation of passengers.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a

part of this specification. For a better understanding of the invention, however, and the advantages possessed by it, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of the invention.

Fig. 1 is a plan view of a portion of a railway having certain special features;

Fig. 2 is a side elevation of a portion of the railway construction shown in Fig. 1, partly broken away and in section on the line 2—2 of Fig. 1; and on a larger scale than Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a somewhat diagrammatic plan view of the framework, wheels and propelling means of a motor vehicle adapted for use on the railway shown in Figs. 1–3;

Fig. 5 is a side elevation with parts broken away and in section, of a portion of the vehicle shown in Fig. 4;

Fig. 6 is a view taken similarly to Fig. 5, showing parts in different relative position;

Fig. 7 is a front end elevation of the vehicle shown in Figs. 4, 5, and 6;

Fig. 8 is a perspective view of a portion of a modified railway crossing arrangement; and

Fig. 9 is a diagrammatic plan view of a portion of a railway including siding switch points and corresponding hump provisions.

In the drawings, A represents the usual track rails of an ordinary steam or electric railway in which the rails project up from the ties and ballast of the roadbed in the usual manner. The portion of the railway shown in Figs. 1–3 includes two humps B and BA, of which the first provides a transfer platform associated with the track rails at a point along the latter at which it is desirable to transfer a motor vehicle C, adapted to run either on the track rails or on an ordinary trackless roadway, to or from the track rails A, from or to a trackless roadway intersecting or alongside the track rails. The hump BA is located at a railway crossing, at which the track rails A intersect similar but transversely extending track rails A. Except in respect to minor features, hereinafter referred to, the general nature and operative effect of the humps B and BA are the same.

The motor vehicle C illustrated, comprises a framework, front and rear unflanged wheels E and *e* at the ends of the front and rear axles F and *f*, respectively, of the vehicle. In the rear wheel drive construction shown, the conventionally illustrated rear axle *f* encloses the usual differential gearing and rear wheel driving shafts, and the latter are operatively connected by a longitudinal driving shaft G, and by a clutch and a variable speed transmission, both enclosed within a housing H, to the driving shaft of the vehicle motor I. The latter is guided in its movements over a street or highway by the usual steering gear, conventionally illustrated as comprising a steering rod, alongside and parallel to the front axle F and connecting crank arms E^1 carried by non-rotative end extensions E^2 of the front axle F; each extension E^2 forms the non-rotatable axle portion of a corresponding front wheel assembly, and is pivotally connected to the axle F by a corresponding pivot shaft F'. In operation over a street or highway, the rod J is angularly adjusted by means of a steering wheel J^1 carried by the steering shaft J^2, and operative connections between the latter and the steering rod J, including the usual drag link J^3 connected to an arm E^3 of one of the front axle extensions E^2. In respect to all of its features above mentioned, the vehicle C may be of any usual or standard motor vehicle design.

For the purposes of the present invention, the vehicle C is provided with flanged front and rear wheels D and *d* respectively, and unflanged front and rear wheels E and *e*, respectively. In the preferred construction illustrated, each unflanged front wheel E and the corresponding flanged wheel D, form parts of a front wheel assembly, and each flanged rear wheel *d* and two side by side unflanged rear wheels *e* form parts of similar rear wheel assembly. The wheels E and *e* may be identical in construction, and the flanged wheels D and *d* may also be identical with one another in construction. In each wheel assembly, the flanged wheel and unflanged wheel or wheels are coaxial, and the flanged wheel, which is adapted to engage a track rail A, has the diameter of its tread surface appreciably smaller than the tread surface diameter of the corresponding unflanged wheel or wheels. Each unflanged wheel is provided with a pneumatic, solid rubber, or other tire suitable for use when the vehicle is running over an ordinary trackless roadway.

The transfer platform B shown in Figs. 1–3, comprises portions between the track rails A, and at the outer sides of the latter, and has its upper surface substantially flush with the tread surfaces of the track rails which are received in slots B' of the platform. The slots B' are wide enough to receive the wheel flanges of railway cars and locomotives running on the track rails. Each of the portions of the platform B at the outer sides of the track rails has at each end a ramp extension B^2. Each ramp B^2 has its upper surface inclined downwardly from the top level of the body of the platform B to the railway roadbed level, or at least to a level as low as the bottoms of the tread surfaces of the vehicle wheels E and *e*, when the flanged wheels D and *d* have their tread surfaces in engagement with the top surfaces of the track rails A.

When the top surface of the platform B is above the adjacent ground surface level, the platform B may be provided with one or more side ramp portions B^3, two of which are shown in Fig. 1, the top surfaces of one side ramp being inclined downwardly from the level of the top of the body portion of the platform B to the ground surface level. When the transfer platform B is located at the intersection of the railway with a street or highway having its surface at substantially the same level as the top of the body portion of the platform B, which then forms in effect a part of the street or highway road surface, the side ramps B^3 are ordinarily unnecessary, unless the street or highway road surface substantially flush with the top of the platform B, is unduly narrow.

