

(No Model.)

9 Sheets—Sheet 1.

F. U. ADAMS.  
RAILWAY CAR AND TRAIN.

No. 489,911.

Patented Jan. 17, 1893.

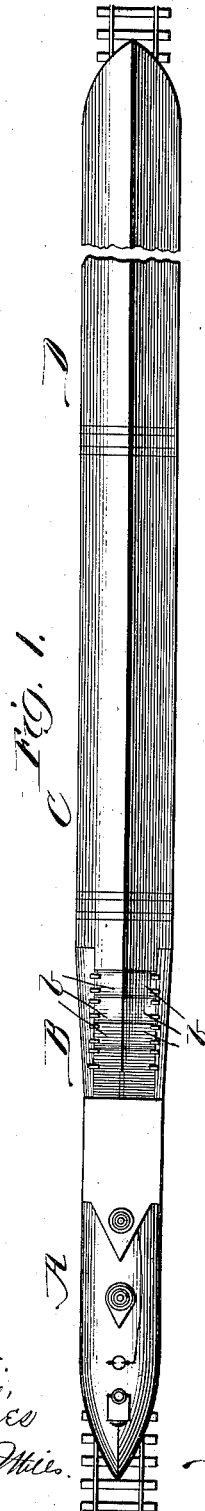
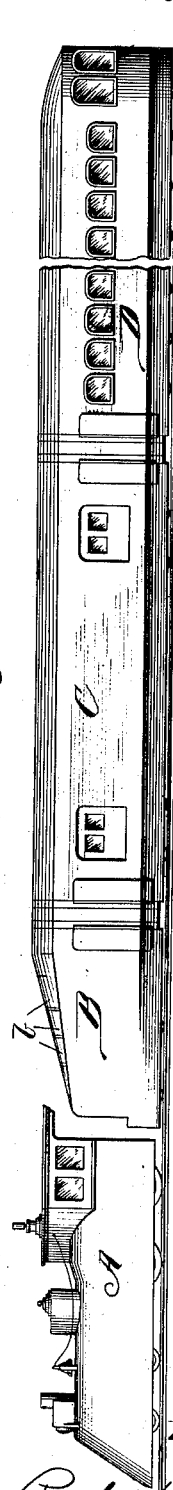


Fig. 2.



Witnesses.  
W. C. Corlies  
Fred R. A. Miles.

By *Lawson, Poole & Brown attys.*

Inventor

Frederick U. Adams.

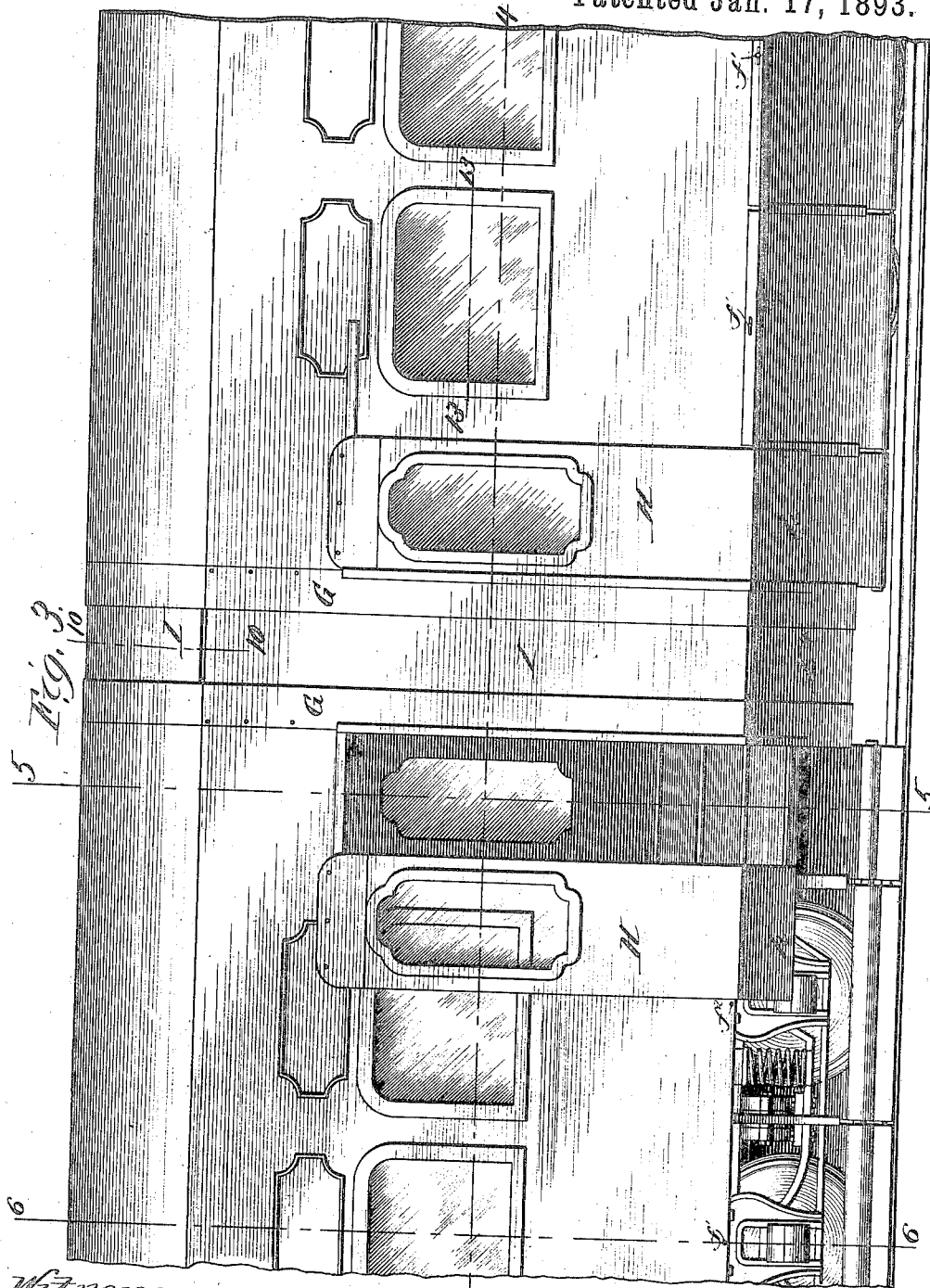
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Witnesses:  
W. C. Collier  
Frederick H. Miles.

