ABSTRACT: There is disclosed a combination railway and passenger automobile transportation system comprising a stretch of railway track on which is disposed a train including a railway car having an underframe and a body; the body is double-decked and has a width to carry automobiles thereon disposed longitudinally and is pivotal upon the underframe into a loading position; a loading area is provided including two double-decked platforms along the track having ramps that cooperate with the ends of the decks on the body when in its loading position at a transfer position so that the automobiles may be run thereonto and therefrom; at the transfer position there is provided structure for centering the car and for turning the body; several coupling structures are disclosed to permit the train to be broken into a front unit, intermediate units and a rear unit.
COMBINATION RAILWAY AND PASSENGER AUTOMOBILE TRANSPORTATION SYSTEM AND PARTS THEREOF

The present invention is directed to a combination railway and passenger automobile transportation system and to improved trains and railway cars useful therein, and to improved parts of the system including the cars.

It is an important object of the present invention to provide a combination railway and passenger automobile transportation system comprising a stretch of railway track, a railway train adapted to run on the stretch of railway track and including a front car and at least one intermediate car and a tail car, the intermediate car including first and second track structures carrying first and second frames, respectively, the first and second frames extending toward each other and being detachably interconnected selectively to provide a draft connection therebetween and to permit decoupling thereof, centersills interconnecting the rear of the front car and the adjacent one of the first frames and interconnecting the front of the tail car and the adjacent one of the second frames, a plurality of bodies corresponding in number to the number of the centersills and each shiftably mounted with respect to the associated centersill for movement between a running position and a loading position, each body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalls and openings in the opposite ends thereof, whereby a passenger automobile may be driven onto and off of the floor through either opening of the body when the body is in the loading position thereof, a loading area including two platforms respectively disposed on the opposite sides of a section of the railway track and including a number of transfer positions therealong equal in number to the number of the centersills, and means for shifting each of the bodies between the running position thereof and the loading position thereof, the openings in the bodies being respectively disposed toward the platforms and respectively operatively associated therewith when the bodies are in the loading positions thereof, whereby a passenger automobile occupying one of the platforms may be driven onto the floor of one of the bodies when it occupies one of the transfer positions at the loading area and is in its loading position, and whereby a passenger automobile occupying a loaded position on the floor of one of the bodies may be driven directly onto either one of the platforms when the body occupies one of the transfer positions at the loading area and is in its loading position.

Another object of this invention is to provide a railway train for the railway transportation of both passenger automobiles and passengers thereof, the railway train comprising a front unit and at least one intermediate unit and a rear unit, the front unit including a front car and a first intermediate car and a first support section arranged in tandem relationship, centersills interconnecting the rear of the front car and the front of the first intermediate car and interconnecting the rear of the first intermediate car and the first support section, each of the intermediate units including a second support section and a second intermediate car and a third support section arranged in tandem relationship, centersills interconnecting the second support section and the front of the second intermediate car and interconnecting the rear of the second intermediate car and the third support section, the rear unit including a tail car, means for coupling the first support section and the adjacent one of the second support section, and means for coupling the front of the tail car to the adjacent one of the third support sections, and a plurality of bodies corresponding in number to the centersills and each shiftably mounted with respect to the associated centersill for movement between a running position and a loading position, each body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalls and openings at the opposite ends thereof, whereby a passenger automobile may be driven onto and off the floor through either open end of the body when the body is in the loading position thereof.

A still further object of the present invention is to provide a railway train for the transportation of both passenger automobiles and the passengers thereof, the railway train comprising a front unit and at least one intermediate unit and a rear unit, the front unit including a front car and a first support car and a first intermediate car arranged in tandem relationship, centersills interconnecting and supported by the rear of the front car and the front of the first support car and interconnecting and supported by the rear of the first support car and the front of the first intermediate car, the intermediate unit including a second support car and a third support car and a second intermediate car arranged in tandem relationship, centersills detachably interconnecting and supported by the rear of the first intermediate car and the front of the associated one of the second support cars and interconnecting the rear of the second support car and the front of the third support car and interconnecting and supported by the rear of the third support car and the front of the second intermediate car, the rear unit including a fourth support car and a fifth support car and a tail car arranged in tandem relationship, centersills detachably interconnecting the rear of the associated one of the second intermediate cars and the front of the fourth support car and interconnecting the rear of the fourth support car and the front of the fifth support car and the front of the tail car, and a plurality of bodies corresponding in number to the centersills and each shiftably mounted with respect to the associated centersill for movement between a running position and loading position, each body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalls and openings in the opposite ends thereof, whereby a passenger automobile may be driven onto and off of the floor through either open end of the body when the body is in its loading position.

