March 27, 1928. 1,663,690

O. A. ELLIS

ELEVATED SUSPENDED RAILWAY

Original Filed May 17, 1922 3 Sheets-Sheet 1

FIG. 1.

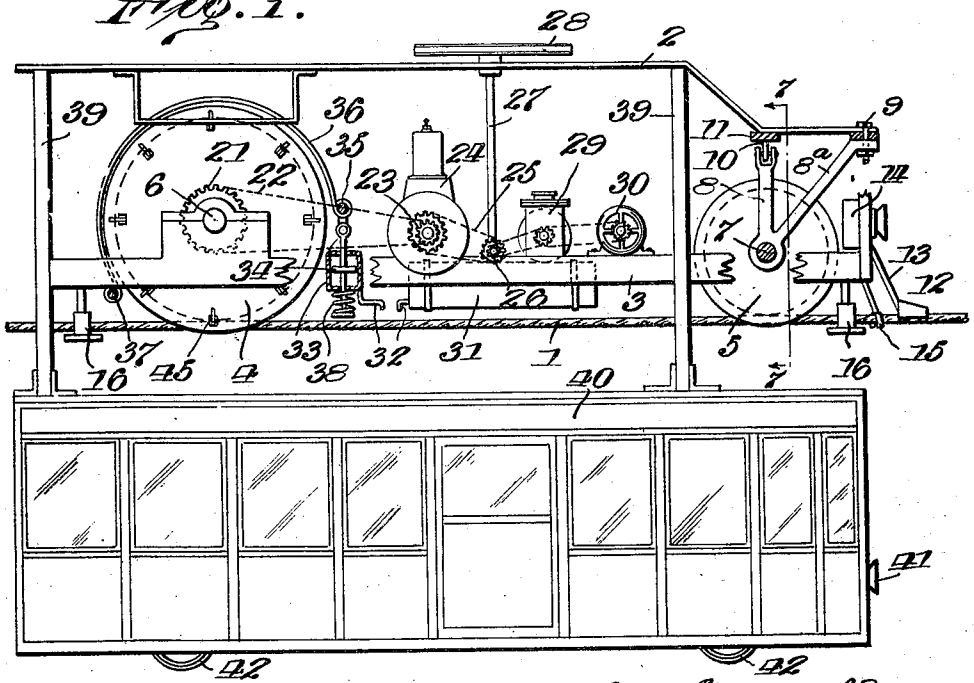


FIG. 2.

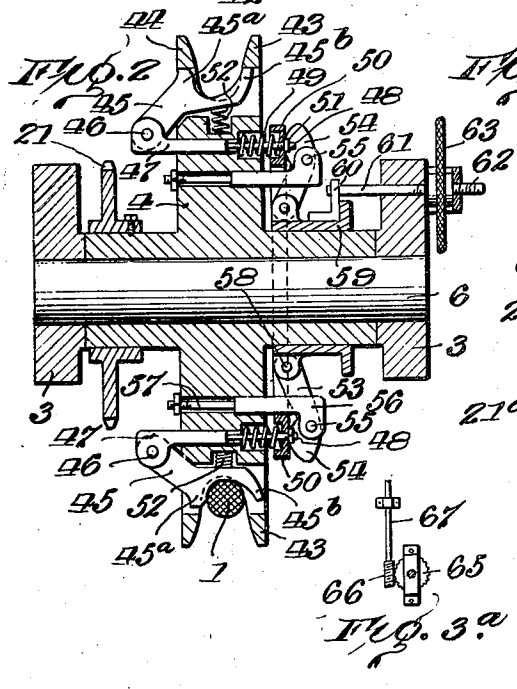


FIG. 3.

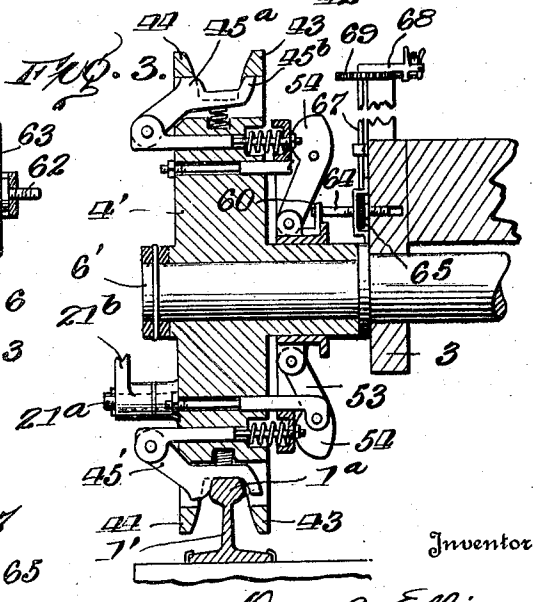


FIG. 3a.

