

Oct. 19, 1926.

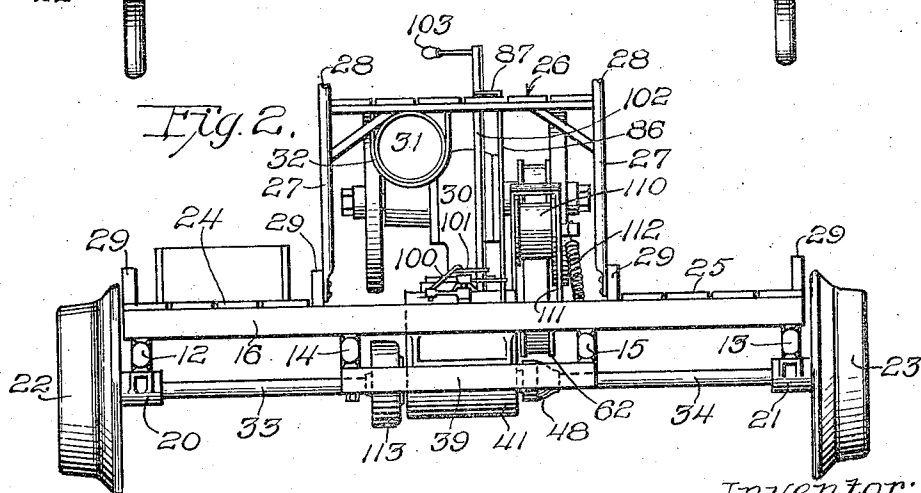
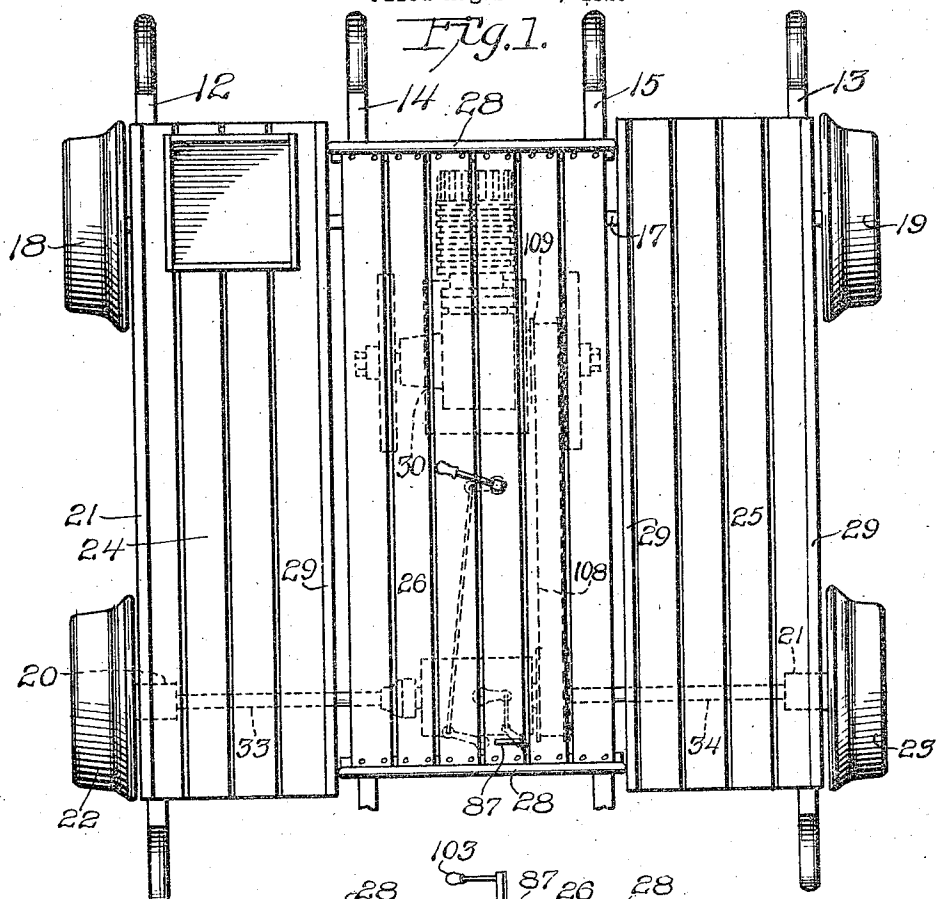
1,603,261

W. E. ADAMS

RAILWAY MOTOR CAR AND THE LIKE

Filed August 13, 1925

4 Sheets-Sheet 1



Inventor:
Warrington E. Adams
by *Sam T. Sam*
Attys.