As the vehicle C, moving along the track rails A in either direction, reaches and moves onto the platform B, the weight of the vehicle is transferred from its flanged wheels D and *d* and the track rails A, to the vehicle's unflanged wheels E and *e* and the portions of the platform B at the outer sides of the track rails A. Conversely, when the vehicle C moves off the transfer platform B onto the rails A, the vehicle weight is transferred from the wheels E and *e* and platform B to the vehicle wheels D and *d* and the track rails A. The platform B with its ramp extensions B^2 forms a hump, which when the vehicle is above the hump body portion, holds the treads of the vehicle flanged wheels D and *d* above the tread surfaces of the track rails A

as indicated in Fig. 6, by an amount equal to the difference between the radius of the tread surface of each flanged wheel D and *d* and the radius of the tread surface of the corresponding unflanged wheel E or *e*. The difference between the said flanged and unflanged wheel radii may well be three or four inches or greater, but desirably is appreciably less than the height of the track rails A, so that when the vehicle is running on the track rails, the bottoms of the unflanged wheels are well above the railway rail bases ties and ballast.

As will be apparent, the purpose of the side ramps B^3, when employed, is to permit of the movement of the vehicle C from or to the platform B to or from the ground or street or highway surface at the corresponding side of the platform. In its movements between the transfer platform B and the highway street or ground level adjacent the platform, the vehicle is guided by adjustment of the ordinary steering wheel J' in the usual manner. Due to the relatively short wheel base of the vehicle C, and to the substantial length of the minimum radius of track curvature of an ordinary railway, the vehicle flanged wheels D and *d* will properly follow the track rails, without any adjustment of the flanged wheel planes of revolution relative to the longitudinal axis of the vehicle, and with the preferred construction illustrated, when the vehicle C is running on the track rails, its steering rod J is locked in its intermediate or straight line movement position. Because of the inevitable back lash in the ordinary connections between the vehicle steering wheel J' and the steering rod J, and to preclude the injurious consequences of a possible inadvertent or accidental adjustment of the steering wheel J' while the vehicle is in motion on the track rails, I provide independent means for then positively holding the steering rod J against longitudinal movement.

In accordance with the present invention, the positive locking means for the steering rod J are associated with novel provisions, devised by me, for guiding the vehicle C in its movement over the hump formed by a transfer table B and over analogous humps, provided as hereinafter described, for the movement of the vehicle over railway crossings and switch points. The said locking means, in the form illustrated, comprises a member K vertically movable between one operative position shown in full lines in Fig. 5 and a second operative position shown in full lines in Fig. 6, and also movable angularly into the idle position shown in dotted lines in Fig. 5. In each of its two operative positions, the member K is connected to the steering rod J so as to control the longitudinal position of the latter. The connecting means illustrated comprises a collar J^4 carried by the rod J, and two projections K' from the member K spaced apart to receive the collar J^4. In the operative position of the member K shown in Fig. 5, the projections K' also straddle a projection F^3 from a bracket member F^4. The latter is rigidly secured to, and extends upwardly and forwardly from the front axle F of the vehicle. When thus straddling both the collar J^4 and the projection F^3, the projections K' positively lock the rod J against longitudinal movement relative to the axle F. In the second operative position of the member K, shown in Fig. 6, the projections K' are below the projection F^3 so that the latter does not prevent movement of the member K necessary to permit such limited longitudinal movement of the rod J as may then be required.

The member K is provided with an uprising stem K^2, slidingly received in a collar member L which has extensions L' secured to a horizontal shaft L^2 journalled in an upper portion of the bracket member F^4. By rotation of the shaft L^2, the member K can be swung from the position in which its stem K^2 is vertical, as shown in Figs. 5 and 6, into the position shown in dotted lines in Fig. 5. To thus adjust the member K between its operative and inoperative positions, I provide means shown as comprising a worm wheel L^3 secured to the shaft L^2, and a worm L^4 in mesh with said wheel, and carried by a shaft L^5, provided with a hand wheel L^6 in position to be rotated by the vehicle operator.

A spring KL surrounding the stem K^2 and acting between the member K and the collar member L, supplements the action of gravity in biasing the member K for movement into the position shown in Fig. 6 from its position shown in full lines in Fig. 5. In the normal condition of the apparatus for movement of the vehicle along the track rails A, the member K is held in the position shown in Fig. 5, by means shown as comprising a locking member, or lever M journaled on the collar L to turn relative thereto about an axis parallel with the shaft L^2 into and out of a locking position in which an upper portion M^2 of the member M is beneath, and prevents down movement of, a head or enlargement K^3 rigidly secured to the upper end of the stem K^2. A spring M^3 acts between the member M and the bracket member F^4 to yieldingly hold the part M^2 in its locking position shown in Fig. 5.

In accordance with the present invention, means are provided for automatically turning the lever M in the counterclockwise direction as seen in Figs. 5 and 6, to move the part M^2 laterally out from under the head K^3, as the vehicle, running along the track rails, approaches a transfer platform. To this end, in the arrangement shown, the member M is provided at its lower end with a roller or wheel M^4 which engages a stationary tripping element N located adjacent the approach side of each platform, and shown as in the form of a short rail section parallel to, and between the track rails A, and, in the arrangement shown, nearer to one than the other of those rails.