Further features of the invention pertain to the particular arrangement of the parts of the combination railway and passenger automobile transportation system of the present invention, including the interconnection and cooperation between those parts, whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a portion of a railway train useful in and forming a part of the present invention;
FIG. 2 is a plan view of the train of FIG. 1, an automobile-carrying body of the train being shown pivoted to the loading position thereof;
FIG. 3 is a view on an enlarged scale in vertical section through one of the cars in the train of FIG. 1 along the line 3-3 thereof;
FIG. 4 is a partly diagrammatic side elevational view of the front unit of one embodiment of the railway train useful in the present invention;
FIG. 5 is a partly diagrammatic side elevational view of an intermediate unit and the rear unit of one embodiment of a railway train useful in the present invention;
FIG. 6 is a diagrammatic plan view of a loading area for the train of FIGS. 4 and 5, all in accordance with the present invention;
FIG. 7 is an enlarged fragmentary side elevational view of a support car forming a part of the train of FIGS. 4 and 5, the parts being shown in the connected positions thereof;
FIG. 8 is view similar to FIG. 7 but showing the parts in the disconnected positions thereof;
FIG. 9 is a fragmentary side elevational view with certain parts broken away, showing interconnecting frames of the support car forming a part of the trains of FIGS. 4 and 5 and illustrated in FIGS. 7 and 8, the parts being shown in the coupled positions thereof.
FIG. 10 is a view similar to FIG. 9 and showing the parts in the decoupled positions thereof;
FIG. 11 is a diagrammatic plan view of a single transfer position in a loading area of the transportation system of the present invention, and illustrating the registry mechanism, the lifting mechanism and the pivoting mechanism positioned therein;
FIG. 12 is an enlarged view in vertical section along the line 12-12 of FIG. 11, the railway car parts being shown in the running positions thereof;
FIG. 13 is a view similar to FIG. 12 but showing the parts including the parts of the railway car in the loading positions thereof;
FIG. 14 is a diagrammatic side elevation view of the front unit of another embodiment of a railway train useful in the present invention;
FIG. 15 is a diagrammatic side elevation view of the intermediate unit of another embodiment of a railway train useful in the present invention;
FIG. 16 is a diagrammatic side elevation view of the rear unit of another embodiment of a railway train useful in the present invention;
FIG. 17 is a side elevation view on an enlarged scale with certain parts broken away of the front car and the support car and the center sill interconnecting them of the railway train of FIG. 14;
FIG. 18 is a plan view of the parts illustrated in FIG. 17 and diagrammatically illustrating a body supported on the center sill and pivoted to the loading position thereof;
FIG. 19 is a diagrammatic side elevation view of the intermediate unit of yet another railway train useful in the present invention;
FIG. 20 is a diagrammatic side elevation view of the intermediate unit of still another railway train useful in the present invention;
FIG. 21 is a diagrammatic plan view of a portion of a loading area constructed to accommodate the railway train of FIG. 20;
FIG. 22 is a side elevation view of still another form of a railway car useful in the present invention; and
FIG. 23 is a plan view of the railway car of FIG. 22, the automobile-carrying body having been pivoted to the loading position thereof.
Referring to FIGS. 1 to 13 of the drawings, there is illustrated a first embodiment of a combination railway and passenger automobile transportation system made in accordance with and embodying the principles of the present invention. The system 100 includes a stretch of railway track 101 formed by a pair of laterally spaced apart rails 102 and 103 preferably mounted upon ties 104, all in the usual manner, the gauge of the railway track of the present invention being standard. It will be understood that in most places there will be provided a double track 101, whereby trains may pass one another going in opposite directions or in the same direction thereon. The general arrangement of the parts is best illustrated in FIGS. 4 to 6, wherein there is illustrated in FIG. 4 a front unit 110 of a railway train, and there is illustrated in FIG. 5 an intermediate unit 240 and a rear unit 245 of a railway train, it being understood that the units 110, 240 and 245 are connected in tandem relationship to form a complete train running upon the railway track 101. The railway train includes automobile-carrying bodies 140 which are pivotally mounted so that they can assume the positions illustrated in FIG. 6 beside the transfer positions or stations 255 in a loading area 250, all as will be explained more fully hereinafter.
The details of the construction of the front unit 110 of the railway train will now be described with special reference to FIGS. 1 to 4 of the drawings, it being seen that the front unit 110 includes a front car 111, a lounge car 120 and a support car 170, with automobile-carrying bodies 140 disposed between the front car 111 and the lounge car 120, and disposed between the lounge car 120 and the support car 170. From FIGS. 1 and 2, it will be seen that the front car 111 more specifically includes a body 112 that is somewhat pointed and
rounded at the left hand and forward end thereof so as to impart thereto an aerodynamic shape which facilitates fast operation thereof, the train of the present invention being designed to travel at speeds of the order of 200 miles per hour. A portion of the body 112 is provided with a wraparound window 113 so that an engineer may view the track 114 ahead of the train. The body 112 is supported upon a standard railway truck 114 which, in turn, is supported by two sets of rail wheels 115.
The lounge car 120 includes a body 121 that is generally rectangular in cross section and is provided along either side thereof with a series of windows 122, the opposite ends of the body 121 being mounted upon standard railway trucks 123, the trucks 123 each being supported by two sets of rail wheels 124 adapted to engage on the railway track 114. For purposes explained more fully hereinafter a pair of stairways 125 and 126 is provided adjacent each end thereof.
Interconnecting the front car 111 and the lounge car 120 is a center sill or underframe 130, the cross section of the center sill 130 being best illustrated at FIG. 3, wherein it will be seen that the center sill 130 includes an upwardly extending portion 131 extending longitudinally of the center sill 130 and a pair of side flanges 132 also extending longitudinally of the center sill 130. The overall width of the center sill 130 is substantially less than the spacing between the rails 102—103, whereby the center sill 130 is in fact narrow and provides a narrow underframe for an associated body 140. As illustrated, one end of the center sill 130 is pivotally connected to the front car 111 as at the pivot 133 (see FIG. 2), while the other end of the center sill 130 is pivotally connected to the adjacent end of the lounge car 120 as at the pivot 134, while the body 140 is pivotally mounted upon the center sill 130 at the longitudinal midpoint thereof as at the pivot 135.
Referring to FIGS. 1 to 4, it will be seen that the automobile-carrying body 140 is generally rectangular both in side elevation view and in plan view, a typical cross section thereof being illustrated in FIG. 3. The body 140 includes a lower floor 141 which extends along the entire length of the body 140 and is adapted to support thereon several automobiles 160, a trackway 142 being provided on the lower floor 141 for this purpose. It will be noted that the overall width of the trackway 142 is substantially equal to that of the railway track 101, and the trackway 142 is generally centered in a lateral direction with respect to the railway track 101. The underside of the lower floor 141 has a recess 143 therein extending the length thereof which receives the centering portion 131 of the center sill 130, the cooperation between the centering portion 131 and the lower floor 141 tending to hold the body 140 in the running position illustrated in FIGS. 1, 3 and 4.
The left-hand side of the lower floor 141 as viewed in FIG. 3 extends outwardly to the left and joins a generally vertically arranged sidewalk 144, while the right-hand side of the lower floor 141 extends outwardly to the right and joins a generally vertically upstanding sidewalk 145, a generally horizontally arranged roof 146, and an inwardly directed wall 147 joining the roof 146 and the upper edge of the wall 145, whereby to provide a substantially boxlike configuration for the body 140. It will be understood that the walls 144, 145 and 147 as well as the roof 146 extend the entire length of the body 140 and terminate at the opposite ends thereof, it being pointed out that the opposite ends of the body 140 are open to provide communication with the adjacent cars in the associated train. It is pointed out however that in order to facilitate movement of the automobile-carrying body 140 from the running position illustrated in FIG. 1 to the loading position illustrated in FIG. 2, each end is provided with a straight end surface 148 disposed substantially normal to the longitudinal axis of the body 140 and an inclined end surface 149 disposed at a slight angle with respect to the end surface 148. These end surfaces cooperate with a straight end surface 118 and an inclined end surface 119 provided on the adjacent end of the front car 111 and a straight surface 128 and an inclined surface 129 on the adjacent end of the lounge car 120.
Interiorly of the body 140, a generally horizontal upper floor 150 divides the interior of the body 140 into a lower storage section 151 and an upper storage section 161, each of the storage sections 151 and 161 accommodating a plurality, namely, the body 160 of the automobiles located longitudinally thereof in end-to-end relationship. The lower storage section 151 is provided with a lower inner wall 153 arranged generally vertically and extending the length of the body 140, and another lower inner wall 154 extending vertically and disposed generally parallel to the wall 153 and extending the entire length of the body 140. The lower inner wall 154 cooperates with the sidewall 145 to define therebetween a lower passageway 155, the lower passageway 155 having a lower walkway 156 formed on the lower floor 141 and communicating with the storage section 151 through a plurality of openings 157 in the lower inner wall 154. A top wall 158 closes the upper end of the lower passageway 155.

