(No Model.) 2 Sheets—Sheet 1.

W. H. H. SISUM.

Car Truck.

No. 238,978. Patented March 15, 1881.

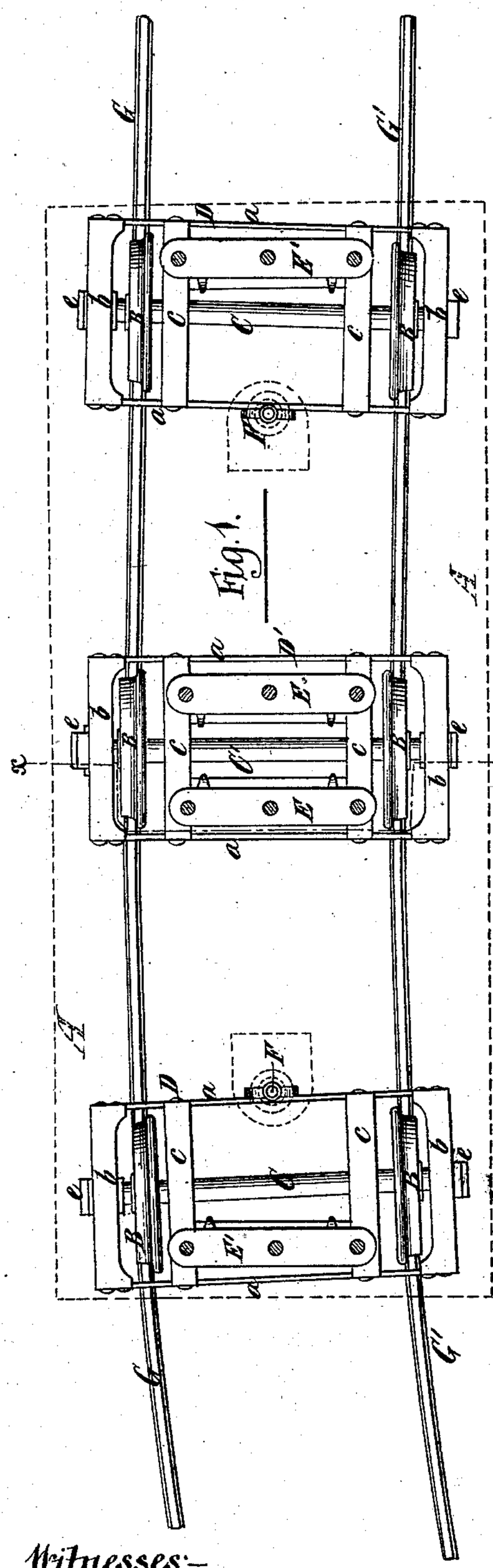

Fig. 1.

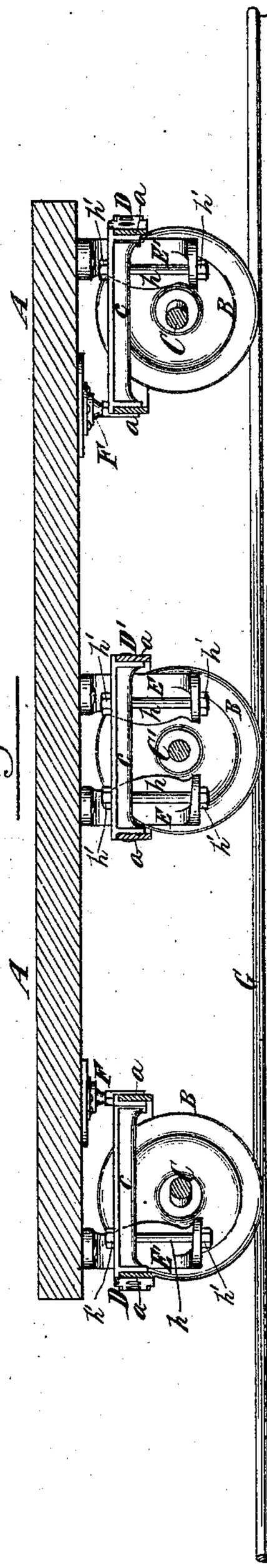

Fig. 2.