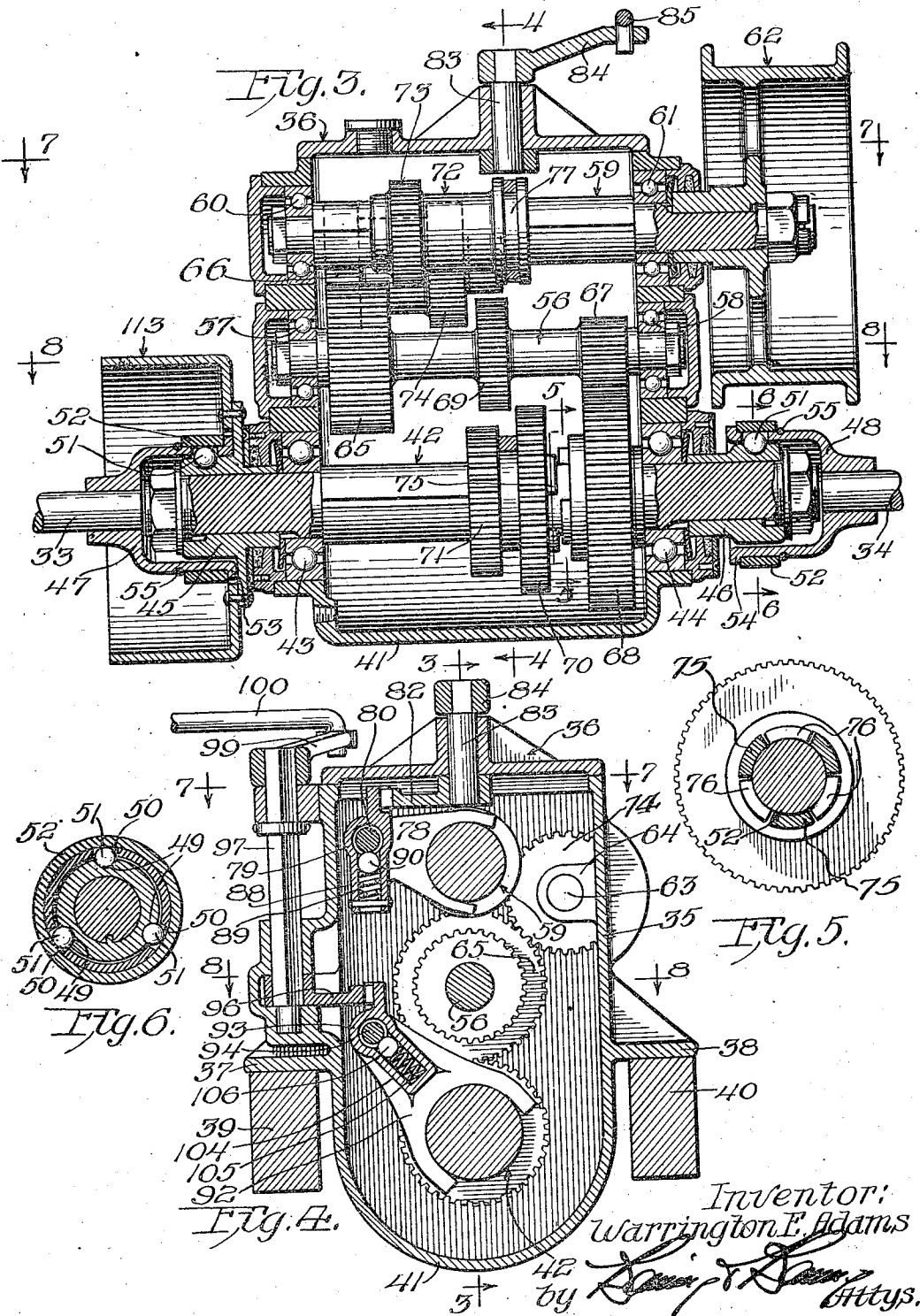
Oct. 19, 1926.