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Fig. 4.

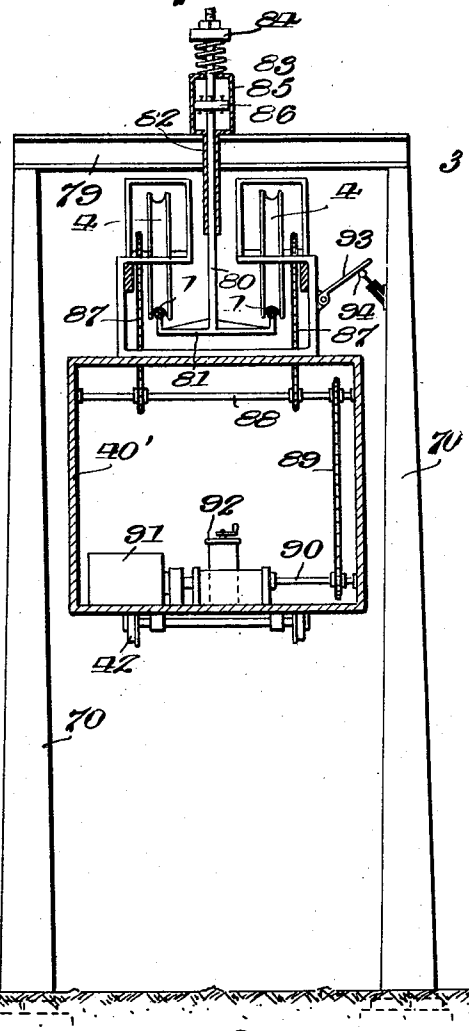


Fig. 6.

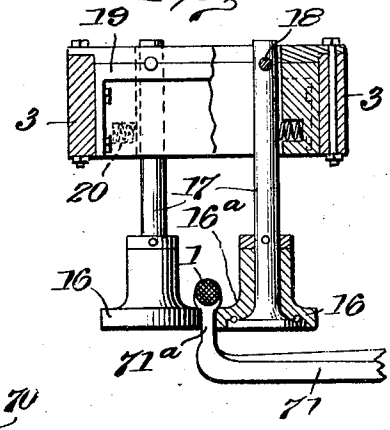


Fig. 7.

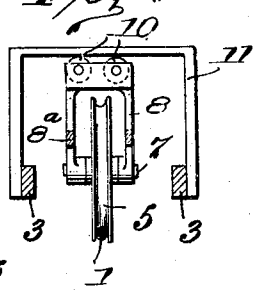
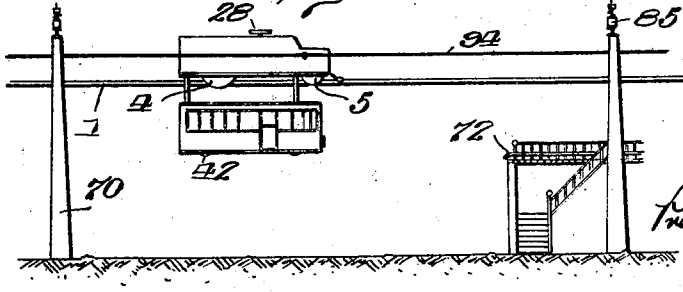


Fig. 5.



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Fig. 8.