When, as shown in Figs. 1–7, the trip rail N has its upper surface at the same level as the surfaces of the track rails, the bottom of the roller M^4 is below the rail top surface level when the vehicle has the treads of its flanged wheels D and *d* in engagement with the track rails A. As the vehicle approaches a platform, the trip rail N is engaged by the wheel M^4, and the trip member M is turned against the tension of the spring M^3 in the direction to move the lever part M^2 out of engagement with the under side of the head portion K^3 of the member K, and the latter is then free to move downward under the action of the spring KL, unless or except as such motion is prevented or arrested by other means. In the arrangement shown, the time and extent of down movement of the member K is controlled by the engagement of a guide wheel K^4, journalled on the member K at the lower end of the latter, with a guide rail O. The latter might be one of the track rails A, if the member K were mounted above such a rail. More conveniently, and as shown, the guide rail engaged is a separate rail O, parallel to, and located midway between the track

rails A, and having its upper surface flush with the tread surfaces of the track rails A.

The guide rail O extends through the platform B, which is formed, for the purpose, with a slot B^5 receiving the rail N. The ends of the guide rail O extend beyond the ends of platform B, and preferably, and as shown, appreciably beyond the lower ends of its ramp extensions B^2. Flanges are provided for causing the wheel K^4 to follow the rail O, while in engagement with the latter. To that end, in the construction shown in Figs. 1–7, the wheel K^4 is provided with flanges at its opposite sides, between which the top of the unflanged guide rail O is received when the guide wheel is in engagement with the guide rail. As will be apparent, however, the wheel K^4 may be unflanged, provided the guide rail is formed with a tread surface and with uprising flanges at opposite sides of the latter, as is the hereinafter mentioned guide rail OB shown in Fig. 8.

The parts are so proportioned that as the vehicle approaches the platform B, the wheel K^4 engages the adjacent end of the guide rail O before the locking member wheel M^4 engages the corresponding trip rail N, and releases the member K for the down movement occurring as hereinafter described when the vehicle moves onto the platform B. To avoid shock on the initial engagement of the wheels M^4 and K^4 with the trip and guide rails N and O, respectively, the approach ends, N′ and O′, those rails may be suitably shaped and to that end said rail ends are advantageously bevelled off, as shown in Fig. 2, said rail ends O′ being tapered in width as shown in Fig. 1.

As the front end of the vehicle is raised by movement of the wheels E up the approach ramps B^2, and the flanges of the wheels D pass out of guiding relation with the track rails A, the member K moves downward relative to the collar L, so that projections K′ pass below the projection F^3, whereupon the longitudinal position of the steering rod J is made subject to control by the member K. If in moving over a hump, the paths of the front wheels E diverge laterally from the track rails, the engagement of the guide wheel K^4 with the guide rail results in an angular adjustment of the member K about the axis of its stem K^2, and a resultant divergence correcting adjustment of the steering rod J.

Such longitudinal movement of the rod J as the member K may thus need to effect, results, in the arrangement shown, from the castor-like movement permitted the member K, as a result of the fact that the axis of the wheel K^4 is slightly to the rear of the axis of the stem K^2. The maximum required turning movement of the stem K^2 in the collar L is so slight, that it is conveniently accommodated by lost motion permitted by the fact that a locking projection or key L^7 carried by the collar member L, is loosely received in a longitudinal guideway K^5, formed in the stem K^2. The key L^7 and guideway K^5 are advantageously provided to limit the angular movement of the stem K^2 in the collar L, so that the projections K′ will be in a position to straddle the collar J^4 when the parts are swung from the dotted line position of Fig. 5 into their full line positions shown in that figure, or into their positions shown in Fig. 6, and also to hold the wheel K^4 in position for engagement with the guide rail O.

Each trip rail N should be long enough to insure that the part M^2 is held out of position to engage the head K^3 during the movement of the vehicle required for the movement of the underside of head K^3 to a level below the top of the part M^2. As the front wheels E move up the ramp portions B^2, the wheel M^4 is raised out of operative engagement with the trip rail N, but the trip lever M is not thereby freed for return movement under the action of the spring M^3 owing to the engagement of the cam edge M^5 of the part M^2 with the periphery of the head K^3. The spring M^3 cannot return the member until the head K^3 is again raised above the part M^2.

If it is desired to move the vehicle laterally off the track way at the platform B upon which the vehicle has moved from the track rails as described, the motion of the vehicle is arrested after the wheels E and *e* are on the platform, and the hand wheel L^6 is rotated to swing the member into its dotted line position shown in Fig. 5, thereby freeing the vehicle for movement in any direction determined by the adjustment of the ordinary steering wheel J′. With the described arrangement, when the member K is thus moved to the dotted line position, the head K^3 will be out of locking engagement with the locking lever part M^2. In its dotted line position, the wheel K^4 may be high enough above the ground level so as not to interfere with the ordinary highway operation of the vehicle, regardless of the axial adjustment of the stem K^2 in the collar L. If the vehicle operator wishes to do so, however, he may then manually move the stem K^2 through the collar L against the tension of the spring KL to thereby re-engage the locking part M^2 with the head K^3. As will be apparent, it is possible, as by means of a cam extension from the bracket F^4, to automatically effect the up movement of the stem K^2 through the collar L required to raise the hand K^3 above the part M^2, as the member K is swung into its dotted line position shown in Fig. 5, but the advantage to be gained by such automatic means is ordinarily not sufficient to justify their use.