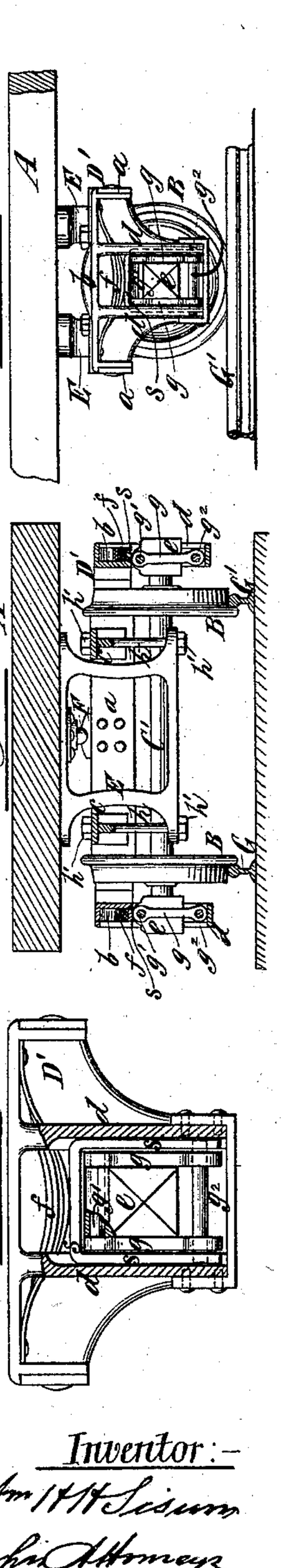

Fig. 3.

Fig. 4.

Fig. 5.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 6.

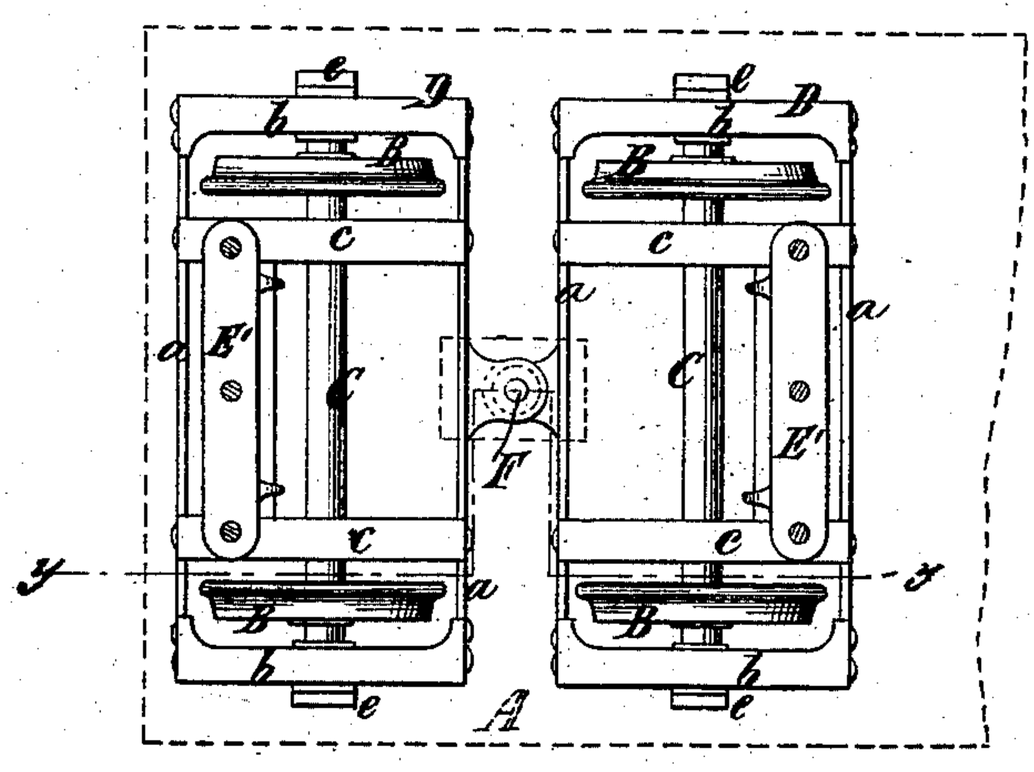
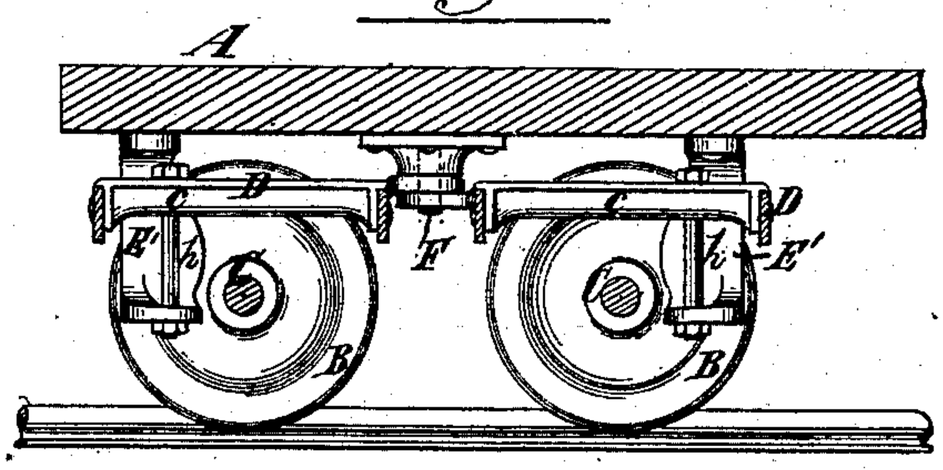