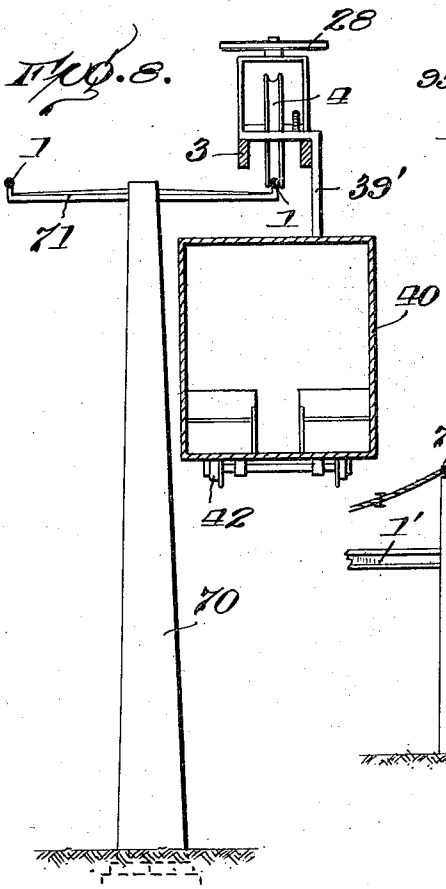


Fig. 12.

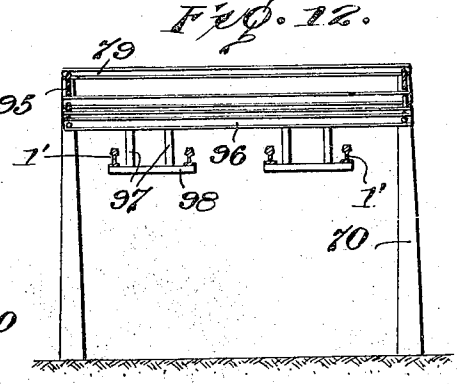


Fig. 13.

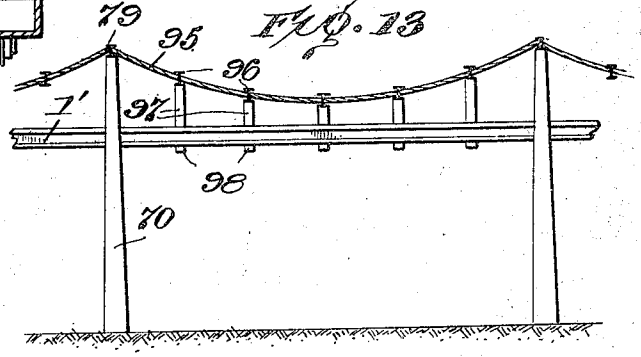


Fig. 9.

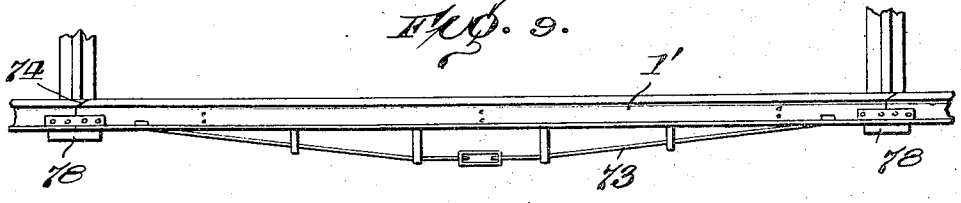


Fig. 10.

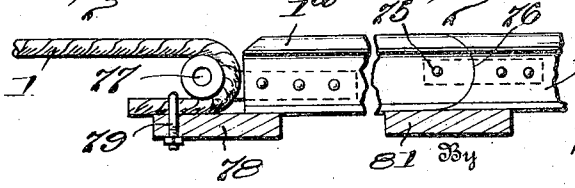


Fig. 11.

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UNITED STATES PATENT OFFICE.

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ELEVATED SUSPENDED RAILWAY.

Application filed May 17, 1922, Serial No. 561,780. Renewed June 22, 1926.

This invention relates to elevated railways, and particularly to elevated railways of the suspended type.

In elevated railways as heretofore constructed, especially those of the single cable rail type, it has been necessary to make the traveling car comparatively light, with the result that the tractive effect of the driving wheels, on the rail, was insufficient to produce satisfactory results. This has been particularly true in cases where, as is usual, steep grades are present, up which it is necessary for the cars to climb.

It is the primary object of the present invention to provide improved means for causing the driving wheels to firmly grip the rail, so as to secure the desired tractive effect, and so as to enable self-propelled cars to easily climb the steepest grades. Such gripping means are applicable to the wheels of cars, adapted to travel on either an ordinary rigid rail, or a flexible cable rail.