1,603,261

W. E. ADAMS

RAILWAY MOTOR CAR AND THE LIKE

Filed August 13, 1925 4 Sheets-Sheet 2



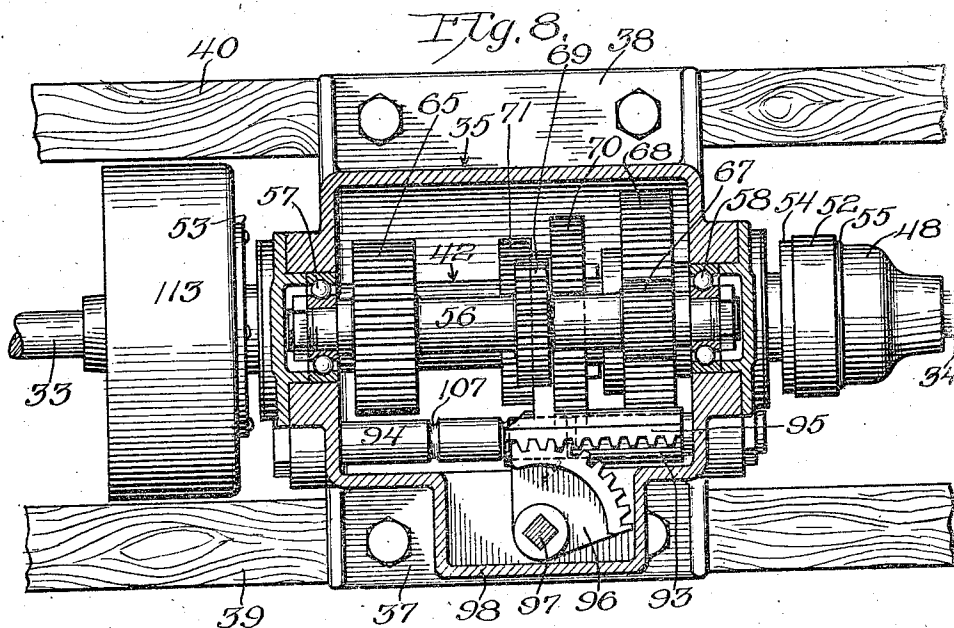
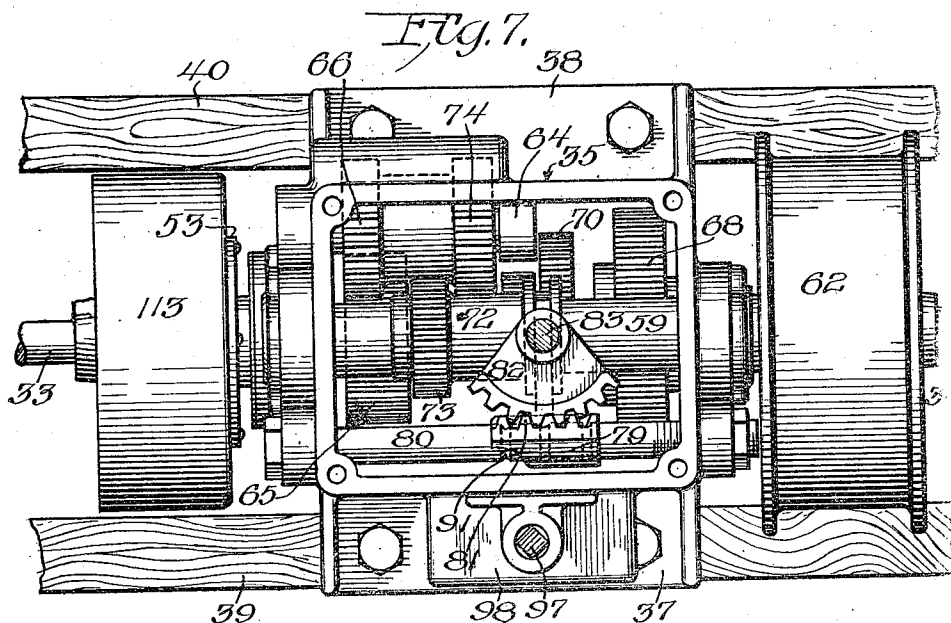
Oct. 19, 1926.

1,603,261

W. E. ADAMS

RAILWAY MOTOR CAR AND THE LIKE

Filed August 13, 1925 4 Sheets-Sheet 3



Inventor:
Warrington E. Adams
by *Samuel E. Adams* Attys

Oct. 19, 1926.