The upper storage section 161 is defined on one side thereof by an upper inner wall 164 arranged generally vertically and extending the full length of the body 140 and on the other side by a second upper inner wall 164 arranged generally vertically and extending the full length of the body 140, whereby the storage section 161 is essentially defined by the upper surface of the upper floor 150, the lower surface of the roof 146 and the inner surfaces of the inner walls 153 and 164. In order readily to accommodate an automobile 160 in the upper storage section 161, the upper surface of the upper floor 150 is provided with a trackway 152 therealong for receiving the wheels 162 of an associated automobile 160. It will be noted that the trackway 152 has essentially the same gauge as the trackway 142 and is positioned vertically thereabove and in both vertical and longitudinal alignment therewith. There is defined between the facing surfaces of the sidewalk 144 and the inner wall 164 an upper passageway 165, a horizontal wall providing a walkway 166. A plurality of openings 167 is provided in the inner wall 164 so as to provide communication between the upper storage section 161 and the upper passageway 165, a step 168 being provided inwardly of the upper walkway 166 to facilitate access to the automobile 160 stored in the upper storage section 161.

It will be understood that three of the openings 157 and 167 are provided respectively in the inner walls 154 and 164, each of the openings 157 and 167, as the case may be, being opposite the doors of one of the automobiles 160 stored in the storage sections 151 and 161, respectively. As a consequence, there will be portions of the walls 154 and 164 opposite only the front ends and the rear ends of the passenger automobiles 160. By this construction, the passengers in the automobiles 160 may readily leave the automobiles to walk along the walkways 156 or 166, as the case may be, and on the other hand, can readily return to their automobiles 160 during operation of the associated railway train. When the body 140 is in the running position thereof, the stairway 125 in the lounge car 120 communicates with the adjacent end of the lower passageway 155, while the stairway 126 in the lounge car 120 communicates with the adjacent end of the upper passengerway 165, whereby the passengers in the automobiles 160 carried by the body 140 have ready access to the lounge car 120 and the usual benefits found therein including seats, rest rooms, food concessions, and the like.

Referring next to FIGS. 7 to 10 of the drawings, the details of construction of the support car 170 will now be described. As illustrated, the support car 170 includes a front section 171 and a rear section 172 and the front section 171 is held in position by the body 140 carried by the frame 173 and the rear section 174 including a rear frame 176. Support for the car 170 is in the form of a separate truck 180, the truck 180 including a pair of side frames 181 connected by a truck bolster 196 (see FIGS. 9 and 10), and carrying on one end thereof an axle 182 fixedly secured thereto for rotation with respect to the body 140 carrying the usual rail wheels 183 engaging upon the rails 102 and 103. There also is provided a pair of bearing blocks 184 which rotatably support therein an axle 185 carrying a pair of rail wheels 186 also engaging upon the rails 102 and 103. The adjacent ends of the side frames 181 are each provided with a recess 187 formed in part by a bearing hook 188, the recesses 187 respectively receiving one of the bearing blocks 184 therein with the hooks 188 engaging the associated bearing block 184 to assist in holding the bearing block 184 in operative and coupling relationship with respect to the associated side frames 181, the parts being illustrated in the assembled or coupled positions in FIG. 7. Each of the bearing blocks 184 is also provided with a keeper 189 that cooperates with a latch mechanism 200 to be described hereinafter. Each of the bearing blocks 184 also is connected by a link 190 to one of the frame members 175, the link 190 being pivotally mounted on the associated bearing block 184 as by the pivot 191 and carrying a pivot pin 192 at the other end thereof. A spring member 175 has a horizontally arranged elongated slot 177 therein which receives the pivot pin 192 for sliding engagement therein. Connecting the link 190 and the frame member 174 is an arm 193 pivoted to the link 190 as at the pivot 194 and carrying at the other end thereof a pivot pin 195. The frame member 174 is provided with a vertically arranged elongated slot 176 which receives the pivot pin 195 for sliding movement therein.