Inventor:  
Frederick U. Adams.  
By Dayton, Reed & Brown Attys

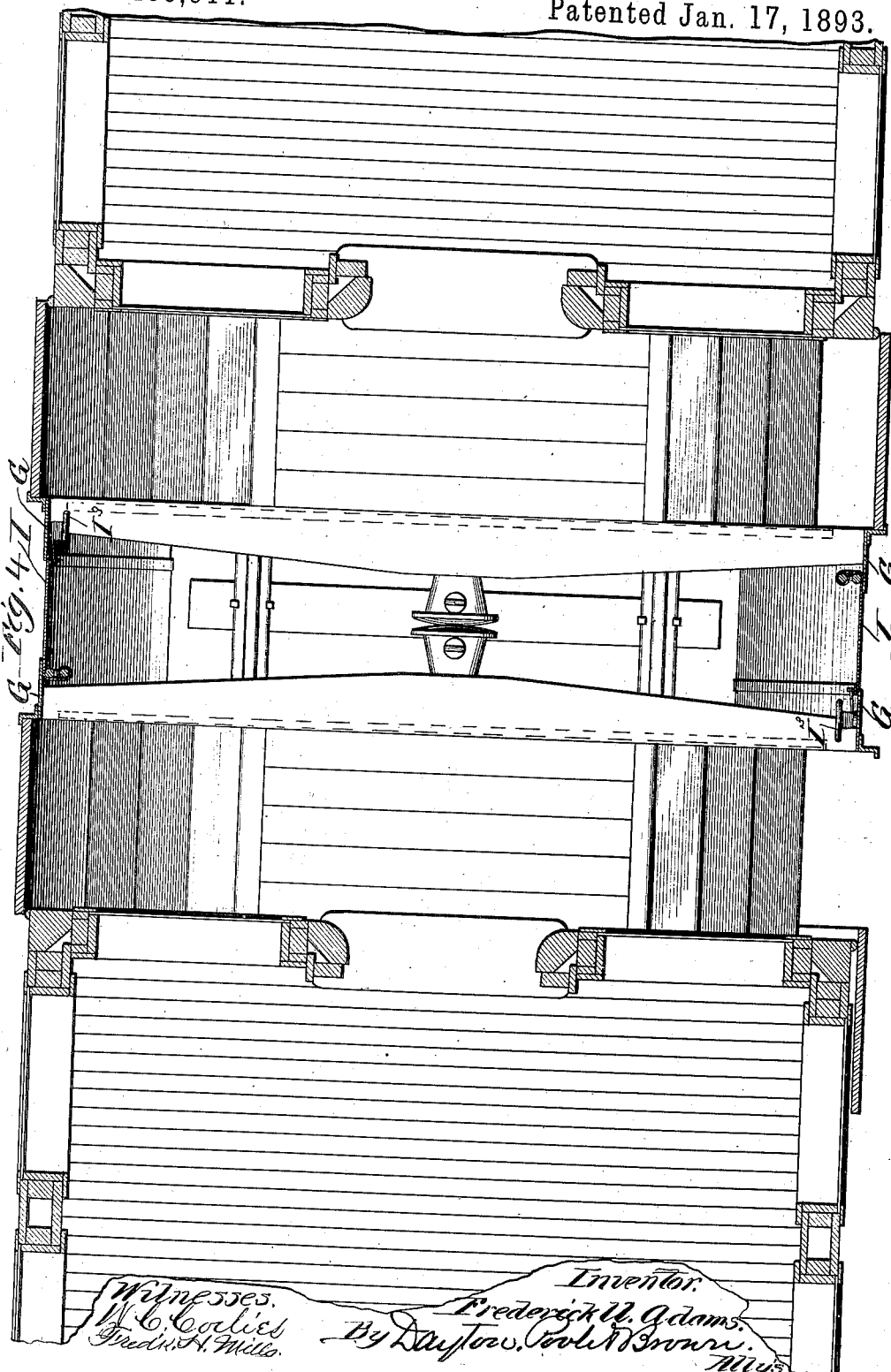
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Witnesses.  
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Fig. 6.

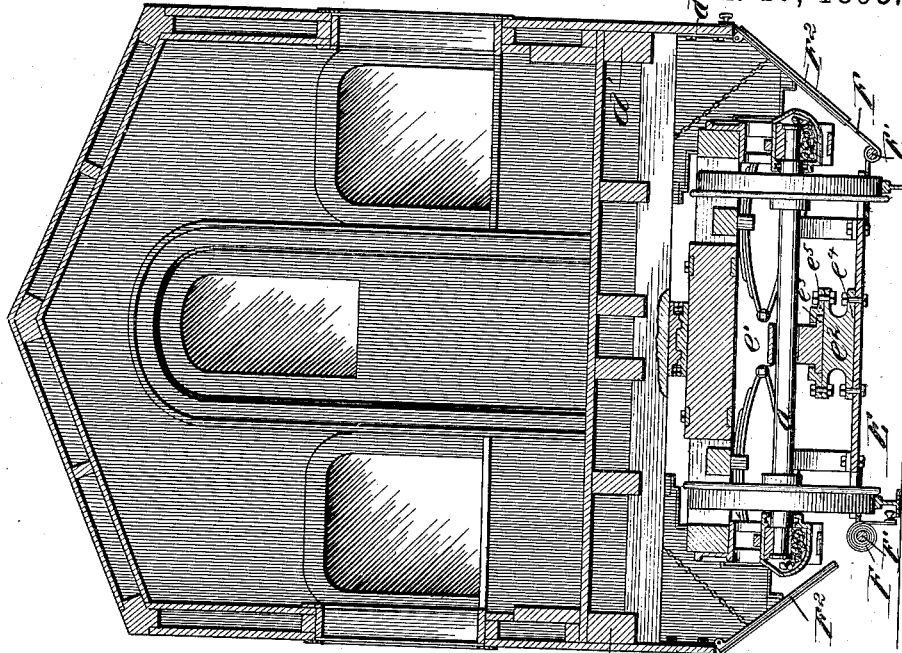
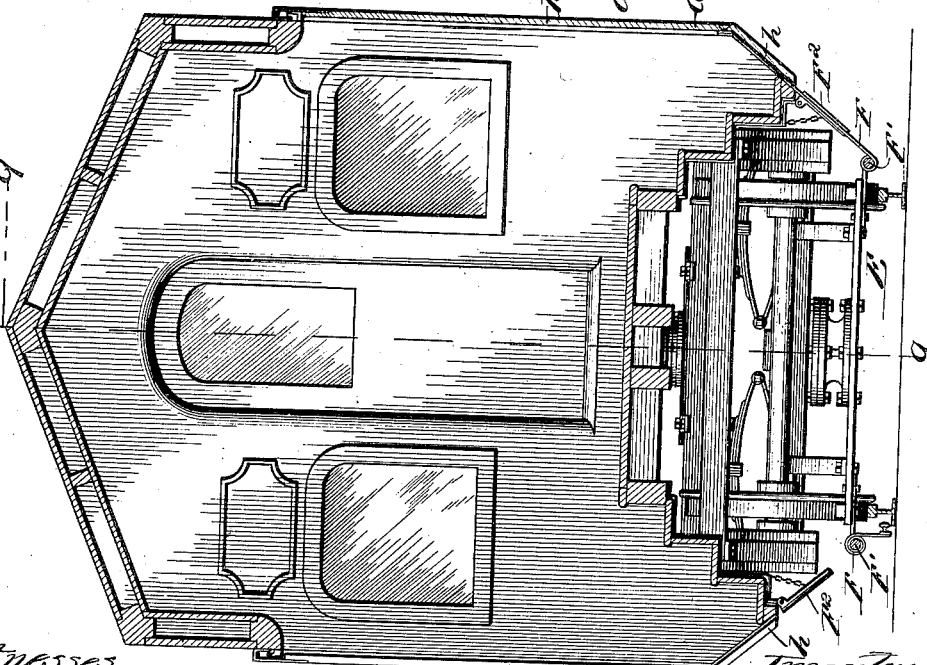