1,603,261

W. E. ADAMS

RAILWAY MOTOR CAR AND THE LIKE

Filed August 13, 1925

4 Sheets-Sheet 4

Fig. 9.

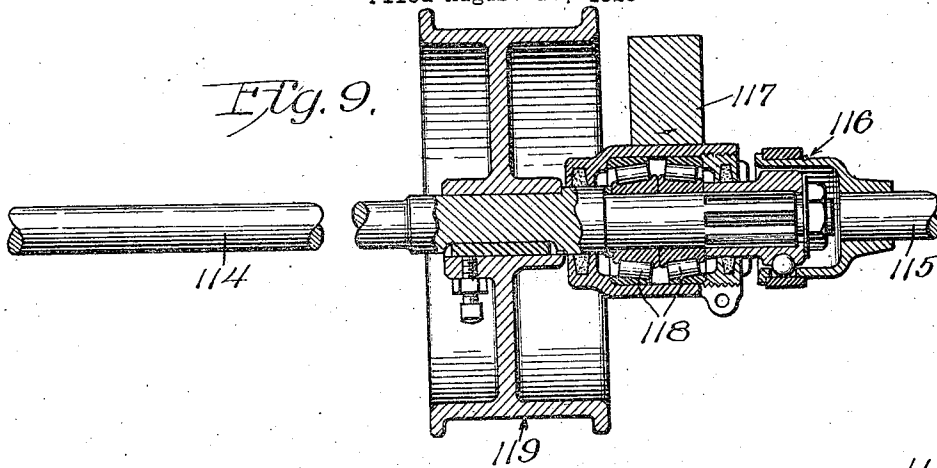


Fig. 10.

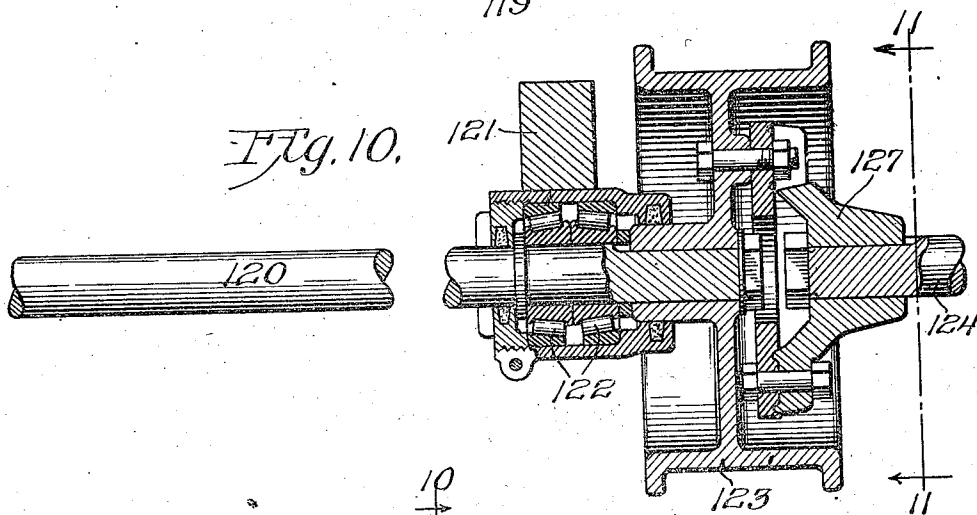
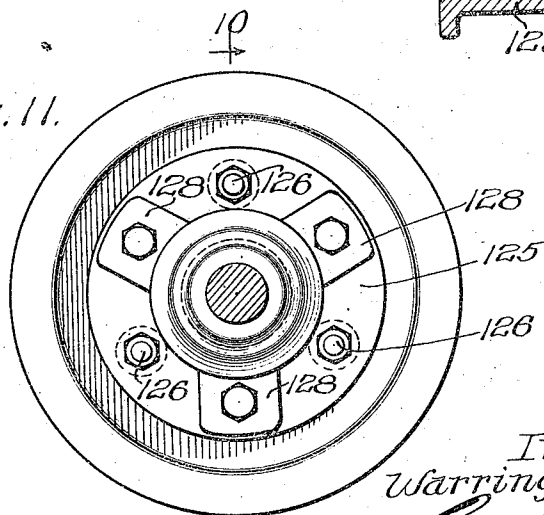


Fig. 11.