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM H. H. SISUM, OF BROOKLYN, NEW YORK, ASSIGNOR TO JAMES W. CHISHOLM, TRUSTEE, OF SAME PLACE.

CAR-TRUCK.

SPECIFICATION forming part of Letters Patent No. 238,978, dated March 15, 1881.

Application filed December 23, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. H. SISUM, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Running-Gear for Railway-Cars, of which the following is a specification.

My invention relates generally to means employed for connecting a car-body with the frames in which are the axles, but more particularly relates to cars in which the said frames are suspended from the axle-boxes, or from points fixed relatively to the length of the axles, by means of links which provide for lateral movement of each pair of wheels, produced by irregularities in the rails, or by other causes independently of the truck or axle-frame, and without transmitting any considerable portion of such movement to the said frame.

The object of one part of my invention is to prevent the truck or axle-frame, in case it does receive more or less lateral movement from the lateral movement of the wheels and axle, from transmitting any portion of such movement to the car-body; and to this end this part of my invention consists in the combination, with a pair of wheels, an axle, and its frame, of pairs of links, whereby the frame is suspended from the axle-boxes or other fixed points relatively to the length of the axle and other pairs of links, whereby the car-body is suspended from the said frame, both of said pairs of links affording provision for the transverse movement of said wheels, axle, and frame independently of said car-body. When so constructed the extent of vibration of the suspending-links from a perpendicular is only about one-half what it would be when the whole amount of lateral movement of the wheels and axle relatively to the car-body is compensated for by one set of links suspending the frame only, varying, of course, as the relative lengths of the two sets of links differ, and hence there is less liability of any portion of the lateral movement of the wheels and axle being transmitted to the car-body.

Another part of my invention relates to cars in which each axle and pair of wheels is provided with a separate frame connected with the car-body separately from and independent of all the frames of all the other axles, whether the car be provided with only two axles and pairs of wheels or with more than two; and the object of this part of my invention is to utilize the momentum of the car-body and load, and their momentum and gravity in passing a curve, for the purpose of shifting the axles to cause them to assume a position radial or normal to the said curve, and to effect the desired result without material shock to the car, and without straining the track.

To this end this part of my invention consists in the combination, with a pair of car-wheels, an axle, and its frame, of a car or truck body and connections between said body and frame, which permit the axle and frame, in passing a curve, to be moved in a direction lengthwise of the axle and lateral to the car or truck body, and also radiated relatively to the track by the momentum and gravity of the car.

The connecting devices or mechanism between the frame and car-body may be of any suitable character to produce the desired result; but I preferably provide a fixed pivotal connection between the frame and the car-body upon the inner side of the axle—that is, the side nearest the middle of the length of the car—and a connection between said car-body and frame at the outer or opposite side of the axle, which will permit of the lateral movement of the car-body independently of said frame. The latter connection may be constructed in various ways; but a very desirable connection is formed by links suspended from the upper portion of the frame, and having connected to their lower ends a bracket rigidly secured to the under side of the car-body, and projecting downwardly therefrom.

When a car having the axle-frames connected in the above-described manner approaches a curve in the track the momentum of the car, tending in a straight line, will cause the flange of the wheel to press against the outer rail, and tend to move the wheels, axle, and frame laterally relatively to the car; but such lateral movement of one side of the frame being prevented by the pivotal connection between the car-body and frame, the said pressure of the

wheel upon the rail turns the frame upon its pivot, radiating the axle relatively to the curved track, and moving it laterally in the line of an arc relatively to the car-body.