Fig. 5—9



Witnesses,  
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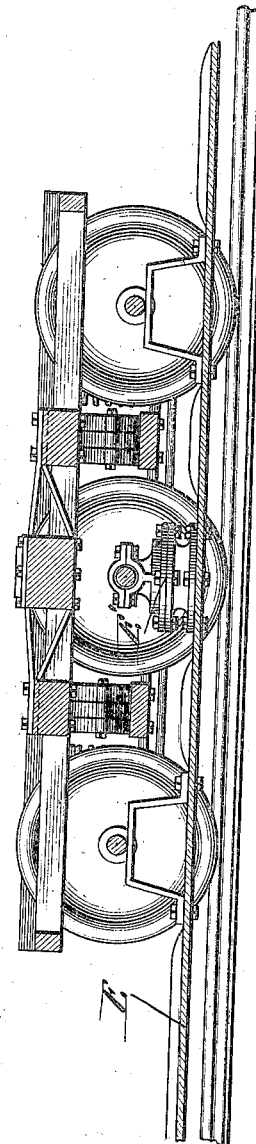
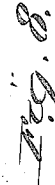
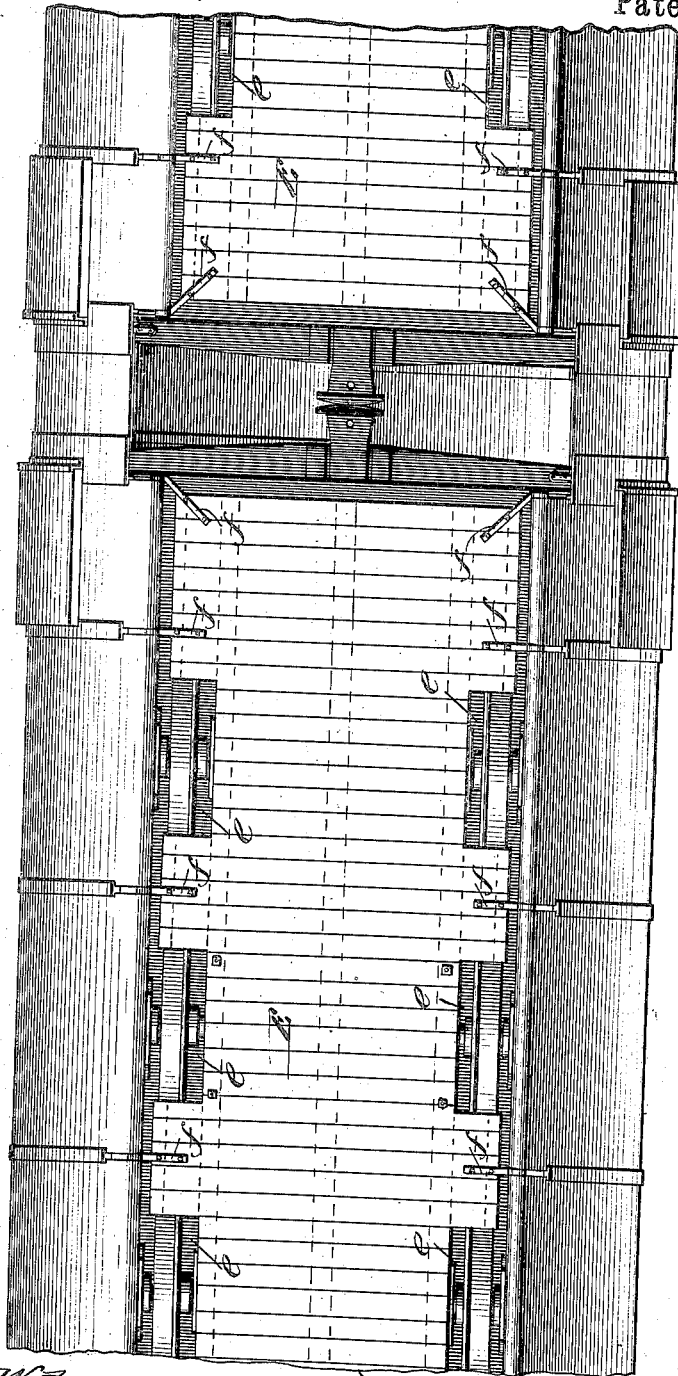
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12