Inventor:
Warrington E. Adams

10

by *Levin & Levin* Attys.

Patented Oct. 19, 1926.

1,603,261

UNITED STATES PATENT OFFICE.

WARRINGTON E. ADAMS, OF CHICAGO, ILLINOIS.

RAILWAY MOTOR CAR AND THE LIKE.

Application filed August 13, 1925. Serial No. 49,957.

This invention has to do with improvements in railway motor cars and the like. The features herein disclosed have been devised with a particular view to meeting the requirements of construction and operation of railway motor cars, often known as speeders, and I have illustrated and will describe the same with this particular use in mind. Nevertheless, I wish it clearly understood that I do not intend to limit the usefulness of the features of the invention to railway motor cars, except as I may do so in the claims.

One object of the invention is to provide an improved construction of driving axle. In this connection, I will state that in previous constructions of railway motor cars with which I am familiar there has been experienced a great deal of difficulty due to the breakage of the driving axles when the central portion of the platform is heavily loaded.

In the past it has been customary to form the driving axle as a solid structure throughout its length and between both of the driving wheels, the power being applied to the central portion thereof. Ordinarily, it is necessary to establish one or more bearings between the central portions of said axle and platform, and as a result any substantial deflection of the central portion of the platform itself will result in such a deflection of the driving axle as to result in its breakage.

It is, therefore, an object of the invention to provide a construction of driving axle such that said axle may be conveniently divided and supported in such a way as to allow for an amount of deflection sufficient to take care of the maximum requirements due to platform loading or other causes, and without any binding of the driving shaft sections.

Another feature of the invention relates to the provision of an improved construction and arrangement of variable speed transmission interposed between the engine and the driving shaft. In this connection, it is an object of the invention to provide a very simple and at the same time rugged construction and one which will provide for the same number of driving speeds in both directions.

A further object is to provide a construction in which the axle shaft sections may be

directly aligned with the driven shaft of the transmission unit, so that the final drive to the axle sections may be effected in the most direct and convenient manner possible. In this connection, it will be understood that in most cases it is unnecessary to provide any differential drive for the axle shaft sections of a railway motor car, so that the transmission itself may be directly associated with the driven axle sections.

A further feature of the invention relates to the provision of an improved construction of universal joint for allowing the desired amount of deflection to take place.

A further feature of the invention relates to the provision of means for driving the divided axle shaft either directly by the driven shaft of the transmission unit or by a suitable belt drive from a transmission unit located at some other point or from the engine.

Other objects or uses of the invention will appear from a detailed description of the same, which consists in the features of construction and combinations of parts hereinafter described and claimed.

Figure 1 shows a plan view of a railway motor car embodying the features of the present invention;

Fig. 2 shows an end view corresponding to Fig. 1, and shows particularly the relationship between the transmission unit, the driven axle sections, and the engine;

Fig. 3 shows a vertical longitudinal section through the transmission unit on enlarged scale as compared to Figs. 1 and 2; and may also be considered a section on the line 3—3 of Fig. 4, looking in the direction of the arrows;

Fig. 4 shows a vertical transverse section on the line 4—4 of Fig. 3, looking in the direction of the arrows;

Fig. 5 shows a fragmentary section on the line 5—5 of Fig. 3, looking in the direction of the arrows;

Fig. 6 shows a cross section on the line 6—6 of Fig. 3, looking in the direction of the arrows;

Fig. 7 shows a horizontal section on the line 7—7 of Figs. 3 and 4, looking in the direction of the arrows, the cover plate being removed;

Fig. 8 shows a horizontal section on the line 8—8 of Figs. 3 and 4, looking in the direction of the arrows;

Fig. 9 shows a fragmentary longitudinal section through a modified construction of axle divided at a single point, the two sections being joined together by a universal joint, and there being a driving pulley for one section;

Fig. 10 shows a view similar to that of Fig. 9, but illustrating another modified form of construction, and may be considered a section on the line 10—10 of Fig. 11, looking in the direction of the arrows; and

Fig. 11 shows a section on the line 11—11 of Fig. 10, looking in the direction of the arrows.