Where not only the car-body is suspended by links from the frame, but the said frame is also suspended by links from the axle, the lateral movement of the wheels and axle will swing the last-mentioned links from their perpendicular, and in such case the lateral and radial movement of the axle and frame will be assisted by the force of gravity of the car-body and frame, causing the said links to tend to a perpendicular position.

Where I arrange three axles and pairs of wheels and three frames under a car, the two end axles and frames are adapted to move both laterally relatively to the car-body and radially relatively to the track; but the intermediate axle and frame need only be adapted to move laterally relatively to the car-body, and this is true where any odd number of axles, pairs of wheels, and frames are used; but where even numbers of axles, pairs of wheels, and frames are used all should be adapted to move both laterally and radially, as described.

In lieu of the frames of the axles being connected directly with the car-body they might be connected with a truck-body, and the car-body have such a truck-body under each end thereof.

My invention also consists in the combination, with a car-body and two pairs of wheels, two axles, and two axle-frames, of a fixed pivot arranged between the two axles and connecting the two frames together, and also connecting both said frames directly with the car-body.

In the accompanying drawings, Figure 1 represents a plan of three axles, pairs of wheels, and frames, together with a dotted outline of a car-body supported thereon and a curved portion of a track. Fig. 2 represents a longitudinal section thereof. Fig. 3 represents a transverse section on the dotted line *x x*, Fig. 1. Fig. 4 represents an end view of the center frame with its axle and wheels. Fig. 5 represents an end view, partly in section, of one of the axle-frames with the axle-box and appurtenances. Fig. 6 represents a plan of two axles and frames arranged together to form a truck; and Fig. 7 represents a section thereof upon the dotted line *y y*, Fig. 6 also representing a portion of a car-body.

Similar letters of reference designate corresponding parts in all the figures.

The only portion of the car-body here represented is the platform A, and with the under side thereof are connected three pairs of wheels, three axles, and their three frames.

B designates the wheels, which may be fixed or loose upon their axles.

The two end axles, C, and their frames D are both susceptible of a lateral movement relatively to and independent of the car-body and a swinging or twisting movement to cause them to radiate relatively to a curved track, and move from positions directly transverse to the car-body in either direction, as shown in Fig. 1. The middle axle, C′, and its frame D are only adapted to move laterally relatively to and independent of the car-body.

Each of the frames D D′ is suspended by pendulous links from the axle-boxes or other points fixed relatively to the length of the axle, and I will first describe how this is done.

Each of the frames D D′ is composed, as here represented, although their construction might be varied, of two side pieces, *a*, two end cross-pieces, *b*, connecting said side pieces, and two intermediate cross-pieces, *c*, also connecting said side pieces, the whole being strongly riveted or bolted together and forming rigid rectangular frames.

Extending downward from the end cross-pieces *b* are pairs of jaws *d d*, (best shown in Fig. 4,) and between said jaws are placed the axle-boxes *e*, which are of any suitable construction. The jaws *d d* are channeled or grooved upon their inner faces, so as to form guides for a yoke, *s*, extending across the top of the axle-box *e* and down upon each side thereof, as clearly shown in Fig. 5.

Between the top of the yoke *s* and the end cross-pieces, *b*, are springs *f*, (shown in Figs. 4 and 5;) but in lieu of this form of springs other springs differently arranged may be used.

Upon opposite sides of each axle-box *e*, and between the box and the adjacent portion of the yoke *s*, are links *g*, connected at their upper ends by a bolt, *g′*, with the axle-box, or other points fixed relatively to the length of the axle, and connected at their lower ends by a bolt, g^2, with the lower ends of the yoke *s*, and by reference to Fig. 4 it will be seen that such axle-box and yoke with the pair of links fill the space between the two jaws *d d*, leaving little space for movement transversely to the axle. By this arrangement each axle and pair of wheels may move laterally relatively to the car-body without imparting movement to its frame, and therefore without moving the car-body or straining the connection between said frame and the car-body.

The car-body is connected with the middle frame, D′, in a novel manner, which I will now describe, it being understood that the connection between the two end frames and the car-body is, in part, the same as that between the middle frame and the car-body.

E designates brackets or hangers, of a form shown clearly in Fig. 3, which are rigidly connected to the under side of the car-body, and project upon each side of the axle C′ for a considerable distance below the frame D′. Each bracket is connected with the intermediate cross-pieces *c* of the said frame, upon each side of the axle, by means of a pair of pendulous links, *h*, having their upper ends connected with said cross-pieces and their lower ends connected with the lower portions of the brackets E. These links are here shown as consisting of bolts inserted through holes in the cross-pieces *c* and the brackets E, and provided above and below the same with nuts *h′*; but

the links may consist of rods or bars of any desired form, and their upper and lower ends may be connected with the frame D′ and brackets E in any suitable manner which will admit of their swinging freely in any direction.