When the vehicle is to be moved from the highway on to the track rails, it is moved by manipulation of the steering wheel J′ into such position on the transfer platform B, that its flanged wheels D and *d* are in register with, though then above, the track rails A, and the member K is then adjusted to bring its wheel K^4 into operative engagement with the guide rail O. If at the time, the part M^2 is in locking engagement with the head K^3, the member M must be adjusted, counter-clockwise as seen in Fig. 5, to release the head K^3. Conveniently, means are provided whereby the driver need not move from his vehicle driving position to thus actuate the member M. The means for the purpose illustrated, comprise a rope, cable or other flexible element P connected at one end to the lever M below its pivot shaft L^7, and connected at its other end to a handle member P′ mounted for longitudinal movement in the vehicle dash board C′. To hold the member P taut under all conditions, and to accommodate the movement of the member M between its full and dotted line position shown in Fig. 5, some suitable resilient slack take-up or tension means are associated with the rope or cable element P. The means shown comprise guide pulleys P^2 and P^3 supported by brackets from the dash board C′, and displaced from one another a short distance longitudinally of the element P and a guide pulley P^4 bearing against the upper side of the portion of the element between the pulleys P^2 and P^3 and carried by a lever P^5 pivoted on the dash board and acted on by a spring P^6 to carry a bight of the element P between the pulleys P^2

and P^3 as shown in Fig. 5, when the member M is out of its dotted line position shown in Fig. 5.

When on the platform with the wheels D and *d* in register with the track rails, and the guide wheel K^4 in engagement with the guide rail O, the vehicle is in condition for forward movement off the platform onto the track rails, leading away from the platform. That condition may be obtained, of course, by movement of the vehicle onto the platform from the highway at the side of the platform B, or from the track rails along which the vehicle has approached the platform. As the vehicle moves forward off the platform, and onto the track rails, the front end of the vehicle is lowered as the wheels E move down the corresponding ramps B^2, and the member K has its stem moved upward through the collar L by the action of the guide rail O on the wheel K^4, until the head K^3 is above the part M^2. The latter then moves into locking position under the action of the spring M^3, and the parts are restored to their normal operative positions, illustrated in Fig. 5, as soon as the continued movement of the vehicle carries the wheel K^4 out of operative engagement with the guide rail O. Preferably, the parts are so proportioned that when the wheels D operatively engage the track rails, with the wheel K^4 bearing on the guide rail O, the head K^3 will be in a position slightly above its position of operative engagement with the locking part M^2, which occurs to facilitate the relatching of the member K in its retracted position by the part M^2 of the member M, as the vehicle moves from the platform or hump onto the track rails.

In continuous movement of the vehicle at any appreciable speed along the portion of the railway including a platform, or hump, an objectionable shock would be experienced as a result of the difference in diameters of the flanged and unflanged driving wheels, if the latter were operatively connected to the driving engine I during such movement. As will be apparent, with the rear wheel drive illustrated, continuous rotative movement of the wheels *d* and *e* without reduction in their angular velocity, would tend to result in a sudden increase in the linear velocity of the vehicle, proportional to the ratio of the diameters of the wheels *e* to the diameters of the wheels *d*, as the wheels *e* move up the ramps B^2 at the approach side of the platform, and become the active driving wheels. A corresponding tendency to a sudden reduction in the linear velocity of the vehicle would occur as the wheels *e* move down the ramps B^2 at the leaving side of the platform, and thereby transfer the weight of the rear end of the vehicle to the smaller wheels *d*.

To avoid the above mentioned tendency to sudden changes in velocity as the vehicle passes over a hump, I have devised means for automatically releasing the driving clutch as the vehicle moves on to the platform. Said means in their form shown in the drawings, are actuated by the member M, and comprise a horizontal rod Q extending longitudinally of the vehicle and slidingly mounted in a sleeve or guide member Q' carried by the front axle F. The front end Q^2 of the rod Q is normally in engagement with the trip lever M except when the latter is in its idle position shown in dotted lines in Fig. 5. The engaging surfaces of the member M and rod end Q^2 may have any suitable forms. As shown, the rod end Q^2 is in the form of an enlarged rounded head portion of the rod Q, and the engaging surface of the member M is smooth and approximately vertical in the operative positions of the member M. The rod Q is prevented from moving forward from its position shown in Fig. 5, by a collar Q^3 secured to the rod at the rear of the sleeve Q' and adapted to engage the latter as shown.

The rear end of the rod Q is engaged by a crank arm Q^4 carried by a crank shaft Q^5 journalled in a bracket F^5 carried by the axle F. The crank shaft Q^5 has a second arm Q^6 connected by a rope, cable, or other flexible element QR to the clutch actuating pedal lever R. The latter may be of any usual or standard form and is carried by an actuating shaft R' extending into the clutch and transmission housing H. The lever R is biased by a spring R^2 for movement into the position shown in Fig. 5, in which the clutch operatively connects the driving wheels to the driving shaft of the vehicle motor I. The flexible element QR is deflected from the straight line between the points of its connection to the arm Q^6 and the lever R, by a pulley S' carried by one end of a second pedal lever S journalled on a pivot shaft S^2 carried by the housing H. The lever S has an uprising end extending through the floor C^2 of the driving compartment of the vehicle C, which carries a pedal S^3 at its upper end. As shown, the lever S is provided with a stop S^4 normally held in engagement with the under side of the floor C^2 by a spring S^5.