Further objects of the invention are to provide an improved construction of motor truck, for use on single rail railways, and to devise improved means for supporting and connecting the suspended rails.

In order that the invention may be readily understood, reference is had to the accompanying drawings, forming part of this specification, and in which:—

Fig. 1 is a side elevation of one form of my improved motor truck and associated car, parts being broken away, and parts being shown in section;

Fig. 2 is a vertical transverse section, on an enlarged scale, through one of my improved traction wheels, adapted for use in connection with a cable rail.

Fig. 3 is a similar view, showing a slightly modified construction, and illustrating a wheel adapted for use on an ordinary T-rail;

Fig. 3ª is a detail of gearing employed in Fig. 3;

Fig. 4 is a transverse section, through one type of track supporting means, which I may employ, the view also showing a construction of car and truck different from that illustrated in Fig. 1;

Fig. 5 is a side elevation on a smaller scale, showing a section of one form of my improved railway, and a station platform adapted to receive the car;

Fig. 6 is a vertical sectional elevation, on an enlarged scale, showing the construction of safety guard wheels, which I may employ;

Fig. 7 is a vertical section substantially on the line 7—7 of Fig. 1, showing the front wheel of the motor truck;

Fig. 8 is a sectional elevation similar to Fig. 4, but showing a different track supporting structure, and illustrating the truck and car shown in Fig. 1;

Fig. 9 is a side elevation of a rail structure, and supporting means therefor, which I may employ;

Fig. 10 is a fragmentary detail on an enlarged scale, showing means for connecting the meeting ends of a cable rail and T-rail;

Fig. 11 is a similar view, showing a hinged joint for connecting sections of the T-rail together; and

Figs. 12 and 13 are a transverse section and side elevation respectively, showing still another method of supporting the track rails.

Referring to the drawings in detail, and more particularly first to Fig. 1 thereof, the numeral 1 designates an elevated suspended track rail, which is here shown as a cable rail. On this rail runs my improved motor vehicle, which consists of a truck 2 and a car 40, suspended therefrom, by means of bars 39. The truck comprises spaced side frames 3, between which are mounted one or more traction wheels 4, and a front pilot wheel 5. The traction wheel 4 is fixed to a shaft 6, and the pilot wheel 5 is carried by a shaft 7. This shaft 7 is carried at the apex of a V-shaped bracket 8, 8ª, the front leg 8ª thereof being secured by a vertical pivot 9 to the truck frame, and the leg 8 carrying at its upper end, one or more rollers 10, (see Fig. 7) adapted to constitute an anti-friction bearing between the auxiliary frame or bracket 8, and a yoke 11, secured to the side frames 3 of the truck. Thus, it will be seen that when curves in the track are encountered, the pilot wheel 5 and associated frame or bracket in which it is mounted may swing about the pivot 9 as required, and thus adapt itself to the curves.

Preferably mounted in front of this pilot wheel is a device 12, in the nature of a torch, for melting off any ice or sleet which may accumulate upon the cable rail 1, this torch being connected by a pipe 13 with a suitable fuel tank 14.

Just behind the torch 12 is a shoe or

scraper 15, which is adapted to clear the rail of any ice or other obstructions.

In order to prevent any possibility of the truck leaving the cable rail, I preferably provide, both at the front and back of the truck, adjacent the driving and pilot wheels thereof, a pair of guard wheels 16. As clearly shown in Fig. 6, these guard wheels are mounted on short vertical shafts 17, pivoted at 18 to a cross-bar 19, mounted between the side frames 3, and springs 20 bear against the sides of the shaft 17 in such a manner as to urge the wheels 16 together. The wheels are therefore normally, substantially in contact below the cable rail 1, and are preferably formed with a concave profile, as shown at 16^a, so as to embrace the cable. When a cable supporting bracket, such as indicated at 71^a, is encountered, the springs 20 permit the wheels 16 to separate so that the bracket 71^a may pass between them.

The traction wheel 4 has a sprocket wheel 21 secured upon the shaft 6 thereof, and this is driven by a sprocket chain 22 from gearing 23, actuated by a motor 24, which may be of the internal combustion type. Any desired transmission between the motor and driving wheel may, of course, be employed instead of that shown.