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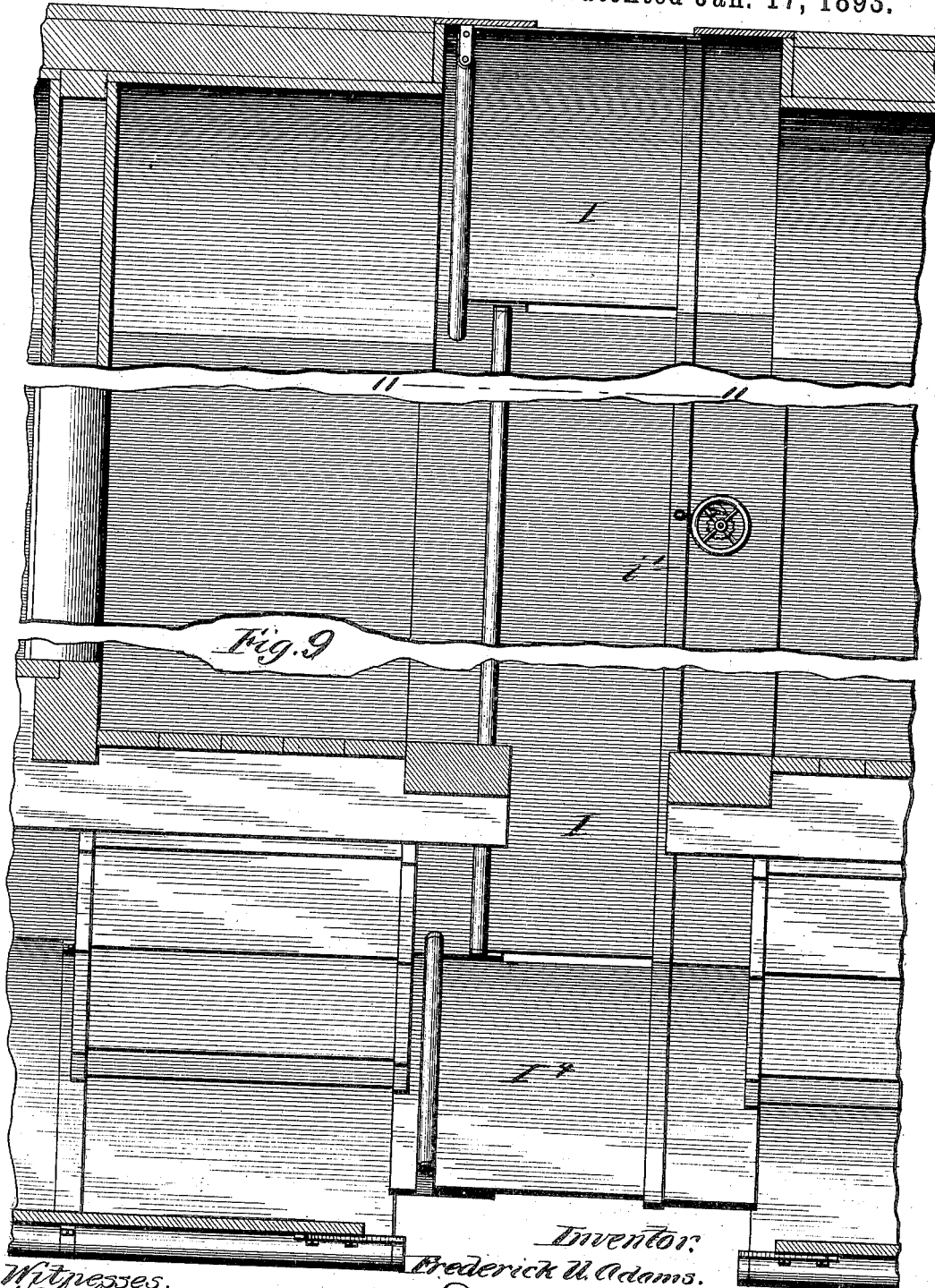
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Witnesses:  
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F. U. ADAMS.  
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Patented Jan. 17, 1893.

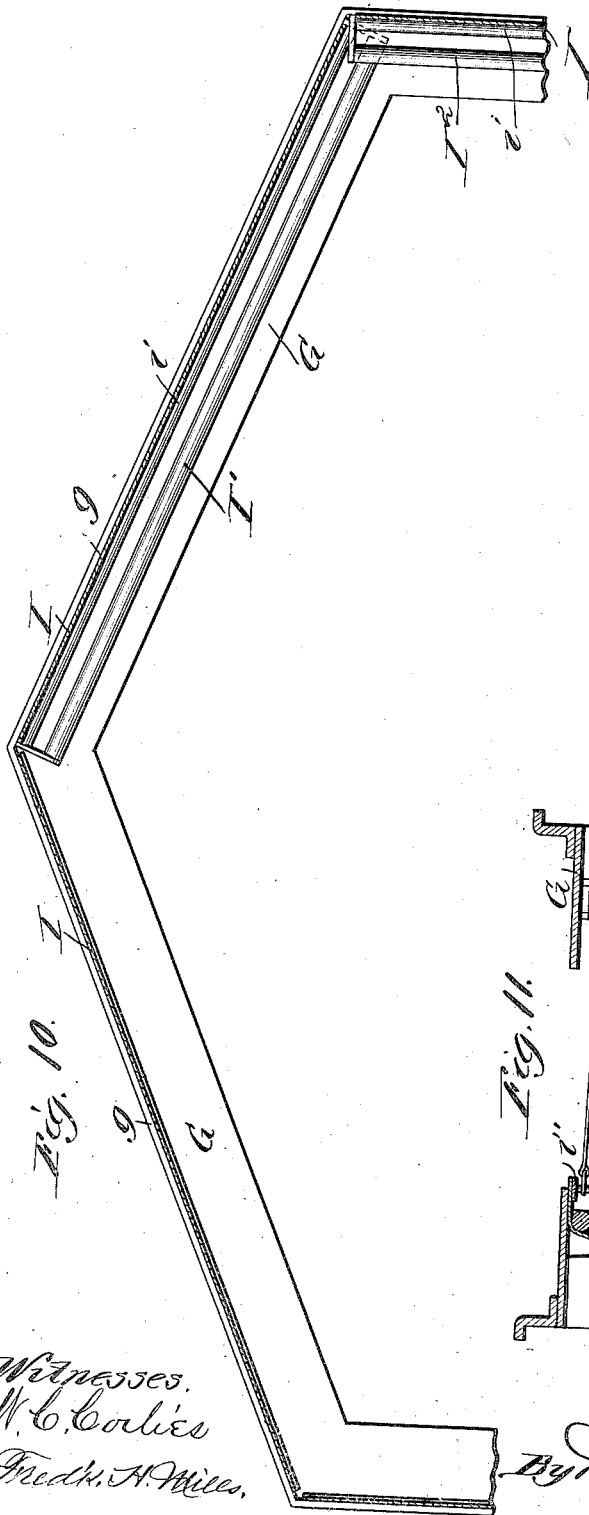


Fig. 10.

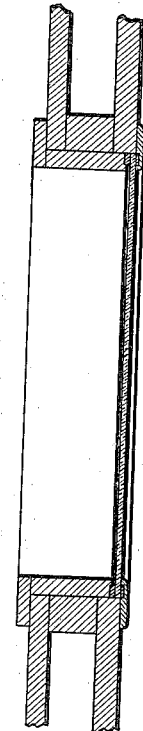


Fig. 13.

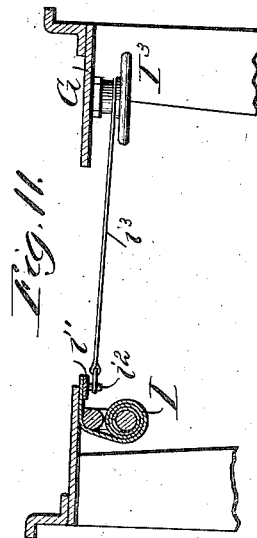


Fig. 11.