Each of the truck side frames 181 is provided with one of the latch mechanisms 200, whereby only the latch mechanism 200 illustrated in FIGS. 7 and 8 will be described in detail. The latch mechanism 200 includes a latch 201 having a locking arm 202 and an actuating arm 203. The arm 203 being pivoted on the associated side frame 181 as at the pivot 204. A spring member 205 under compression is provided between the side frame 181 and the actuating arm 203 and continually urges the latch 201 in an unlatching direction. Cooperating with the latch 201 is a first link 206 having a nose 207 engaging the upper surface of the actuating arm 203, and also having an arm 208 extending therefrom, the link 206 being pivotally mounted on the side frame 181 as at the pivot 209. A spring member 211, under compression is disposed between the side frame 181 and the underside of the arm 208 urging the link 206 in the latching direction thereof. A crank 212 is provided carried by one end of a pivot shaft 212 mounted on the front section 171 and positioned to rotate about a pivot axis arranged horizontally and transversely of the associated railway truck. The crank 212 carries a crank arm 214 that engages second link 215, one end of the link 215 having an elongated slot 216 thereof receiving the crank arm 214 therethrough, and the other end of the link 215 being pivotally connected to the link 206 as at the pivot 217.

The parts are illustrated in FIG. 7 in the latching positions thereof; i.e., the locking arm 202 is in engagement beneath the keeper 189 to hold the bearing block 184 in the side frame 181 in the extended or coupled position with respect to the truck side frame 181. With the parts in this position, the truck 180 articulates with respect to the front section 171 in the usual manner, while the link 190 and the arm 193 are essentially inactive, the bearing blocks 184 being fixedly secured to the truck side frames 181 and the truck bolster 196 being pivotally mounted on the front section 171 in the usual manner. If it is desired to separate the truck 180, i.e., to disconnect the front section 171 from the rear section 172 in the support car 170 the pivot shaft 212 is rotated in a counterclockwise direction from the position illustrated in FIG. 7 to the position illustrated in FIG. 8. Such rotation of the shaft 212 rotates the crank 210 and the crank arm 214 carried thereby generally upwardly in the slot 216 until the link 215 is engaged, after which further movement of the shaft 212 causes the link 206 to be pivoted in a counterclockwise direction from the position illustrated in FIG. 7 to the position illustrated in FIG. 8, all against the action of the spring 211. Such movement of the link 206 moves the nose 207 thereof upwardly thus to permit the spring 205 to cause the latch 201 to retract and disengage from the position illustrated in FIG. 7 to that illustrated in FIG. 8. Removal of the locking arm 202 from engagement with the keeper 189 is accompanied by the pivoting of the side frames 181 in a
counterclockwise direction from the position illustrated in FIG. 7 to that illustrated in FIG. 8 so as to cause the side frames 181 to disengage the bearing blocks 184. As will be explained later, the coupling portion 221, the vertical support being removed from the car sections 171 and 172 is simultaneously removed by the rotation of the pivot shaft 212 whereby the rear section 172 falls from the position illustrated in FIG. 7 to that illustrated in FIG. 8. This latter vertical downward movement of the rear section 172 causes the pivot pin 195 to move to the upper end of the slot 174 and the pivot pin 192 to move to the left-hand end of the slot 177, all as viewed in FIG. 8. The rear section 172 and the parts carried thereby are now supported upon the bearing blocks 184 through the action of the link 190 and the arm 193. As a consequence, the front section 171 is now supported by the axle 182 upon the associated wheels 183, while the rear section 172 is supported by the axle 185 upon the associated wheels 186.

The frames of the sections 171 and 172 of the support car 170 are also pivotally interconnected. As illustrated in FIGS. 9 and 10, the front section 171 is provided with the front frame 173 extending rearwardly therefrom and terminating at a coupling mechanism 220, while the rear section 172 includes the rear frame 178 extending forwardly therefrom and terminates at the coupling mechanism 220. The front frame 173 carries a coupling portion 221, while the rear frame 178 carries a coupling portion 222, the coupling portion 221 being disposed above the coupling portion 222 and carrying a downwardly extending pin 223 received in an opening 224 in the coupling portion 222. A retainer 225 is provided for holding the coupling portions 221—222 in the coupled position, the retainer 225 being pivotally mounted about the pivot 226 on the front frame 173.

In order to hold the retainer 225 in the coupling position illustrated in FIG. 9, a hydraulic motor 230 has been provided, the hydraulic motor 230 including the usual cylinder 231 pivoted to the front frame as at 232, the cylinder 231 having a piston therein slidably movable with respect thereto and carrying a piston rod 233 extending forwardly therefrom. The outer end of the piston rod 233 is connected to a bellcrank 227 that is fixedly attached to the pivot shaft 212 described above and which is journaled in the front section 171. One arm of the bellcrank 227 is pivotally connected as at 234 to the outer end of the piston rod 233 and the other arm 235 thereof is pivotally connected to a link 235 as at the pivot 236. The inner end of the link 235 is connected by a pivot 237 to the retainer 225.