The two end frames D are just alike, and are connected with the car-body in a similar manner, and, as before stated, each frame is composed of side pieces, *a*, and cross-pieces *b*, and intermediate cross-pieces, *c*. Each end frame D is connected with the car-body upon the inner side of its axle C—that is upon the side toward the middle of the length of the car—by a fixed pivotal connection, F, in the middle of the width of the car and about midway of the length of the side piece, *a*. This connection may be of any suitable character, and it forms a pivot or center, upon which the frame D may swing laterally relatively to the car-body in an arc-shaped path. In order to reduce friction and wear upon this pivotal connection, I may provide in addition thereto a link similar to the links *h*, previously described, for suspending the weight of the car-body from the frame; but, unlike the links *h*, this will not swing or vibrate from a perpendicular position, but will always be maintained in nearly a perpendicular position. Upon the opposite side of the axle—that is, upon the outside thereof, or upon the side farthest from the middle of the car—the frame is connected with the car-body by any suitable devices which will permit the frame to move laterally relatively to and independently of the car-body; but I prefer to employ links *h*, in all respects similar to those previously described, and connected with the cross-pieces *c* of the frame D and the bracket or hanger E′, whereby the car-body is suspended from the frame by long pendulous supports.

Turning, now, to a description of the operation of my invention, we will suppose that the car is moving toward the left and that the front pair of wheels have just reached a curve in the track, the rail G being the outer rail of the curve and the rail G′ the inner rail thereof, while the rear pair of wheels is still upon a straight portion of the track. Before the front pair of wheels strike the curve all the axles and their frames stand directly across the car-body at a right angle to the length thereof. When the curve is reached the momentum of the car will cause it to tend in a straight line tangential to the curve; but such line of movement will bring the flange of one wheel against the outer rail, the bearing-point of said wheel forming the resistance opposed to the continued movement of the front pair of wheels in a straight line. The momentum of the car-body is unchecked by the wheel striking the outer rail, G, and hence a pressure is exerted upon the pivotal connection F of the car-body with the front frame, D, in a line tangential to the curve, and said pressure, continuing, causes the front axle and its frame to swing from a position straight across the car into a position radial or normal to the curve, and canted relatively to the end of the car, as shown in Fig. 1. Thus it will be understood how the front axle and its frame are radiated relatively to the track and moved laterally in an arc-shaped path independently of the car-body. When the front axle and frame are moved into a position radial or normal to the curve, as described, the momentum of the car continues to cause it to tend in a direction tangential to the curve, and hence the links *h*, which connect the outer side of the front frame with the car-body, are swung from a perpendicular position by the movement of their upper ends and assume an inclined position, and thereby the gravity of the car-body is opposed to the centrifugal force, and tends to cause the said body to swing or move from its tangential course to the line of travel of the first pair of wheels on the curve. It will be obvious that now the effect of gravty constantly increases, while the centrifugal force, which is opposed to its gravity, constantly decreases, and when the effect of gravity is sufficiently strong to overcome the tangential momentum the front end of the car-body is caused to move toward the center of the curve, following the movement of the front axle and its frame. The movement of the front end of the car toward the center of the curve causes the links *h*, by which the car-body is suspended from the middle frame, to vibrate from the perpendicular in the opposite direction to the vibration of the links, which suspend the car-body from the frame of the front axle, and the force of gravity, tending to cause the car-body to move to permit the return of said links to their perpendicular position, causes the rear end of the car to move laterally in the opposite direction to that in which the front moves. This lateral movement of the rear end of the car, acting through the pivotal connection between the car-body and the frame of the rear axle, causes said frame and its axle to move laterally relatively to and independently of the car-body in an arc-shaped path, and this swings said frame and axle so that they stand radial to the curve. When the axles and frames are thus swiveled or moved the links *h*, by which the car-body is suspended from the front and rear axle-frames, vibrate in one direction, while the links by which the car-body is suspended from the middle axle-frame vibrate in the reverse direction, and the center of gravity falls centrally between the reversely-inclined positions which the links occupy.

Although the wheels B are here shown as fast on the axles, they might be loose, and thereby the ease in rounding curves would be increased to the extent of the advantage possessed by a pair of loose wheels over a pair of fixed wheels.