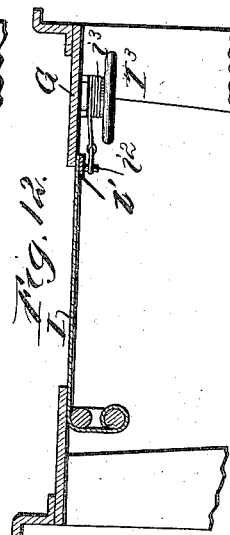


Fig. 12.

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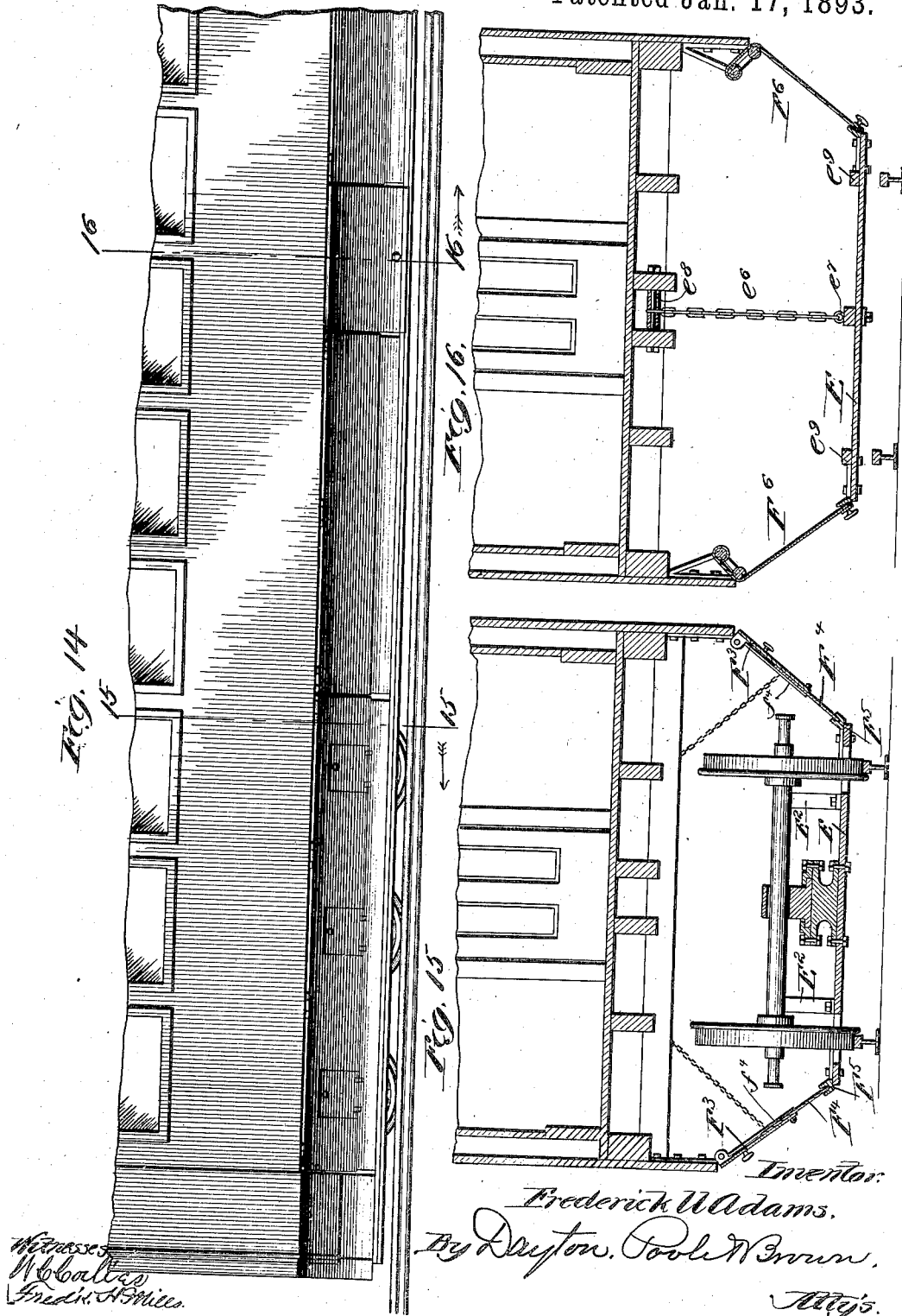
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(No Model.)

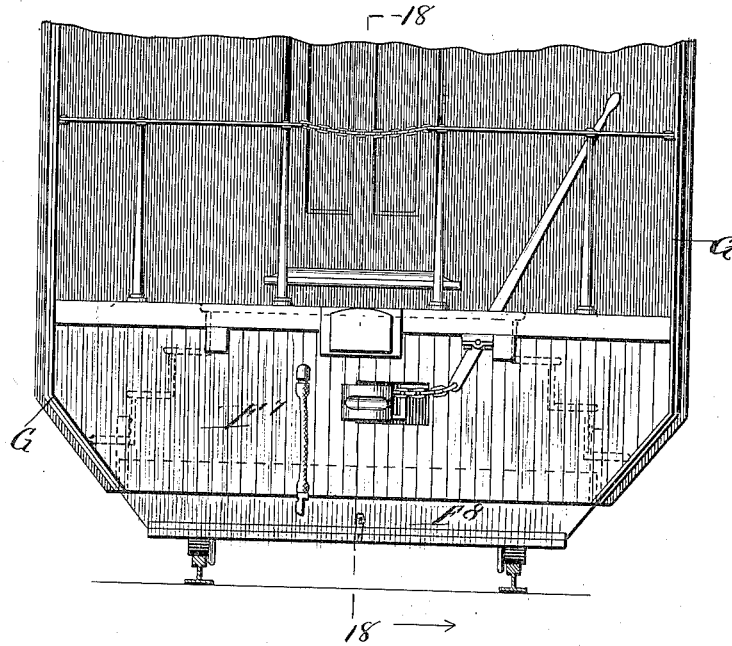
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F. U. ADAMS.  
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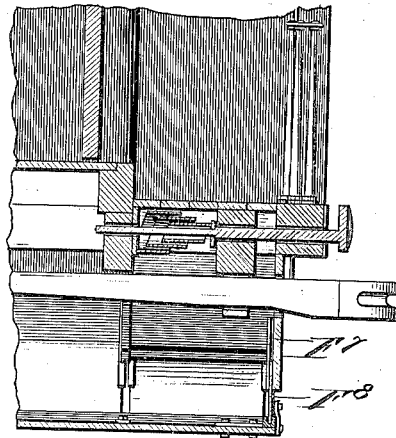
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*Fig. 17*



*Fig. 18*



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Fredk. H. Miller

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By Dayton, Pool & Brown  
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# UNITED STATES PATENT OFFICE.

FREDERICK U. ADAMS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO  
ROBERT S. McCORMICK, OF SAME PLACE.