The parts are illustrated in the coupled position in FIG. 9, wherein the retainer 225 is disposed below the coupling portions 221—222 and serves to hold these parts in the coupled positions, whereby the front frame 173 and the rear frame 178 are pivotally connected thereby. When it is desired to decouple the front section 171 from the rear section 172, the hydraulic motor 230 is actuated (by standard mechanism and connections not illustrated) from the position illustrated in FIG. 9 to the position illustrated in FIG. 10, whereby to pivot the bellcrank 227 in a counterclockwise direction, this serving also to rotate the shaft 212 in a counterclockwise direction. Such movement of the bellcrank 227 lowers the arm 226 and thus the attached link 235 so as to lower the retainer 225 to the position illustrated in FIG. 10. It will be noted that this permits the rear frame 178 to drop, until it is supported upon the bearing blocks 184 by the link 190 and the arm 193 as described hereinabove with respect to FIGS. 7 and 8. When it is desired again to couple the front frame 173 to the rear frame 178, the parts are moved until the pivot pin 223 is vertically aligned above the opening 224, whereby the coupling portion 221 is pivotally connected with the coupling portion 222 of the rear section 172. The rear end of the tail car 246 is supported by a standard railroad truck 247 carrying two sets of rail wheels 248.

It will be appreciated that the above-noted operation of the hydraulic motor 230 serves to operate the latch mechanism 200 described above, whereby when the hydraulic motor 230 is actuated from the position illustrated in FIG. 9 to that illustrated in FIG. 10, the pivot shaft 212 is rotated in a counterclockwise direction so as to move the crank 210 in a counterclockwise direction from the position illustrated in FIG. 7 to that illustrated in FIG. 8. As has been explained heretofore this causes a release of the latch mechanism 200 and also lifts the right-hand ends of the side frames 181 from the position illustrated in FIG. 7 to that illustrated in FIG. 8, thus to clear the hooks 188 with respect to the bearing blocks 184. Simultaneously, the weight of the rear section 172 and all the parts thereof is transferred to the bearing blocks 184 via the link 182 or arm 193, all as explained above. The front section 171 and the rear section 172 are now fully independent of one another and can be separated for decoupling purposes.

In order to decouple the two sections of the support car 170, it is necessary only that they be placed in juxtaposition so that the right-hand ends of the side frames 181 overlie the bearing blocks 184 and the pivot pin 223 overlies the opening 224. Operation of the hydraulic motor 230 will now cause the rear frame 178 and the parts mounted thereon to be lifted to reengage the pivot pin 223 in the opening 224 by operation of the retainer 225. This movement of the hydraulic motor 230 also causes the coupling portion 221 to be turned 210 in a clockwise direction to lower the right-hand ends of the side frames 181 and again to latch the right-hand ends of the side frames 181 to the bearing blocks 184 by engagement of the locking arms 202 beneath the associated keepers 189.

Referring again to FIGS. 4 to 6, the adjacent front unit 110 includes only the front section 171 of a support car 170, while the rear section 172 of the support car 170 is intermediate unit 240 illustrated in FIG. 5. It will be understood that one or more of the intermediate units 240 may be provided in making up a railway train of the present invention, the intermediate units 240 being arranged to couple to each other and with the forward end thereof coupled to the rear of the front unit 110 and rear thereof coupled to the rear unit 245. As illustrated, the intermediate unit 240 is formed of the rear section 172 of a support car 170, an automobile carrying body 140, a lounge car 120, an automobile-carrying body 140 and the front section 171 of a second support car 170. It will be understood that the bodies 140 are supported upon center-sills 130, one center-sill 130 having the front end pivotally connected to the rear section 172 and the rear end pivotally connected to the adjacent end of the lounge car 120, and the other center-sill 130 having the front end pivotally connected to the rear of the lounge car 120 and the rear end pivotally connected to the front section 171 disposed to the right in FIG. 5.

The rear unit 245 as illustrated comprises a tail car 246 which is essentially tear-shaped so as to present good aerodynamic characteristics during high-speed travel of the railway train, it having been pointed out that the train of the present invention may travel at speeds on the order of 200 miles per hour. The tail car 246 is supported at the forward end by a pair of rail wheels 186 carrying bearing blocks connected to the car by links 190 and arm 193, the car having a coupling portion 224 extending forwardly for cooperation with the coupling portion 221 in the same manner as the coupling portion 222 cooperates with the coupling portion 211. It will be appreciated also that the wheels 186 form the part of a supportable truck 180, whereby the front of the tail car 246 can be coupled to the adjacent front section 171 in the same manner as the rear section 172 and the coupling portion 172. The rear end of the tail car 246 is supported by a standard railroad truck 247 carrying two sets of rail wheels 248.

In order to facilitate the loading of the automobiles 160 into the bodies 140 and the unloading of the automobiles 160 from the bodies 140, a loading area 250 has been provided along a section with the railway track 101, the loading area 250 being
best illustrated in FIG. 6 of the drawings, the loading area 250 includes a loading platform 251 which extends longitudinally in a direction essentially parallel to the associated rails 102—103 on one side thereof, and also includes an unloading platform 252 also extending longitudinally and essentially parallel to both the rails 102—103 and the loading platform 251. As illustrated, there are provided four transfer positions or stations 255 along the platforms 251—253, each of the stations being provided with a loading ramp 252 and an unloading ramp 254 respectively communicating with the loading platform 251 and the unloading platform 253. The longitudinal axes of the ramps 252 and 254 are disposed at acute angles of approximately 20° with respect to the longitudinal axes of the loading platforms 251 and 253 and terminate short distances from the adjacent rails 103 and 102, respectively.