Although the middle axle and its frame, which can only move laterally relatively to the car-body, are only shown in connection with end axles and their frames, which can move laterally and also radiate relatively to the

track, the said middle axle and its frame possesses advantages in itself, as I provide for a great amount of lateral movement of the axle relatively to the car without necessitating the vibration of the suspending links to any considerable angle from a perpendicular, and the angle of each of the links *g* and *h* is only half as great to produce a given extent of lateral movement as would be the angle of the links *g* if they alone were used, the difference varying, of course, as the relative lengths of the two sets of links differ.

Although I prefer to have the frames D of the end axles, to which the car-body is connected by the fixed pivotal connection F and links *h*, themselves suspended by the links *g* from the axle-boxes or other points fixed relatively to the length of the axles C, still the advantages of such pivotal and suspended connections of the car-body from the frame would result in a less degree if the axles and their frames were not capable of lateral movement relatively to each other.

Although I have represented a form of mechanism for carrying out my invention which is very advantageous, still the mechanism might be modified in its several features without departing from the spirit of my invention, which consists, essentially, in connecting a single pair of wheels, an axle, and its frame, with a car-body by means of devices which permit of the axles and frames, separately and independently of each other, moving laterally and independently relatively to the car, and also radiating relatively to the track, so as to be in all cases normal to the curves therein while passing the same.

Although I have here shown the axle-frames in Figs. 1, 2, 3, 4, and 5 as connected directly with the car-body, they might be connected in a similar manner with the body of a truck, and the car-body have such a truck under each end connected with it by a king-bolt or center-pin, or otherwise.

In Figs. 6 and 7 I have shown an arrangement of axles which may be adapted for a truck for each end of a car. The two axle-frames D D are in all respects like the end frames shown in Figs. 1 and 2, and are connected with the body A in the same way, except that one common pivotal connection, F, serves as a fixed pivotal connection between each of the frames and the body, and also serves to pivot the two frames together, so that either may swing independently of the other.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with a pair of car-wheels, an axle, and its frame, of pairs of links by which the frame is suspended from the axle-boxes or other points fixed relatively to the length of the axle, and provision afforded for the transverse movement of said wheels and axle independently of said frame, and other pairs of links by which the car-body is suspended from said frame and provision afforded for the transverse movement of said frame independently of said car-body, substantially as specified.

2. The combination, with a pair of car-wheels, an axle, and its frame, of a car or truck body and connections between said body and frame which permit the axle and frame, in passing a curve, to be moved in a direction lengthwise of the axle and lateral to the car or truck body, and also radiated relatively to the track by the momentum and gravity of the car, substantially as specified.

3. The combination, with a pair of car-wheels, an axle, and its frame, of a car or truck body having a fixed pivotal connection with said frame upon one side of said axle, and suspended by links from said frame upon the opposite side of said axle, substantially as and for the purpose specified.

4. The combination, with a pair of car-wheels, an axle, an axle-frame, and links whereby said frame is suspended from the axle-boxes or other points fixed relatively to the length of the axle, of a car or truck body having a fixed pivotal connection with said frame upon one side of said axle, substantially as specified.

5. The combination, with a pair of car-wheels, an axle, an axle-frame, and pairs of links whereby said frame is suspended from the axle-boxes or other points fixed relatively to the length of the axle, of a car or truck body having a fixed pivotal connection with said frame upon one side of the axle, and suspended by links from said frame upon the other side of the axle, substantially as and for the purpose specified.

6. The combination, with a car or truck body, of three pairs of wheels, three axles, and their three frames, pairs of links whereby each frame is suspended from the axle-box or other points fixed relatively to the length of the axle, pairs of links whereby the said car or truck body is suspended from the frame of the middle axle upon each side of said axle, other links whereby said car or truck body is suspended from each end frame upon one side of its axle, and a fixed pivotal connection between the car or truck body and the opposite side of each end frame, substantially as and for the purpose specified.

7. The combination of the axle C, the jaws *d d*, the yoke *s*, adjustable vertically between said jaws, the axle-box *e*, and the links *g*, pivoted at their upper ends to the axle-box and at their lower ends to said yoke, substantially as specified.

8. The combination of the car-body A, the two axle-frames D D and their axles and wheels, and the connecting-pivot F, the said pivot being fixed relatively to the car-body and forming the only pivotal connection between the said frames themselves and between said frames and the car-body, substantially as specified.

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