## RAILWAY CAR AND TRAIN.

SPECIFICATION forming part of Letters Patent No. 489,911, dated January 17, 1893.

Application filed October 27, 1891. Renewed November 9, 1892. Serial No. 451,430. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK U. ADAMS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Railway-Cars and Trains of Cars; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention has reference to the construction of railway trains with the primary object of diminishing atmospheric resistance to their movement and with the ultimate object of making a higher speed of such trains attainable with a given expenditure of motive power.

The general invention contemplates the provision of substantially continuous outer surfaces of the train in unbroken lines, and the convergence of said surfaces at the extremities of the train. This involves inclosure of the running gear, the flush and flexible connection of the cars and a modification of the present forms of some of the vehicles composing the train. The general idea above outlined is that which has been applied to the lateral and bottom surfaces of vessels with reference to the action thereon of the water in which they float, and it has been suggested in connection with railway trains with reference to atmospheric resistance; but no construction has been disclosed up to the present time, so far as I am aware, by which its application to modern railway trains is made practicable.

The structural conditions of modern railway passenger trains which are to be recognized in any practical application of what may be called the ship principle thereto, include the necessary contact of the wheels with the track, the flexure of the train, the lateral oscillatory movement of the cars upon their trucks, a limited rotary movement of each truck with respect to the car, and lateral, vertical and oblique movements of the ends of contiguous cars relative to each other. In addition to these may be mentioned the necessity for frequent access to the running gear,

that of removability or interchangeability of trucks and ready detachability and union of cars. It is the purpose of my invention to provide a construction that will meet these conditions.

The present application, while showing the engine, is more especially confined to the vehicles drawn by the engine, and the other applications will be filed relating particularly to the engine.

In the accompanying drawings which illustrate my invention: Figure 1 is a top view of a complete train containing my improvements and Fig. 2 is a side view thereof. Fig. 3 is an elevation of contiguous ends of connected cars enlarged, showing particularly devices for laterally inclosing the running gear, doors leading to the platform and a flush, flexible connection joining the cars. Fig. 4 is an enlarged horizontal section in the line 4—4 of Fig. 3. Fig. 5 is a transverse, vertical section through the platform, in the line 5—5 of Fig. 3. Fig. 6 is a vertical, transverse section in the line 6—6 of Fig. 3. Fig. 7 is a bottom view of portions of two connected cars. Fig. 8 is a central, longitudinal, vertical section of a truck, showing a form of device by which the bottom inclosure for the running gear may be sustained therefrom. Fig. 9 is an enlarged central, vertical and longitudinal section of end portions of two connected cars. Fig. 10 is an enlarged transverse, vertical section in the line 10—10 of Fig. 3, of the upper portion of the outer open frame which surmounts the platform. Fig. 11 is a detail in horizontal section in the line 11—11 of Fig. 9, looking downward, showing the flush flexible connection between the cars, retracted. Fig. 12 is the same view as Fig. 11, showing the flexible connection extended. Fig. 13 is a partial horizontal section of a side of the car through a window, as in the line 13—13 of Fig. 3. Fig. 14 is a partial side view showing a modification of the side walls of the housing for the running gear. Fig. 15 is a vertical, transverse section in the line 15—15 of Fig. 14, the truck beams and bearings being omitted. Fig. 16 is a vertical, transverse section in the line 16—16 of Fig. 14. Fig. 17 is an end view of a car de-

tached from the train, showing an end wall of the inclosure for the running gear. Fig. 18 is a central, vertical, longitudinal section in the line 18—18 of Fig. 17.

5 In Figs. 1 and 2 A represents the engine, B the tender, C a baggage car and D a passenger car or coach. The train may of course include any desired number of baggage and passenger cars, the rear end of the rear passenger coach alone having the tapering or wedge form shown in these figures.

The construction that will be first described is the inclosure for the running gear. E is the bottom of this inclosure and consists of 15 a flat or substantially flat structure, illustrated as being formed of cross boards fastened to longitudinal string-pieces, but which may be otherwise constructed if preferred. This bottom E has openings *e* for the wheels, 20 wide enough to allow of the necessary oscillation of the truck upon its vertical axis, and is so sustained that it may practically preserve its lateral relation to the car body and at the same time its parallelism with the track. 25 It will for this purpose be suspended from points in or near the axes of the trucks and preferably from the running gear, though it may be in part sustained from the car, as will be explained.

30 As a suitable means for supporting the floor E from the trucks, when the latter have three axles each, Figs. 5, 6 and 8 show a swiveled hanger *E'*, comprising an upper member *e'* and a lower member *e''*. The member *e'* is 35 constructed to form a bearing box embracing the middle axle *a* at its middle point and to furnish a supporting flange *e'''* for the suspension of the member *e''* therefrom. The said member *e''* is made in two parts, of which the 40 part *e''*<sup>1</sup> is attached to the bottom E and the other and annular part *e''*<sup>2</sup> overlaps the flange *e'''* and is fastened to the part *e''*<sup>1</sup> (see Fig. 6). The suspension of the bottom E from the middle points of the middle axles (which are 45 in the vertical axes of the trucks) or otherwise from points in the axes of the trucks, by swiveled hangers, manifestly allows the trucks to oscillate on their king-bolts with respect to the bottom E, as well as with respect to the car body, and said bottom may 50 therefore preserve its relation laterally to the car body. A suspension of the bottom from the axle of course further preserves the distance of the bottom E from the tracks, notwithstanding the rise and fall of the car body 55 on its sustaining springs. This latter fact may, however, be disregarded, if thought to be of little importance, and the points of suspension of the floor E may be the central points of the truck frames, or the central line 60 of the car body itself.

A suspensory device connecting the middle of the floor with the middle of the car body is shown in Fig. 16, consisting of a chain *e*<sup>6</sup> 65 connected with an eye-bolt *e'* at the floor and by a cross bar *e''* with the central sills of the

car body. This may be employed whether the floor be suspended at its ends from the axle or axles or from the truck frames.

It is not especially desirable that the floor 70 E, which is as close as practicable to the ground, shall not share the oscillations of the car body, but shall substantially preserve a horizontal position. To attain this object it must have suitable connections with the axles 75 or frames of the trucks. As such a provision, acting with respect to the axles, Figs. 8 and 15 show metal brackets *E*<sup>2</sup> attached to the floor E near the wheels and rising into contact or proximity with an axle of each truck. 80 Chains hanging from the axles or, less desirably, from the truck frames, will produce the same result.