Referring first to Figs. 1 and 2, the motor car includes a suitable frame. In the construction illustrated said frame has the longitudinal sills 12, 13, 14 and 15 together with suitable cross beams such as 16. At one end, called the front end for convenience, is an axle 17 on the ends of which are secured the rail wheels 18 and 19. The axle 17 is journaled to the outer sills 12 and 13, but is preferably free of the intermediate sills 14 and 15. The axle at the other end is journaled to the outside sills 12 and 13 at the points 20 and 21 and the ends of said axle carry the rail wheels 22 and 23.

The side portions 24 and 25 of the platform form are preferably laid directly upon the cross beams 16 and are, therefore, at relatively low elevation, whereas the central portion 26 of the platform is preferably of raised elevation, as indicated in Fig. 2. For this purpose, it is supported by suitable vertical struts including corner struts 27. These corner struts are carried up and curved over to establish end rails 28 at the ends of the raised platform 26.

Extending along the two lower platform sections 24 and 25 are the beams 29 which are placed on edge, as shown in Fig. 2, and serve to establish rails along the sides of said platform sections. The engine 30 is supported upon the frame beneath one end of the raised platform section 26. The gas tank 31 is conveniently supported immediately beneath said raised platform section as by means of the straps 32, indicated in Fig. 2.

Suitable driving means must be established between the engine and the axle which carries the wheels 22 and 23. Furthermore, it is desirable to establish a bearing between said axle and the frame of the device so as to give proper support to the central portion of the axle and thus enable it to carry the strains imposed by said driving connection. Where such a bearing is provided any deflection of the central portion of the platform will necessarily throw a heavy strain on the axle provided said axle be a unitary structure from end to end. In the absence of any such intermediate bearing, it is very necessary to reinforce the axle

itself by increasing its size as otherwise it will not be strong enough to withstand the forces communicated to it.

According to one aspect of the present invention, I divide said axle in its central portion so as to provide the axle sections 33 and 34 connected to the wheels 22 and 23, respectively. The inner ends of said axle sections may then be suitably supported with respect to the frame, and any deflection of the central portion of the frame will be readily compensated for by a slight deflection of the inner ends of the axle sections with respect to each other. At the same time, I have provided a transmission unit directly supported by the frame and which communicates directly with the inner ends of the axle sections.

Referring particularly to Figs. 3 to 8, inclusive the transmission housing includes a box 35 the upper portion of which is closed by a removable cover plate 36. Said housing is also provided with a series of pedestals 37 and 38 at its sides which may be supported upon short cross beams 39 and 40 reaching between the sills 14 and 15, respectively. Preferably the lower portion 41 of the housing 35 is semi-circular, as indicated in Fig. 6.

Extending across said lower portion of the housing is a driven shaft 42, the same being journaled in the end walls of the housing as by ball bearings 43 and 44, respectively. The end portions of the shaft reach beyond said bearings and to the outside of the housing and carry a flanged sleeve 45 and an unflanged sleeve 46, respectively, as shown in Fig. 3.

The inner ends of the axle shaft sections 33 and 34 are provided with yokes 47 and 48, respectively, which have cup shaped extensions reaching over the collars 45 and 46. Said cup shaped extensions are slightly larger than the collars which they embrace; a sufficient freedom of movement is thus assured between the parts. Each collar has three outwardly facing recesses (see Fig. 6) and the corresponding cup shaped extension has the companion through openings 50. Balls 51 are set into the through openings and reach into the recesses and are held in place by encircling rings 52 which may be slipped into place from the outside. The cup shaped extensions 47 and 48 have end flanges 53 and 54 at their inner ends, respectively, against which the corresponding rings 52 set, as shown in Fig. 3. Removable locking rings 55 are provided for retaining the encircling rings 52 in place.

The openings 50 are slightly elongated as is evident from careful examination of Fig. 3, so that a sufficient amount of deflection of the axle shafts with respect to the shaft 42 is provided for. Therefore, these ball bearing connections constitute in effect uni-

versal joints between the shaft sections. Any deflection of the central portion of the platform, resulting in a corresponding deflection of the casing 35 is, therefore, compensated for and the axle shaft sections are allowed to deflect without any binding whatsoever.

Above the driven shaft 42 is a lay shaft 56 having its ends journaled in the end walls of the casing by the ball bearings 57 and 58, respectively. Above said lay shaft is the driving shaft 59 having one end journaled in the casing wall by the ball bearing 60, and its other end reaching through the other casing wall wherein it is journaled by a ball bearing 61. Said end of the driving shaft 59 projects to the outside of the casing and receives a driving pulley 62.