Also driven from the motor 24 as by a sprocket chain 25 is shaft 26, which is geared to a vertical shaft 27, on the upper end of which is fixed a gyroscope wheel 28. This has the effect of lending stability to the combined truck and car, and it will be observed that the gyroscope wheel 28 and car 40 are located on opposite sides of the rail 1, the gyroscope thus serving to counteract any tendency of the car 40 to swing about the rail 1 as a pivot.

Also driven from the shaft 26, or in any other suitable manner, is an air compressor 29 and a dynamo 30, for supplying lights. The air compressor 29 delivers into a tank 31 and from this extends a pipe 32 to the braking mechanism. This pipe 32 is, of course, provided with a control valve, suitably located, but not shown in the drawing. The brake mechanism comprises a vertical cylinder 33 having a piston 34 therein, mounted on a piston rod, connected at its upper end with one end 35 of a band brake, partially encircling the driving wheel 4, and secured at its other end to the truck frame as shown at 37. The lower end of the piston rod projects below the cylinder and is surrounded by a compression spring 38. The pipe 32 enters the cylinder 33 at a point below the piston 34, and when the control valve is open, air enters under the piston 34 and raises it, thus compressing the spring 38 and disengaging the brake band from the wheel. When, however, the air pressure is shut off from the cylinder 33, the spring 38 forces the piston and associated parts downwardly, thus bringing the brake band into engagement with the wheel.

The car 40 is preferably provided with a head light 41, and with ordinary front and rear pairs of flanged wheels 42. These wheels 42 are adapted to engage and roll upon suitably placed rails 72 (see Fig. 5) mounted on an elevated platform, at any desired station. Thus, at a terminal station, for example, the cars may be transferred from the suspended rail 1 to the ordinary rails 72, and having once been properly supported on the rails 72, may be stored on sidings or switched, at pleasure, in accordance with the usual railway practice.

Referring now particularly to Fig. 2, I will proceed to describe the construction of one of my improved traction wheels. The wheel, such as 4, is provided with a pair of parallel peripheral flanges 43 and 44, spaced apart to provide a cable receiving groove. As clearly shown at the lower part of Fig. 2, this groove is somewhat wider than the thickness of the cable. Carried by the wheel adjacent the above mentioned groove, is a plurality of grip members 45, each of which comprises a body portion, and a pair of fingers 45^a, 45^b, forming between them a U-shaped seat. These grip members are mounted in recesses or slots in the wheel, in such a manner that the U-shaped seats therein substantially register with the groove in the wheel.

Although the grip members may, in some cases, be pivoted directly to fixed brackets carried by the wheel, they are, in the present case, pivoted at 46 to axially movable brackets 47, slidably mounted in, and extending transversely through the wheel. Each bracket 47 is provided at its free end with a reduced shank 48, around which is mounted a compression spring 49, fitted in a pocket in the face of the wheel. A floating ring 50 of a diameter equal to the distance between opposite brackets 47, is provided, and is arranged to bear against the free ends of the springs 49. The shanks 48 of the brackets 47 slide freely through this ring 50 and are secured on the outside by nuts 51. A compression spring 52 is mounted in a radial pocket under each grip member 45, and tends to throw such grip member into its outermost position, as shown at the top of Fig. 2.

A plurality of levers 53 are provided with cam shaped end portions 54, adapted to bear against the outer face of the ring 50, and are pivotally mounted at 55 on a series of brackets 56, having shanks 57 extending transversely through the wheel, and secured therein. The inner ends of the levers 53 are pivoted at 58 to a collar 59, slidable on the wheel hub, and engaged by a fork 60, or the like, secured to one end of a rod 61, which

passes loosely through one of the side frames 3, and has a threaded outer end 62, on which works an adjusting wheel 63.

From the above, it is obvious that the tendency of the springs 49 is to push the ring 50 away from the wheel, thus drawing all of the brackets 47 and associated grip members 45, to the right. By turning the wheel 63, however, and thus drawing the rod 61 and collar 59 toward the right, the levers 53 are swung on their pivots 55 and the cam ends thereof caused to bear against the ring 50, so as to force it toward the left. Thus, the position of the grip members 45, transversely of the wheel, may be adjusted as desired. Such adjustment may be necessary to compensate for wear, or to adapt the wheel for use with cables of different sizes. Moreover, the springs 49 permit the grip members 45 to yield laterally, in case a cable support or other obstruction is encountered.