Preferably, and as illustrated in Fig. 5, the parts are so proportioned that with the parts in their normal positions shown in full lines in Fig. 5, the crank arm Q^4 will hold the collar Q^3 against the end of the sleeve Q'. The clutch lever R will be in its clutch engaging position, the lever S will have its collar S^4 in engagement with the floor C^2, and the flexible element QR will be without slack. As the vehicle moving along the track rails comes into engagement with the approach ramps B^2 of a platform B or analogous hump, and the lever M is turned from the position shown in full lines in Fig. 5 into the position shown in Fig. 6, it engages the head Q^2 of the rod Q, and moves the latter rearwardly through the sleeve Q' sufficiently to move the clutch lever R from its clutch connecting position, into its clutch releasing position, against the tension of the spring R^2. Preferably, the tension of the spring S^5 is sufficiently greater than the tension of the spring R^2 to prevent movement of the lever S in the operation just described.

In the normal movement of the vehicle along a portion of the railway including a hump, the clutch lever R will be held in its clutch releasing position until the movement of the front wheels down the leaving ramps of the hump, moves the member K upward and permits the member M to move into locking position. Preferably the clutch lever R is prevented from returning to its clutch engaging position until the vehicle movement has been sufficient for the operative engagement of the flanged wheels *d*, with the track rails. To this end, the ends of the guide rails O are extended sufficiently beyond the ends of the body portion of the platform B or hump to hold the member K^4 in its elevated position until the rear flanged wheels *d* come into operative engagement with the track rails, and means are provided for holding the lever M out of its locking position until the flanged wheels *d* operatively engage the track rails. The last mentioned means, in the form illustrated, include a rail NA at each end

of the hump. As the vehicle moves away from the hump, the wheel M^4 operatively engages the rail NA at the leaving end of the hump in the same manner in which said wheel M^4 engages a rail N on movement of the vehicle along the track rails into engagement with the hump.

In continuous movement at ordinary speed along a portion of the track including a hump, no operative action by the driver is required in passing over the hump, since the momentum of the vehicle is then sufficient to carry the vehicle over the hump, notwithstanding the temporary release of the clutch. If the vehicle is stopped, or is moving so slowly that it tends to stall on the hump, and when the vehicle is moved onto the platform from the highway or street, actuation of the pedal S^3 by the driver, will raise the pulley S', and thereby permits the return of the clutch lever R to its clutch engaging position, notwithstanding the position of the trip member M at the time.

In Figs. 1 and 2 the structure AA shown is of the kind commonly employed at the intersection of one railway track with another. The structure AA includes flanged track rail sections interposed between sections of the track rails A, and other flanged rail sections interposed between sections of the transversely extending track rails A' of the railway intersecting the railway to which the track rails A pertain. The hump BA associated with the railway crossing including the structure AA, comprises portions at the outer sides of the track rails A, each said portion comprising three sections, one between the portions of the structure AA in alignment with the rails A^1 and end portions at the opposite sides of the said portions of the structure AA. Each of the last mentioned hump portions has an end ramp extension B^2. Similarly the hump BA includes portions at the outer sides of the track rails A^1, each divided into three sections with end ramp extensions B^2, as in the case of the portions of the hump running alongside the track rails A. The rectangle outlined by the portions of the structure AA in line with the rails A and the portions in line with the rails A' includes no portion of the hump structure proper.

At the crossing, including the structures AA and hump BA guide rail OA and trip rails N and NA, parallel to the track rails A, are associated with the latter, and similarly a guide rail OA' and trip rails N and NA are associated with the track rails A'. Each of the trip rails N and NA associated with the hump BA may be exactly like those associated with the hump B. Each of the guide rails OA and OA' may also be exactly like the previously mentioned guide rail O except that it is formed in sections interposed between which are transverse track portions of the crossing structure AA. At the intersection of the two guide rails OA and OA', special provisions are required. As shown in Figs. 1 and 2, each of rails OA and OA' has a section removed at the intersection of the two rails, the adjacent ends of the sections of each guide rail at the opposite sides of the other guide rail being spaced apart just far enough to permit the passage between them of the guide wheel K^4.

In lieu of the guide rail intersection arrangement just described, other arrangements may be employed, and in particular I may employ the arrangement shown in Fig. 8. In that arrangement I locate a one piece metallic structure OB of cruciform shape in the space outlined by the intersecting track rails A and A'. Two aligned arms of the structure OB form a rail section having a groove or channel OB' at its upper side extending between the track rails A^1 and in alignment with sections of the guide rail OA at the opposite sides of those track rails. The other two arms of the structure OB form another rail section having a groove or channel OB^2 at its upper side which extends between the track rails A, and is in alignment with the sections of the guide rail OA' at the opposite sides of the track rails A.