Set off to one side is the idler shaft 63 which is journaled in lugs such as 64 in the side wall of the casing. At one end the lay shaft 56 is provided with a gear 65 of double face width, with which constantly meshes the gear 66 of the idler shaft 63. At its other end the lay shaft 56 carries a pinion 67 which meshes with the gear 68 which is journaled on the driven shaft 42. On the lay shaft 66 is a pinion 69 of size intermediate between the gear 65 and the pinion 67.

Splined upon the driven shaft 42 is a double gear including the gears 70 and 71 which are integrally formed and operate as a unit. Splined upon the driving shaft 59 is a collar 72 having a pinion 73; and a companion gear 74 is formed on the idler shaft 63.

On the opposing faces of the gears 70 and 68 are the companion clutch elements comprising lugs 75 and sockets 76, as clearly shown in Figs. 3 and 5. The arrangement is such as to permit of the following operations:

With the collar 72 in the position indicated in Fig. 3 its gear 73 is disengaged from both of the gears 65 and 74. This gear 73 is what I call the reversing gear. When thrown to the left in Fig. 3 it meshes directly with the right hand half of the teeth of the gear 65 for reverse drive, but when thrown to the right hand in Fig. 3 it meshes directly with the gear 74 on the idler shaft 63, and the companion gear 66 of said gear 74 meshes directly with the gear 65 of the lay shaft 56. Therefore, forward drive of the lay shaft 56 is secured by shifting the sleeve 72 to the right in Fig. 3, and reverse drive is secured by shifting said sleeve 72 to the left in said figure.

Low speed drive from the lay shaft to the driven shaft 42 is effected by shifting the splined gear unit 70—71 to the right so as to clutch it to the gear 68 for low speed drive. Intermediate speed is secured by shifting the gear combinations 70—71 slightly to the left of the position shown in Fig. 3 so as to engage the gear 70 with the inter-

mediate gear 69 of the lay shaft, and high speed is secured by shifting the gear combination 70—71 to the extreme left hand position wherein the gear 71 meshes directly with the gear 65 for high speed. From the above it is evident that this arrangement permits of three speeds either forward or backward, thus making the motor car equally serviceable for drive in either direction.

Preferably the gears are provided with the following number of teeth, although it will be understood that these are mentioned by way of illustration and not for the purpose of limitation: The gear 68 has fifty-six teeth, and the gears 70 and 71 have thirty-one and twenty-three teeth, respectively. The pinion 67 has sixteen teeth and the gears 69 and 65 have seventeen and twenty-five teeth, respectively. The gears 74 and 66 each have nineteen teeth, and the pinion 73 has sixteen teeth. From the above it is evident that the gear ratio between the driving and lay shafts would be 16 to 25 for either direction of drive.

Any convenient means may be used for shifting the collar 72 and the gear unit 70—71. In the particular construction illustrated, said means includes a slotted extension 77 of the collar 72, receiving a fork 78 which reaches sidewise from a collar 79 slidably mounted upon a rod 80 which reaches across the upper portion of the housing. Said collar 79 has on its upper face a rack 81 receiving the teeth of a segmental rack 82 which is carried by the lower end of a stem 83 journaled in the cover plate 36. On its outer end said stem 83 carries an arm 84 which may be operated from any convenient point as by means of a link 85. Said link 85 may be operated by suitable connection with a shaft 86 reaching up through the platform 26 and having an operating handle 87 on its upper end.

Preferably the sleeve 79 has a downwardly depending box 88 within which is a spring 89 which presses a ball 90 upwards to engage either one of a number of recesses 91 in the rod 80 so as to hold the collar 72 in any given set position.

In the construction illustrated, the gear unit 70—71 is operated by a fork 92 which engages said unit between the gears thereof, said fork being located on a collar 93 which is slidably mounted on a rod 94 reaching across the lower portion of the housing. Said collar 93 has an upstanding rack 95 which is engaged by a segmental rack 96 on the lower end of a rock shaft 97. The segmental rack 96 works within a side extension 98 of the housing, the shaft 97 reaching into said extension, as clearly illustrated in Figs. 4 and 8.

The upper end of the shaft 97 carries a crank 99 which may be operated by a link 100. Said link 100 is conveniently connected

to a crank 101 on the lower end of a vertical shaft 102 which reaches up through the raised portion of the platform 26 and has an operating handle 103 on its upper end.