The lateral walls of the inclosure for the running gear must be such as to permit oscillation of the car body without corresponding oscillation of the floor E. They may be variously constructed to attain this end. The construction shown in Figs. 3, 5, 6, 7 and 9 90 embraces a series of flexible self-rolling curtains which extend from the lower edges of the car body to the outer edges of the floor E. As here shown, each of the curtains *F*, is attached to a roller *F'* (which is of the well-known spring-winding order and, therefore, 95 not illustrated in detail) the rollers *F'* being mounted in brackets *f* on the floor E and the curtains being drawn upward for connection with the car body. These curtains *F* may desirably be of elastic sheet metal, and, if 100 guides and supports for their free side edges be considered desirable, metal bars *F*<sup>2</sup> may be employed pivoted to the lower edges of the car and provided with longitudinal grooves in their opposite sides to receive the edges of 105 the curtains. Said grooved bars *F*<sup>2</sup> will not extend to the edges of the floor E but will be short enough to permit the fullest possible oscillation of the car body without their striking said floor. They should, however, be of 110 sufficient length to afford a practical support to the curtains and to close the principal portion of the spaces between them. Each of the curtains *F*, will be provided with one or more handles *f'* by which it may be drawn 115 out or extended and with a hole or holes *f*<sup>2</sup> by which it may be secured to a pin or pins *f*<sup>3</sup> on the car body. A series of curtains *F* may extend the entire length of the car on each side and thereby complete the lateral inclosure of 120 the running gear. In the oscillation of the car body upon its trucks the curtains will be permitted to be farther drawn out or will be drawn in, by the automatic spring rollers *F'*, and they will thus accommodate themselves to 125 the oscillation of the car body while preserving their tension. The pivoted guide bars *F*<sup>2</sup>, if employed, will meantime adjust themselves on their pivots to the varying direction of the curtains with respect to the car body. 130 It will manifestly not be a material change to reverse the connections of the curtains de-

scribed, or to employ other retracting devices than spring rollers. Whatever the form of the extensible connections between the car body and the bottom E it will be desirable to extend the vertical sides  $d$   $d'$  of the cars downward below the sills  $d'$ , as indicated in the sectional views, Figs. 5 and 6, in order that the curtains or other form of connections may at all times freely clear the journal boxes and hangers of the trucks.

In Figs. 15 and 16 is shown a modification of the extensible side walls of the running gear inclosure. Here the principal part of each side wall is composed of two vertically overlapping or telescoping plates  $F^3$   $F^4$ , one of which,  $F^3$ , is hinged to the car body and the other of which  $F^4$ , rests with its lower edge seated in a groove of a step  $F^5$ , attached to the bottom E. Each upper part  $F^3$  has end cleats  $f^4$  on its inner surface which cleats have side grooves to receive the vertical edges of the lower parts  $F^4$ , as indicated clearly in Figs. 5 and 6, and it is also provided with doors  $f^5$ , opposite the journal boxes to give ready access to the latter and to the wheels for the usual purposes of oiling and examination. A central section,  $F^6$ , of the side wall is, however, in this case shown as a rolling curtain, essentially like those previously described, but having its spring roller on the car body and its free edge detachably connected with the edge of the bottom E. This gives general access to the running gear.

In Figs. 17 and 18 is shown an end wall of the running gear inclosure, located under the outer cross-beam of the platform or outside the platform steps. This end wall also comprises two parts, as shown, the upper part  $F^7$ , being secured to the car body and the lower part  $F^8$ , resting upon the bottom E, suitably extended for the purpose. These two parts have a vertically sliding relation to each other as in the case of the side walls just described and as indicated plainly in Fig. 18. The lateral inclosure at the sides of the platform and between the steps may correspond with either of those described for the intervening portions of the sides, as, for example, indicated in Figs. 5, 7, 9 and 18.

In any of the constructions described a removal of a truck from beneath the car may be effected by disconnecting the devices by which the bottom E is suspended and lowering the said bottom to the track and then pushing the truck out over the bottom E, the end wall of the inclosure, if employed, being also removed. If desired the bottom E may be provided with shallow rails to receive the tread of the wheels and to guide the trucks in their passage from beneath the car, and said rails may serve as part of the stiffening devices or as string-pieces of the said bottom, as indicated at  $e^9$  in Fig. 16.

In the vertical plane of the outer cross-beam of the platform, each car is provided with a fixed interiorly open frame G, corresponding in lateral and vertical dimensions

and in external contour with the end of the car body. This frame forms jambs for the opposite sliding doors H, H, which are shown to be exterior to the car body but which may obviously slide into recesses formed in the ends of the car, if desired. The doors H H extend to or below the lower steps and, if those shall terminate inside the plane of the car sides, as shown and as believed to be desirable, each door will have an inwardly inclined lower portion  $h$ , extending to or inclosing said lower steps. The roof and upper sides of the car will extend in straight lines into junction with the frames G G, as shown in Fig. 3, and when the doors H H are closed, each car (excepting as to the rear end of the rear car of the train) presents on all sides straight and substantially unbroken surfaces between the outer extremities of its platforms.

The flush, elastic connections between adjacent cars will join their frames G G. These connections may be of any approved form as, for example, such as are now in use on vestibuled trains, or partly of that form and partly of other forms. For simplicity, a form of such connection is here shown consisting of only horizontally extensible curtains mounted on spring rollers.

Fig. 10 illustrates the upper portion of the frame G of a car having top and side curtain rollers attached thereto at one side of the middle of the car, a car to be coupled therewith having the same provision, so that when the two cars are brought together the curtains from each car will be drawn across the space to the other and both sets of curtains will complete the inclosure. The roof of the car is shown peaked, to accommodate a single roof roller  $I^1$  at each side of the middle, and said roller and the adjacent vertical roller  $I^2$  are both shown supported at a distance from the flange  $g$ , of the frame G, and a guide bar or roller  $i$  is provided near the flange  $g$ , to hold the curtain I close to the latter at all stages of extension.

In Figs. 9, 11 and 12 are shown suitable devices for drawing and holding these curtains extended, each of said curtains being provided with a stiff marginal bar  $i'$ , from which projects a pin  $i^2$ . On the opposite car frame G is located a suitable ratchet and pawl winding shaft  $I^3$ , provided with a cord  $i^3$ , which will be engaged with the pin  $i^2$ , after which the shaft  $I^3$  will be rotated to forcibly extend the curtain. This unwinding or curtain-extending device is illustrated only in connection with the vertical side curtain I, but one will be provided for each. A similar curtain may be applied to the space below the platforms, as indicated at  $I^4$  in Fig. 9, and a similar or other suitable connection may be extended from the bottom E of one car to that of the next to complete the continuity of all external surfaces of the cars at their junction with each other.