In order to unload the automobiles from the bodies 140 at the transfer positions 255, the train is stopped at a predetermined position so that the pivot points 135 are disposed essentially midway between a cooperating set of ramps 252—254. More specifically, the pivot 135 is aligned with the longitudinal axes of the associated set of ramps 252—254. With the train so positioned, the bodies 140 are then lifted and pivoted to the positions illustrated in FIG. 6, all as will be explained more fully hereinafter. When so pivoted, the longitudinal axis of each body 140 is in alignment with the longitudinal axes of the associated set of ramp 252—254. It is pointed out in FIGS. 21 and 22 that the ramps 252—254 are in fact double-decked, whereby to provide cooperative ramps and platforms for both the automobiles positioned on the lower floor 141 and the automobiles positioned on the upper floor 150 of the associated body 140. It is now possible to drive any automobiles in the bodies 140 onto the associated unloading ramp 254 and thus onto the adjacent unloading platform 253 in the direction of the upper arrows. After clearing the automobiles from the bodies 140, other automobiles can be loaded thereinto by being driven in the direction of the arrows along the loading platform 251 and then into the bodies 140.

Referring now to FIGS. 11 to 13 of the drawings, details of one of the transfer positions 255 will now be described. As has been explained herefore, in order to provide the proper alignment between the ends of the pivoted bodies 140 and the several ramp sets 252—254, and to this end a pair of centering mechanisms indicated by the numeral 260 has been provided. Each of the centering mechanism 260 cooperates with and acts upon a centering and lifting pad 261 disposed adjacent to the longitudinal midpoint of the body 140 but extending slightly over that point in the direction of the lower arrows. The body 140 is provided and arranged with the longitudinal axes parallel to the longitudinal axis of the body 140 but spaced laterally with respect to the longitudinal centerline thereof. The centering mechanisms 260 are mounted adjacent to the associated rails 102—103 and slightly outwardly thereof and spaced longitudinally from a transverse line passing through the desired position of the pivot 135. Each of the centering mechanisms 260 includes a hydraulic motor 261 having one end anchored to the ground and provided at the other end thereof with the usual shaft 262 carrying at its outer end an actuating head 263. Elevating mechanism (not shown) is also provided for each of the centering mechanisms 260 so that the heads 263 can be lowered while the associated train passes thereover, and after the train has stopped, the centering mechanisms 260 are raised to bring the heads 263 into vertical alignment with an adjacent end of the associated pad 137. It has been found that it is possible to stop the train within about a foot of the correct location, after which the heads 263 all along the train are raised, all of the heads 263 on one side of the train engaging the associated pads 137 if the train is in front of the registration point, and all of the heads 263 on the other side of the train engaging the associated pads 137 if the train is in front of the registration point. All of the hydraulic motors 261 operating in unison along the length of the train are adequate to move the train the short distance needed to provide for proper registration of each of the pivot centers 135 with respect to the adjacent set of the ramps 252—254.

Having placed the train in proper registration and retracted the centering mechanisms 260, another set of pads 136 on the under side of each of the bodies 140 is in registration with an associated turning mechanism 270. Each pad 136 is positioned adjacent to one end of the body 140 and along one side thereof, the pads 136 having a substantial area and being essentially square in outline. The turning mechanisms 270 acting beneath the associated pads 136 are useful in turning the body 140 from the running position thereof wherein the longitudinal axis is aligned with the associated rails 102—103 to the loading position thereof wherein the longitudinal axis of the body 140 is disposed at an angle of approximately 20° with respect to the rails 102—103 and is in longitudinal alignment with the axes of the associated ramps 252—254.

The turning mechanisms 270 are identical in construction, whereby the same reference numerals have been applied to like parts thereof, and as illustrated, each of the turning mechanisms 270 is mounted upon the base 271 formed for example of concrete, adjacent to the railway track and having a flat and smooth surface 272 positioned adjacent to the railway track, the surface 272 being in general horizontal alignment with the tops of the rails 102—103. The turning mechanism 270 includes a bogie 272 carrying a pair of longitudinally spaced-apart rollers 273 and 275 mounted upon the axles 274 and 276, respectively, carried by the bogie 272, the axles 274 and 276 being disposed essentially parallel to each other.

The position and operation of each of the bogies 272 is controlled by a hydraulic turn motor 280 provided with the usual reciprocating shaft 281 extending from one end thereof, the other end being pivotally mounted upon the base 271 as by the pivot the shaft 281 being provided by a universal joint 277 to one end of the bogie 272, the universal joint 277 permitting the bogie to articulate both in a horizontal direction and in a vertical direction and in combinations thereof with respect to the shaft 280.

As has been explained above, the center sill 130 has a centering portion 131 received in a cooperating recess 143 in the bottom of the body 140, whereby it is necessary to lift the body 140 with respect to the center sill 130 before the body 140 may be turned upon its pivot 135, it being pointed out that the pivot 135 is of the type which will accommodate such relative vertical movement between the center sill 130 and the body 140. Such lifting is accomplished by means of two pairs of hydraulic lift motors 285 and 285 provided in wells in the pivot the shafts thereof being provided by a universal joint 286 which is oriented with the longitudinal axis thereof disposed vertically and carrying on the upper end thereof of the lifting table 287 having a flat horizontal surface 288 on the upper side thereof. The motor 285 is disposed directly below the outer portion of the associated lifting pad 136 when the train is properly positioned at the transfer position 255.