5 Preferably also the sleeve 93 has a downwardly extending box 104 within which is a spring 105 pressing a ball 106 up against one or the other of a series of recesses 107 in the rod 94 so as to retain the sleeve 93 in
10 any given set position.

The pulley 62 of the driving shaft 59 may be driven in any convenient manner, as by means of a belt 108 reaching from the engine pulley 109. Said belt is provided with a sufficient amount of slack, so that it can run entirely free, but a take up pulley 110 is provided on an arm 111 suitably pivoted to the frame of the car and normally drawn down by the spring 112. Said pulley 110 may be
20 released in any convenient manner when it is desired to slack up the belt in order to shift the gears.

A brake drum 113 may be conveniently connected to the flange of the collar 45, already referred to, so that a suitable brake band working on the drum 113 will operate directly on the driven shaft 42 of the transmission unit. In this way the braking action will be delivered to both of the wheels 22 and
30 23.

In the modified construction illustrated in Fig. 9, the two axle shaft sections 114 and 115 are connected together by a universal joint 116 of construction similar to those
35 already described. Preferably, the inner end of the axle shaft 114 is journaled to the frame sill 117 by a set of roller bearings 118. The inner end of the axle shaft section 114 carries a pulley 119 which may be driven
40 by a belt or in other convenient manner. It will be evident that with this construction the deflection of the frame sill 117 will be compensated for by the universal joint 116 without strain.

45 In the modified construction of Figs. 10 and 11, the axle shaft section 120 is journaled to the frame sill 121 by a roller bearing 122 and carries at its inner end the driving pulley 123. The other axle shaft 124 is connected to this pulley by a flexible ring 125 of fiber, leather or other suitable material. For this purpose, said ring 125 is
50 itself connected to the pulley 123, by a series of three bolts 126 reaching into bosses formed on the face of the pulley, and a hub 127 is placed on the axle shaft section 124, being provided with a series of three lugs 128 which are connected to the ring
55 125 at points intermediate between the pulley connections already referred to.

60 While I have herein shown and described only certain embodiments of the features of my present invention, still I do not intend to limit myself to the same, except as I may
65 do so in the claims.

I claim:

1. In a railway motor car, the combination of a suitable frame work, a prime mover mounted thereon, a transmission housing mounted on the central portion of the frame
70 work adjacent to the other end thereof, a drive shaft extending across the upper portion of the housing, means for driving the same by the use of the prime mover, a driven shaft extending across the lower portion of
75 the housing, means for driving the same selectively in either direction and at various gear ratios with respect to the driving shaft, means under the control of the operator for
80 effecting such selective drive, axle shafts extending sidewise from both ends of the driven shaft, universal joint connections between the ends of the driven shaft and said
85 axle shafts, and rail wheels on the outer ends of the axle shafts.

2. In a railway motor car, the combination of a suitable frame work, a prime mover mounted thereon, a transmission housing mounted on the central portion of the frame
90 work, a drive shaft extending across the upper portion of the housing, means for driving the same by the use of the prime mover, a driven shaft extending across the lower portion of the housing, means for
95 driving the same selectively in either direction and at various gear ratios with respect to the driving shaft, means under the control of the operator for effecting such selective drive, axle shafts extending sidewise from
100 both ends of the driven shaft, universal joint connections between the ends of the driven shaft and said axle shafts, and rail wheels on the outer ends of the axle shafts.

3. In a railway motor car, the combination of a suitable frame work, a prime mover mounted thereon, a transmission housing mounted on the frame work, a driven shaft
105 extending across the housing, means under the control of the operator for driving said shaft in either direction selectively at any one of an equal number of forward or reverse speeds, axle shafts extending sidewise from both ends of the driven shaft, universal
110 joint connections between the ends of the driven shaft and said axle shafts, and rail wheels on the outer ends of the axle shafts.

4. In a railway motor car, the combination of a suitable frame work, a divided axle shaft extending across the same and having its outer ends journaled with respect to the
120 sides of the frame work, yieldable joint means between the inner ends of said divided axle shaft permitting rotation of said shafts irrespective of conditions of alignment and preventing endwise movement of said shafts,
125 a bearing connection between the inner end of one of the axle shaft sections and the central portion of the frame work.

WARRINGTON E. ADAMS.