Each groove or channel OB^1 and OB^2 is of a width to receive and guide the flanges of the vehicle guide wheel K^4, with the peripheral edges of the latter running on the bottom wall of the slot. To avoid objectionable jar as the guide wheel K^4 moves over a track rail, the bottom walls of the grooves or channels OB' and OB^2 may be at the level of the top surfaces of the track rails A and A' and the structure AA. In such case the tread surfaces of the guide rails OA and OA', or, at least, of the portions of those guide rails adjacent the track rails, are preferably at a level above the track rail tread surfaces by a distance equal to the radial extent of the flanges of the guide wheel K^4 beyond the tread surface of the latter. With the described arrangement, the flanges of the guide wheel K^4 roll on the tread surfaces of the track rails in crossing the latter.

As will be apparent, all portions of the guide rails O, OA and OA' may be formed with channels similar to the channels OB^1 and OB^2, and in such cases the guide wheel K^4 would not need peripheral flanges, but might be a wheel having its rail engaging portion rectangular in cross section and of a width to run in the guide rail channel. I prefer, however, to employ a guide wheel with flanges, as is the wheel K^4, and to employ a guide rail in association with each transfer platform hump similar to the guide rail O first described.

The proper guidance of the wheel K^4 at the intersection of a railway crossing presents less difficulties than it might otherwise present, because of the fact that ordinary safety conditions make it essential, in practically all cases, that the motor vehicle should stop or slow down to a very slow speed, before moving over a railway crossing, and should move over the crossing at a low rate of speed. In moving continuously over a transfer platform hump, however, the vehicle may proceed with little or no reduction in its normal speed along the railway.

In the use of the present invention, I consider it ordinarily desirable that the motor vehicle should continue to move along the main track, and not onto the side track, at a side track intersection with the main track, unless manually steered onto the side track. Fig. 9 shows a hump arrangement for use at a switch point at which the main track rails are associated with siding track rails, or with branch line track rails.

The hump shown in Fig. 9, includes a portion BB at the outer side of the main track rail A not intersected by a siding rail A^2, like the portion of the previously described hump B at the outer side of either track rail, and at the outer side of the main track rail intersected by one of the siding rails A^2, includes sections BB' and BB^2 at the opposite sides of the siding track, and a section BB^3 between the two siding rails A^2. As shown, the section BB' has an extension BB^4 at the outer side of the adjacent rail A^2, and the hump section BB^2 has an extension BB^5 at

the outer side of the second rail A^2, and the hump includes sections BB^6, between the main track rails A', and at the convex side of the extension A^3 of one of the siding rails A^2 lying between the main track rails. The hump sections BB^6 and extensions BB^4 and BB^5 are adapted to support the unflanged vehicle wheels when the vehicle is moved between the main track and the siding track.

For automatically guiding the movement of the vehicle along the main track at the siding intersection, I provide a guide rail OC, like the guide rail O, except for special portions OC' and OC^2 at opposite sides of the rail extension A^3. As shown, the portions OC' and OC^2 include tread portions at the level of the top of the rail A^3 and uprising side flanges for the guidance of the wheel K^4 to provide a trough or groove, like the grooves OB^2 of Fig. 8, in which the wheel K^4 can run, thus making it unnecessary to notch the rail section A^3 for the passage of the flanges of the wheel K^4. Associated with the main track portion of the hump structure shown in Fig. 9, are trip rails N and NA corresponding to the rails N and NA of Fig. 1. For the automatic guidance of the vehicle in its movement along the siding rails A^2, a guide rail OC^4 may be provided, and corresponding trip rails N and NA associated therewith as shown in Fig. 9.

In operation, the vehicle C may move along the main track rails over the siding intersection shown in Fig. 9, without stopping and without requiring any manual action by the vehicle driver except that ordinarily the vehicle should be slowed down as it approaches the siding intersection.

If the automatic steering mechanism be rendered inoperative, as by suitable manipulation of the wheel L^6, the vehicle may then be guided by manipulation of the steering wheel J' for movement of the vehicle from or to the main track rails to or from the siding rails respectively. With the vehicle speed suitably slowed down, the automatic steering mechanism may be rendered inoperative by adjustment of the wheel L^6 without stoppage of the vehicle for vehicle movement under the control of the steering wheel J' between the main track and siding track rails. Similarly, without stoppage of movement of the vehicle and without use of the automatic steering mechanism, the vehicle may be guided by manipulation of the wheel J' as required for vehicle movement along track rails in passing over a hump alongside those rails, or in passing between the track rails and a trackless roadway alongside or intersecting the track rails at such a transfer platform hump B as is shown in Fig. 1.

In some uses of the invention, it may be desirable to provide the railway with special signal provisions for controlling the movements of motor vehicles, such as the vehicle C, along the railway track rails, and to provide for the control of such signals by the train despatcher who controls the movements of ordinary railway rolling stock along the track rails. Where no such special signal provisions are made, the driver of a motor vehicle running along the railroad track, can derive the same information as to railway rolling stock movements and track conditions from the ordinary railway signals, as the latter give to the engineer or engine driver in a locomotive moving along the track rails.