In order to lift and turn the body 140 using the above-described mechanisms, it is essential that the mechanisms be worked in conjunction with one another. More specifically, each of the bogies 272 is first placed in the position illustrated in FIG. 12 of the drawings, i.e., with the rollers 273 resting upon the surface 288, the hydraulic motor 285 being in its retracted position and the hydraulic motor 285 being in its extended position. It will be noted that at this time the roller 275 is positioned on the surface 278 and that the roller 273 not only is positioned on the surface 278 but is disposed below the outer edge of the lifting pad 136. The two hydraulic lift motors 285 are then simultaneously actuated to raise the associated rollers 273 into contact with the associated lifting pads 136, and thereafter through the roller 275 to lift the body 140 upwardly from the position illustrated in FIG. 12 to the dashed line position illustrated to the left in FIG. 13.

Next the two hydraulic turn motors 280 are actuated to retract the shafts 281 thereinto, thus to pull the bogies 272
opposite directions with respect to the pivot 135, such movement being to the right as viewed in FIG. 13. During the movement of the hydraulic turn motors 280 from the fully extended positions thereof to the fully retracted positions thereof, the support of the body 140 and the contact with the lifting pads 136 thereof is shifted from the rollers 273 to the rollers 275, it being pointed out that the width of the lifting pads 136 must be greater than the longitudinal distance between the uppermost points on the rollers 273—275 (i.e., the distance between the centers of the axles 274—276). In order to avoid such a transfer. When the hydraulic turn motors 280 are in the fully retracted positions thereof, the body 140 is in the loading position thereof and the parts as illustrated in FIG. 13 are in a solid line or right-hand positions thereof.

In order to assist in the lifting of the body 140, and also to provide additional support and stability adjacent to the longitudinal midpoint thereof, an additional pair of lift mechanisms 290 has been provided on each side of the pivot 135 and in lateral alignment therewith, the lift mechanisms 290 being identical in structure, whereby only the details of one will be described and like reference numerals applied to like parts of the other. As illustrated, the lift mechanisms include the hydraulic lift motor 295 that is disposed in a well in the base 271 and is provided with the usual operating shaft 296 operating in synchronization with the longitudinal shaft thereof oriented vertically. The upper end of the shaft 296 carries a yoke 291 supporting a roller 292 upon an axle 293. The roller 292 is disposed laterally in position to contact the associated lifting pad 137, the contact being at a point therealong in lateral alignment with the pivot 135.

It will be understood that the hydraulic lift motors 295 are operated in unison and synchronism with the hydraulic motors 285, whereby the support surface of each roller 292 is brought into contact with the associated pad 137 at the same time that the roller 283 is brought into contact with the associated pad 136, and thereafter the lifting forces are applied equally and in unison by all four of the hydraulic lift motors 285 and 295. During the operation of the hydraulic turn motor 280, it will be appreciated that the friction between the rollers 292 and the associated pads 137 will cause the yokes 291 to pivot with respect to the shafts 296 to maintain the rollers 292 in alignment with the associated pads 137. Also, it will be appreciated that the rollers 292 will move along the associated pads 137 as the body 140 is pivoted about its pivot 135. As a consequence, a strong lifting force is applied to the center of the body 140, which lifting force is maintained constant during the turning, loading and unloading of the body 140, the rollers 292 providing lateral stability as well as a lifting operating force.

Considering now the full operation at the transfer position 285, the operator of the train stops it with the pivots 135 positioned within approximately 1 foot of the proper registration position with respect to the associated set of ramps 252—254. The heads 263 on the centering mechanisms 260 are thereafter raised into contact with the underside of the body 140 and the hydraulic motors 261 operated to the full centered positions thereof. It will be appreciated that only one of the heads 263 associated with each of the bodies 140 will encounter the associated pad 137, one of the heads 263 encountering the associated pad 137 if the train is stopped short of the registration point, and the other head 263 contacting the associated pad 137 if the train is stopped beyond the registration point. All of the hydraulic motors 261, along the train acting in unison can shift the entire train so as to place each of the pivots 135 at the proper registration point.

The hydraulic motors 280 are next operated into the fully extended positions thereof so as to place the rollers 273 on the table surfaces 285. Next the hydraulic motors 285 and 295 are operated in synchronism so as to place the rollers 273 in contact with the pads 136 and to place the rollers 292 in contact with the pads 137, whereby further operation of the motors 285 and 295 will lift the body 140 to the elevated position disposed to the left in FIG. 13.

The turning mechanism 270 is then operated, and more specifically the hydraulic turn motors 280 associated with one of the bodies 140, for example, are operated in unison from the fully extended positions, such as that illustrated by dashed lines in FIG. 13, to the fully retracted positions, such as that illustrated by solid lines to the right in FIG. 13. Such operation of the motors 280 will pivot the body 140 from the running position thereof to the loading position thereof, and more specifically will place the openings in the ends thereof adjacent to the ramps 252 and 254, respectively. There also are provided bridging structures 256 and 257 associated with the ramps 252 and 254, respectively, to bridge the short distance between the associated ramp and the adjacent end of the body 140. The automobiles 160 can now be unloaded from and loaded onto the body 140 in a rapid and simple manner.

After the loading operation has been completed, the hydraulic turn motors 280 are operated from the fully retracted positions thereof to the fully extended positions thereof, thereby to move the body 140 from the loading position to the running position, i.e., to place the rollers 273 again on top of the support surfaces 285 in engagement with the associated lifting pads 136, thus to place the pads in the position illustrated in dashed lines in FIG. 13. Next the hydraulic lift motors 285 and 295 are operated to reposition the body 140 into the retracted positions thereof, thus to return the parts to the positions illustrated in FIG. 12, wherein the body 140 again receives the centrivals 130 therein and the rollers 273 are out of contact with the lifting pads 136 and the rollers 292 are out of contact with the lifting pads 137. It also may be advisable to operate the hydraulic turn motors into the retracted positions thereof so as to ensure that there will be no clearance problems with respect to the bogies 272 and any part of the adjacent train.