From the above description, it will be understood that as the wheel rolls along the cable, each of the grip members 45 is brought into engagement with the cable, and the weight of the vehicle, as each grip member comes into contact with the cable, will cause the spring 52 to be compressed as indicated at the bottom of Fig. 2, and the grip member thereby swung on its pivot 46, thus causing it to yieldingly grip the cable between the flange 43 of the wheel and the finger 45^a the grip member. In other words, the cable is pressed against one of the wheel flanges, and is pinched between such flange and the opposing finger of the grip member. This causes the wheel to securely bite the cable and enables it to exert tremendous tractive effort without slipping. As the wheel rolls along, and the weight of the vehicle is shifted from each grip member, the spring 52 will restore such grip members to normal or inoperative position, this restoring action being greatly assisted by centrifugal force, which, of course, tends to throw the grip members radially outward.

In Fig. 3, I have illustrated a slightly different construction, and have also shown grip members shaped to cooperate with an ordinary T-rail having the usual head. In this figure, a wheel 4′ is mounted on a shaft or axle 6′ and is arranged to run upon a rail 1′ having the usual head 1^a. Grip members 45′ are mounted as in Fig. 2, but the seat formed between the fingers 45^a and 45^b thereof is shaped to fit the rail head, as clearly shown at the bottom of Fig. 3. As described in connection with Fig. 2, this rail head is gripped between the grip members 45′ and the flange 43 of the wheel, and the desired tractive effect is secured in the same way. In Fig. 3, however, I have shown means whereby the adjustment of the levers 53 can be effected from the top instead of from the side. To this end, a rod 64 is secured to the fork 60, and is provided with a screw threaded portion, which passes loosely through a suitable bracket and on which works a nut in the form of a worm wheel 65, with which meshes a worm 66, carried at the end of a vertical shaft 67, provided at its upper end with a lever 68 and locking rack 69 by means of which the worm may be rotated and locked in any desired adjusted position.

In Fig. 3, I have also shown the driving wheel 4′ as provided with a wrist pin 21^a and connecting rod 21^b, like an ordinary locomotive driver, instead of with a sprocket wheel, such as shown in Fig. 2. It will, therefore, be understood that the manner of driving the traction wheel is immaterial, the important feature being the provision of means, actuated by the weight of the vehicle, for causing such wheel to firmly grip the rail.

Referring to Fig. 8, I have illustrated a supporting structure consisting of a post 70 and a cross-arm 71, on which one or more cable rails 1 are mounted. In this figure, I have shown two such rails, one for traffic in each direction. In Fig. 8, I have also shown a truck and car similar to that illustrated in Fig. 1, the car being suspended by a slightly different form of hanger 39′.

In Figure 9, I have shown a track rail 1′, which I may employ, this track rail being preferably reinforced by a truss rod 73 to give increased rigidity on long spans. As shown in this figure, the rail sections are carried on rigid supports 78 and are preferably united by means of scarf joints 74, so as to avoid interference with the action of the grip members.

In some cases, it may be desirable to construct a suspended way partly of cable rail and partly of rigid track rail, and in such cases it becomes desirable to unite the meeting ends of the rigid and cable rail, so that the car may readily pass from one to the other. In Fig. 10, I have shown such a connection, the end of the cable 1 being carried around a pin 77 and secured to the support 78 by means of a clip 79, the arrangement being such that the cable 1 is in alignment with the head 1^a of the rigid rail.

Referring to Fig. 4, I have shown a slightly modified arrangement embodying some of the features of my invention. In this arrangement, the rails 1 are carried by a supporting structure comprising pairs of posts 70 united by cross-bars 79. Preferably the rails 1, which are shown as cables, are carried by an inverted T-shapend hanger, comprising a vertical rod 80 and a cross-bar 81, the rod 80 sliding freely through a guide 82, carried by the cross bar 79. A compression spring 83 surrounds the upper end of the rod and is adjustably secured by a plate and nut 84. Between the spring 83 and the cross-bar 79 is preferably disposed a pneu-

matic cylinder or dash pot 85 in which works a piston 86 secured to the rod 80 and provided with one or more check valves opening downwardly. Normally, the spring 83 sustains the weight of the track. When, however, a car comes along, its weight compresses the spring 83 and tends to move the piston 86 downwardly. As the piston begins to move, however, the check valves carried thereby close, thus confining the air below the piston and constituting a pneumatic cushion, which sustains or assists in sustaining the weight of the car as it passes. This prevents noise and vibration. After the car has passed, the spring 83 restores the parts to normal position, the check valves in the piston automatically opening to permit the air to pass.