The motor vehicle C may be provided with a guard serving the general purposes of a "cow catcher" on a locomotive, or a front fender or bumper on an automobile. The guard U may be rigidly attached to the front axle F, or to some front portion of the vehicle framework, but as illustrated, the guard U is secured to the shaft L^2, so that when the parts K and M are shifted into their dotted line positions shown in Fig. 5, the guard U will be correspondingly shifted. With the guard mounted on the shaft L, as described, it is in close proximity to the member M when the vehicle is running on the railway track rails, so as to thereby restrict the risk of having the member M tripped accidentally by engagement with a dog or other trespassing animal, or other obstruction in the line of movement of the member M.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The combination with railway track rails having tread surfaces at a level above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway, and having flanged wheels adapted to run on said track rails and unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above and out of engagement with said roadway, and including vehicle steering mechanism, said road bed including a hump comprising elevated portions alongside localized portions of the track rails and adapted to be engaged by said unflanged wheels and to support the vehicle with its flanged wheels above the track rail tread surfaces, and means including cooperative railway road bed carried parts and vehicle carried parts adapted to automatically lock said steering mechanism for straight line vehicle movement as the vehicle moves off said hump onto the track rails, and to control said steering mechanism as required for movement of the vehicle in the direction of the track rails while the flanged vehicle wheels are held above the track rail tread surfaces by said hump.

2. A combination as specified in claim 1, including means for automatically unlocking said steering mechanism as the vehicle moves onto said hump from the track rails.

3. A combination as specified in claim 1, including vehicle carried means adapted for adjustment to render said vehicle carried parts inoperative to interfere with the adjustments of said steering mechanism required to guide the vehicle in its movements over a trackless roadway.

4. The combination with railway track rails having tread surfaces above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway, and including flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a

trackless roadway and support the vehicle with its flanged wheels above said roadway, and a steering mechanism, said road bed being formed with a hump comprising portions alongside localized portions of said track rails adapted to be engaged by said unflanged wheels and thereby hold said flanged wheels above the level of the adjacent track rail tread surfaces, a stationary guide rail alongside said localized sections, a control part mounted on said vehicle including a guide wheel adapted to engage said guide rail and adjust said steering mechanism as required for movement in the direction of said track rails when the unflanged vehicle wheels are moving along said hump.

5. The combination with railway track rails having tread surfaces above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway, and including flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above said road bed, and a steering mechanism, said road bed being formed with a hump comprising elevated portions alongside localized portions of said track rails adapted to be engaged by said unflanged wheels and thereby hold said flanged wheels above the level of the adjacent track rail tread surfaces, a stationary guide rail alongside said localized sections, a control part mounted on said vehicle and including a guide wheel and movable between a locking position and a position in which said guide wheel is adapted to engage said guide rail and control said steering mechanism as required for vehicle movement in the direction of said track rails when the flanged vehicle wheels are moving along said hump, and adapted when in said locking position to maintain said steering mechanism in condition for straight line vehicle movement, a member mounted on said vehicle and adapted to releasably secure said member in its locking position, and means associated with said hump for actuating said member to release said part, as the vehicle moves respectively from the track rails onto said hump.

6. The combination with railway track rails having tread surfaces above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway, and including flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above said road bed, and a steering mechanism, said road bed being formed with a hump comprising elevated portions alongside localized portions of said track rails adapted to be engaged by said unflanged wheels and thereby hold said flanged wheels above the level of the adjacent track rail tread surfaces, a stationary guide rail alongside said localized sections, a control part mounted on said vehicle and including a guide wheel and movable between a locking position and a position in which said guide wheel is adapted to engage said guide rail and control said steering mechanism as required for vehicle movement in the direction of said track rails when the flanged vehicle wheels are moving along said hump, and adapted when in said locking position to maintain said steering mechanism in condition for straight line vehicle movement, a member mounted on said vehicle and adapted to releasably secure said member in its locking position, and means associated with said hump for actuating said member to release said part as the vehicle moves from the track rails onto said hump, said guide rail being extended beyond said hump and being adapted to move said part into its locking position as the vehicle is lowered by its movement from the hump onto the track rails.

7. The combination with railway track rails having tread surfaces above the railway roadbed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway, and including flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above said roadway, and a steering mechanism, said roadbed being formed with a hump comprising elevated portions alongside localized sections of said track rails adapted to be engaged by said unflanged wheels and thereby hold said flanged wheels above the level of the adjacent track rail tread surfaces, a stationary guide rail alongside said localized sections, and having an end portion extending beyond the end of said hump portions, a control part mounted on said vehicle and adjustable relative thereto between an upper position in which it locks said steering mechanism against adjustment, and a lower position in which said steering mechanism is released for adjustment by movement of said part laterally of said vehicle, said part including a guide wheel adapted to engage and run along said guide rail, said part being automatically adjusted into its locking position by said guide rail end portion as the vehicle is lowered as it moves off said hump portions and its flanged wheels come into engagement with the track rails, a device for releasably securing said part in its upper locking position, and means actuating said device to release said control part and permit it to move down into its guiding position as the vehicle is raised in moving onto said hump portions from the track rails.

8. The combination with railway track rails having tread surfaces at a level above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway and comprising flanged wheels adapted to run on said track rails, unflanged wheels respectively alongside said flanged wheels and of larger diameter than the latter and adapted to support the vehicle in its movements over a trackless roadway, a driving motor, and a clutch adapted when operative to operatively connect said motor and wheels, said road bed including a hump comprising elevated portions alongside localized sections of said track rails in position for engagement by the unflanged vehicle wheels to thereby raise the flanged vehicle wheels out of engagement with the track rails, means for rendering said clutch inoperative, and means including cooperating hump and vehicle carried parts adapted to automatically make said clutch operative as said unflanged wheels move out of engagement with said hump.