By the above described devices, or their equivalents, for inclosing the running gears

of the cars of a train and providing substantially flush, continuous surfaces at the intervals between cars, a large percentage of the atmospheric resistance which is met by the train when running at a high speed will be obviated. But in addition to these provisions, the tender should be similarly connected with the adjacent baggage or service car, and to this end it is suitably expanded and shaped at its rear end to conform proximately or perfectly with the end of the adjacent car. It also has its running gear inclosed, as indicated in Figs. 1 and 2. Its top is removable in sections *b b*, for the introduction of coal and water. The rear car of the train should also be tapered at its rear end somewhat as shown in the same figure of the drawings, to avoid the suction which otherwise takes place when a train is run at a high speed.

To fully carry out the idea which forms the basis of my invention and to realize the fullest advantage thereof, the engine should also be formed or curved in such manner as to penetrate and pass through the body of air which the train encounters with the least degree of resistance attainable. This construction of the engine is only generally indicated in Figs. 1 and 2 of the drawings and is not claimed in this application.

Of that construction of the inclosure for the running gear of the cars which contains the lateral curtains and spring rollers, or other spring retracting devices, it may be said that the springs, if suitably strong will tend materially to prevent lateral oscillation of the car body upon its trucks, because, although springs on opposite sides of the car oppose each other, they are of equal force only when the car is erect, and upon its being tilted, the springs upon that side toward which it tilts are lessened in force in proportion to the extent of the tilt while those on the opposite side are simultaneously increased in force.

In the flush connections between cars there are objections to the use of curtains to form the roof of the space thus inclosed and it will be preferable to extend the roofs of the cars by the now familiar form of "accordion" extensions which are alike on both cars and which meet at their end faces. The curtains described for the sides may be used with such roof extensions because the relative vertical movements of the sides of the connected cars are comparatively slight.

I claim as my invention:

1. A railway car provided with a housing for the running gear comprising sides and a bottom which bottom is independent of the car body as to the oscillatory movement of the latter.
2. In combination with a railway car, a housing for the running gear comprising a bottom connected with the said gear, whereby its horizontal position is practically maintained, and extensible side walls connecting the bottom with the car body.

3. In combination with a railway car, a housing for the running gear comprising sides and a bottom, which bottom is suspended from points in the axes of the trucks of said gear.

4. In combination with a railway car, a housing for the running gear comprising sides and a bottom which bottom is adapted to be lowered to the tracks whereby a disabled truck may be removed over said bottom.

5. In combination with a railway car, a housing for the running gear comprising a bottom adapted to be lowered to the tracks and provided with track rails on its upper surface over which a disabled truck may be run from beneath the car body.

6. In combination with a railway car, a housing for the running gear comprising a bottom which is sustained wholly or in part from the said gear and with respect to which the trucks of the gear may vibrate on their axes, and side walls which are extensible and which are connected with both the car body and said bottom.

7. In combination with a railway car, a housing for the running gear comprising a bottom connected with the running gear for the maintenance of its position laterally and horizontally and an extensible, flexible curtain connecting the edge of the bottom with the car body.

8. In combination with a railway car, a housing for the running gear comprising a bottom connected with the running gear, extensible side walls connecting said bottom with the car body and an extensible end wall also connecting the bottom with the car body.

9. In combination with a railway car, a housing for the running gear comprising a bottom connected with the running gear, an end wall or walls composed of two vertically overlapping and relatively sliding portions, and vertically extensible side walls.

10. In combination with a railway car, a housing for the running gear comprising a bottom connected with the running gear, and a side curtain mounted on a spring-winding roller connected with either the bottom or the car body and extended to and detachably connected to the other of said parts.

11. In a railway car, the combination with the car body having its sides extended downwardly below the sills, of an inclosure for the running gear comprising a bottom connected with the running gear and lateral walls for said inclosure composed of the said downward extensions of the car sides and extensible portions reaching from said downward extensions to the bottom.

12. In combination with a railway car, an inclosure for the running gear comprising a bottom connected with said running gear, and lateral walls containing an extensible two-part flap, the upper part of which is hinged to the car body and the lower part of which rests upon the edge of said bottom, the said bottom being provided with a notched or

grooved step to receive the lower edge of the flap.

13. In combination with a car provided with an inclosure for the running gear, having sides, end and a bottom a roof covering the platform, door jambs rising from the outer cross-beam of the platform to said roof and doors, substantially flush with the sides of the car and gear housings and extending to the bottom step leading to the platform.

14. A railway train comprising a plurality of cars each having trucks pivoted thereto, each car having an inclosure for its running gear of which the bottom is sustained in a substantially fixed lateral relation to the car body but is practically maintained in a horizontal position by connection with the running gear, and means for inclosing the spaces between cars substantially flush with the tops, sides and bottoms of the cars and of their running gear inclosures.

15. A railway train comprising a plurality of cars each having trucks pivoted thereto and each having an inclosure for its running gear of which the bottom is sustained in a substantially fixed lateral relation to the car body but is practically maintained in a horizontal position by connection with the gear, and expansible means for inclosing the space or spaces between cars substantially flush with the tops, sides and bottoms of the cars and their running gear inclosures, the rear car of the train being tapered or contracted at its rear end, substantially as shown and described.

16. A railway train comprising a plurality of cars each having trucks pivoted thereto and each having an inclosure for its running gear, of which the bottom is sustained in a substantially fixed lateral position relative to the car body but is practically maintained in a horizontal position by connection with the running gear, a tender having an inclosure for its running gear and its rear end of the same or nearly the same dimensions as that of the adjacent car, and expansible means for inclosing the spaces between these vehicles substantially flush with the surfaces of the vehicles connected.

17. In combination with a railway car provided with pivoted trucks, an inclosure for the running gear comprising sides and bottom, the bottom being suspended from the running gear in the axis of its rotation beneath the car, and projections from the said bottom at opposite sides of its points of suspension, connection with the gear for the maintenance of the said bottom in a substantially horizontal position.

18. In combination with a railway car provided with pivoted trucks, an inclosure for the running gear comprising sides and bottom, the bottom being sustained from the middle of the middle axle of each truck and provided with side connections with an axle of each truck for the preservation of the horizontal position of said bottom.

19. In combination with a railway car having pivoted trucks, an inclosure for the running gear comprising sides and a bottom the bottom of which is sustained near its ends from points on the axes of the trucks and is centrally sustained from the middle of the car body.

20. In combination with a six-wheeled truck centrally pivoted to a car body, an inclosure for the running gear provided with a bottom, a bearing box hanging at the middle of the middle truck axle, and an extension of said bearing box pivoted to the latter by a vertical pivot and secured to the bottom of the running gear inclosure.

21. In combination with the pivoted truck of a railway car, a lateral and bottom inclosure for the running gear of which the bottom is suspended from the axes of the trucks, and standards rising from the said bottom on opposite sides of its median line, beneath and into proximity with the axles of the trucks.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses:

FREDERICK U. ADAMS.

Witnesses:

M. E. DAYTON,  
C. CLARENCE POOLE.