Instead of a single cylinder 85 as shown in Fig. 4, I may, if preferred, attach the upper end of rod 80 to a cross-bar, at each end of which is located a supporting spring and cylinder, as will be obvious.

In Fig. 4, I have shown a modified construction of car and truck, in which both rails 1 serve to support the same car, and in which the motor is carried by the car itself, instead of by the truck. The traction wheels 4 are driven by sprocket chains 87 from a jack shaft 88, which is in turn driven by a sprocket chain 89, actuated by a shaft 90, driven by an electric motor 91. This is governed by a controller 92, of any desired type, and power for the motor is obtained by means of a contact shoe or trolley 93, engaging a trolley wire 94 carried by the poles 70 on suitable insulators. This wire is also shown in Fig. 5.

When using rigid track rails in connection with a pneumatic cushion or other yieldable support, as shown in Fig. 4, it is desirable to connect the rail sections by means of a flexible or hinged joint. This is illustrated in Fig. 11, in which the rail sections are hinged together by a pivot pin 75, passing through the usual fish plates, the meeting ends of the rail sections being cut on complementary arcs, around the pin 75 as a center, as shown at 76. This construction will permit the rail sections to move up and down as the car passes the yielding supports or pneumatic cushions.

In Figs. 12 and 13, I have shown conventionally still another method in which elevated suspended ways may be supported. In these figures, I may employ pairs of supporting posts 70, connected by cross-bars 79, as before. In this case, however, I have illustrated two tracks of two rails each, suitable for cars of the type shown in Fig. 4, and these tracks are supported by means of a pair of cables 95, after the manner of a suspension bridge. Cross-beams or girders 96 extend between the cables and from these cross-beams project hangers 97 to which are secured the bars or ties 98, on which the rails 1′ rest.

What I claim is:—

1. The combination with a vehicle having a traction wheel having a tread portion adapted to run upon a rail and with which the rail has a tangential engagement, of grip members carried by the wheel and independent of said tread portion and constructed to engage the rail only during the moment of such tangential engagement.

2. The combination with a vehicle having a traction wheel having a tread portion adapted to run upon a rail, of grip members carried by the wheel and independent of said tread portion, and brought into gripping relation with the rail by the weight of the vehicle.

3. The combination with a vehicle having a flanged wheel having a tread portion adapted to run upon a rail, of grip members movably mounted on the wheel and independent of said tread portion and constructed to grip the rail between themselves and the wheel flange.

4. The combination with a vehicle having a flanged wheel having a tread portion adapted to run upon a rail, of grip members carried by the wheel and independent of said tread portion, and means actuated by the weight of the vehicle for causing said grip members to grip the rail between themselves and the wheel flange.

5. The combination with a vehicle having a flanged wheel having a tread portion adapted to run upon a rail, of grip members pivotally mounted on said wheel around the periphery thereof and independent of said tread portion, and means whereby said grip members are caused to successively engage and release the rail as said wheel rolls along.

6. The combination with a vehicle having a flanged wheel having a tread portion adapted to run upon a rail, of grip members pivotally mounted on said wheel and independent of said tread portion, and means actuated by the weight of said vehicle for swinging said grip members on their pivots and causing them to grip the rail between themselves and the wheel flange.

7. The combination with a vehicle having a wheel adapted to run upon a rail and provided with a pair of peripheral flanges spaced apart to form a rail receiving groove between them, said groove being wider than the rail, of grip members movably mounted on said wheel and independent of said receiving groove and capable of yielding transversely, said members having portions lying in said groove, and means actuated by the weight of said vehicle for causing said members to resiliently grip the rail between themselves and one of said flanges.

In testimony whereof I affix my signature.

OSCAR A. ELLIS.