9. The combination with railway track rails having tread surfaces at a level above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway and comprising flanged wheels adapted to run on said track rails, unflanged wheels respectively alongside said flanged wheels and of larger diameter than the latter and adapted to support the vehicle in its movements over a trackless roadway, a driving motor, and a clutch adapted when operative to operatively connect said motor and wheels, said road bed including a hump comprising elevated portions alongside localized sections of said track rails in position for engagement by the unflanged vehicle wheels to thereby raise the flanged vehicle wheels out of engagement with the track rails, and means including cooperating hump and vehicle carried parts adapted to automatically make said clutch inoperative, as vehicle movement in the direction of track rails moves said unflanged wheels into engagement with said hump portion.

10. The combination with railway track rails having tread surfaces at a level above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway and comprising flanged wheels adapted to run on said track rails, unflanged wheels respectively alongside said flanged wheels and of larger diameter than the latter and adapted to support the vehicle in its movements over a trackless roadway, a driving motor, and a clutch adapted when operative to operatively connect said motor and wheels, said road bed including a hump comprising elevated portions alongside localized sections of said track rails in position for engagement by the unflanged vehicle wheels to thereby raise the flanged vehicle wheels out of engagement with the track rails, and means including cooperating hump and vehicle carried parts adapted to automatically make said clutch inoperative, as vehicle movement in the direction of track rails moves said unflanged wheels into engagement with said hump portion, and manually operable means for rendering the previously mentioned means inoperative.

11. The combination with railway track rails having tread surfaces at a level above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway and comprising flanged wheels adapted to run on said track rails, unflanged wheels respectively alongside said flanged wheels and of larger diameter than the latter and adapted to support the vehicle in its movements over a trackless roadway, a driving motor, and a clutch adapted when operative to operatively connect said motor and wheels, said road bed including a hump comprising elevated portions alongside localized sections of said track rails in position for engagement by the unflanged vehicle wheels to thereby raise the flanged vehicle wheels out of engagement with the track rails, and means including cooperating hump and vehicle carried parts adapted to automatically make said clutch inoperative as vehicle movement in the direction of track rails moves said unflanged wheels into engagement with said hump portion, and to automatically make said clutch operative as said unflanged wheels move out of engagement with said hump, and manually operable means for rendering the previously mentioned means inoperative.

12. In a motor vehicle adapted for movement optionally on railway track rails and on a trackless roadway, flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above said roadway, a vehicle steering mechanism, means for manually adjusting said mechanism, and automatic controlling means for said mechanism adapted to be adjusted into and out of operative relation with said steering mechanism, and including a member adjustable, when said means are in operative relation with said mechanism, between one position in which it locks said steering mechanism for straight line movement of said vehicle, and a second position in which it is adapted to engage a guide rail and adjust said mechanism for movement of the vehicle in the direction of said guide rail.

13. In a motor vehicle adapted for movement optionally on railway track rails and on a trackless roadway, flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above said roadway, a vehicle steering mechanism, means for manually adjusting said mechanism, and automatic controlling means for said mechanism adapted to be adjusted into and out of operative relation with said steering mechanism, and including a member adjustable when said means are in operative relation with said mechanism, between one position in which it locks said steering mechanism for straight line movement of said vehicle, and a second position in which it is adapted to engage a guide rail and control said mechanism for movement of the vehicle in the direction of said guide rail, and means adapted to be actuated by engagement with stationary control parts located along the railway track, to adjust said member between its two positions.

14. In a motor vehicle adapted for movement optionally on railway track rails and on a trackless roadway, flanged wheels adapted to run on said track rails and support the vehicle when moving along said railway, unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above said roadway, a vehicle steering mechanism, means for manually adjusting said mechanism, and automatic controlling means for said mechanism adapted to be adjusted into and out of operative relation with said steering mechanism, and including a member, and a locking part, said member, adjustable, when said means are in operative relation with said mechanism, between one position in which it locks said steering mechanism for straight line movement of said vehicle, and a second position in which it is adapted to engage a guide rail and control said mechanism for movement of the vehicle in the direction of said guide rail, said member being biased for movement from said one position into said second position, and said locking part being adapted for adjustment, on engagement with stationary control parts located along the railway track, from one position in which it locks said member in its said one position and a second position in

which said member is free to move into said second position.

15. The combination with railway track rails having tread surfaces at a level above the railway road bed and adapted to support and guide ordinary railway cars and locomotives, of a motor vehicle adapted for movement optionally on said track rails and on a trackless roadway, and having flanged wheels adapted to run on said track rails and unflanged wheels adapted to run on a trackless roadway and support the vehicle with its flanged wheels above and out of engagement with said roadway, and including vehicle steering means, said road bed including a hump comprising elevated portions alongside localized portions of the track rails and adapted to be engaged by said unflanged wheels and to support the vehicle with its flanged wheels above the track rail tread surfaces, means for locking said steering mechanism for straight line vehicle movement, and means including cooperative railway roadbed carried parts and vehicle carried parts for rendering the first mentioned means operative and inoperative respectively, as the vehicle moves off of and onto said hump.

JESSE P. HUBBELL.