The combination railway and passenger automobile transportation system 100 described in detail above is useful in effecting high-speed rail transportation of a large number of automobiles and the passengers thereof on standard gauge railway track systems. In order to utilize the standard gauge track system, the automobiles 160 have been arranged longitudinally in single file in the carrier bodies 140, the automobiles being arranged in double-decked configuration with a passenger walkway on the opposite sides thereof for the decks, whereby passengers may remain in their automobiles, leave their automobiles or return to their automobiles, as they desire.

By arranging the bottom of the lower floor low and only a few inches above the rails 102 and 103 and by placing no automobile over the supporting tracks, the overall height and the overall width of the automobile-carrying bodies 140 is within the limits imposed by the present railway right-of-way systems. In fact, the carrier bodies 140 have an overall height and width less than the height and width of present passenger railway cars, the low configuration promoting a stabilization against overturning at high speeds and also minimizing aerodynamic drag at high speeds.

Each of the automobile-carrying bodies 140 is open at both ends and accommodates four to six automobiles therein, connections being made to adjacent railway cars in the train, such as the lounge car 120, which lounge car 120 accommodates passengers who do not wish to remain with their automobiles in travel, and to provide rest room and food-dispensing facilities and if desired, to accommodate nonmotorizing passengers as well.

The load/unload time including rotation of the carrier bodies 140 is less than 2 minutes, whereby not to interfere with rapid and frequent train operation. It will be appreciated that it is essential to have all automobiles disposed on a floor of a body 140 destined for the same station so as to minimize traffic problems.

Easy coupling and uncoupling between units of the train is provided by the structure of the car 170 incorporating the separable trucks 120 therein. This structure provides for wheel support of both ends of decoupled units for low speed operation, yet
providing for the usual articulated movement of the truck 180 during high-speed operation.

The propulsion for the trains of the present invention may be effected in any one of various ways. A locomotive may be utilized for the front car 111 so as to provide all of the motive power for the attached train, whereby all of the other cars in the train including the automobile carrier bodies 140 and lounge car 120 may be passive. On the other hand, the locomotive may also generate electrical power for traction motors mounted in the lounge car 120 and in the support cars 170 and in the tail car 246, for example, whereby to drive all, or selected ones of the wheels throughout the train. Finally propulsion motors may be provided in each of the units, the propulsion motors being self-contained, whereby each of the cars such as the front car 111, the lounge car 120, the support car 70 and the tail car 246 are self-propelled, the motive power being provided by traction motors wherein power is collected from an overhead wire if or by a combustion engine such as a diesel engine, a gas turbine, and the like. It will be understood that space for propulsion equipment is available on the underside of the lounge car 120 and the underside of the support car 170 and in the tail car 246.

Referring to FIGS. 14 to 18 of the drawings, there is illustrated a second form 300 of a combination railway and passenger automobile transportation system made in accordance with and embodying the principles of the present invention. As illustrated, the system 300 includes a railway track of standard gauge formed of rails such as the rail 302 and carrying thereon a train composed of a front unit 310, an intermediate unit 350 and a rear unit 355 respectively illustrated in FIGS. 14, 15 and 16. The front unit 310 as illustrated in FIG. 4 includes a front car 311, a first automobile-carrying body 340, a support car 370, a second automobile-carrying body 345 and a lounge car 320 assembled in tandem relationship. The intermediate unit 350 as illustrated in FIG. 15 includes a first automobile-carrying body 340, a first support car 370, a second automobile-carrying body 340, a second support car 370, a third automobile-carrying body 345, a second support car 370, and a lounge car 320 connected in tandem relationship. The rear unit 355 as illustrated in FIG. 16 includes a second support car 370, a second automobile-carrying body 345, a second support car 370, and a tail car 356, all arranged in tandem relationship. The front car 311 includes a body 312 which is aerodynamically shaped in the same manner as the body 112 described above and is supported upon a truck 314 carrying two sets of rail wheels 315. The lounge car 320 is constructed essentially identical to the lounge car 120 described above and includes a body 321 supported upon a pair of standard trucks 322 each carrying two sets of rail wheels 323.

The details of construction of the body 340 and the support car 370, as well as further details of construction of the front car 311 are illustrated in FIGS. 17 and 18 of the drawings, wherein it will be seen that a centrills 330 has been provided interconnecting the front car 311 and the adjacent support car 370. As illustrated, the centrill 330 is narrow and has a width substantially less than the gauge of the associated railway track but has a length to accommodate the body 340 pivotable thereon at 335. The forward end of the centrill 330 is supported by the front car 311, the front car 311 being provided with a rearwardly extending support 316 receiving a coupling portion 331 on the adjacent end of the centrill 330, the support 316 and the coupling portion 331 being detachably interconnected by a coupling pin 317. There is also provided adjacent to the forward end of the centrill 330 a pair of auxiliary wheels 332 mounted on an axle 333, the wheels 332 having small diameters but being of the same gauge as the track forwardly extending to the rails 302, whereby when the centrill 330 is decoupled from the front car 311, the forward end of the centrill 330 is supported by the auxiliary wheels 332 upon the adjacent railway track. The rear end of the centrill 330 is provided with a coupling portion 338 that is pivotally connected to and mounted on the support car 370.

The body 340 is constructed essentially-like the body 140 described above, and specifically includes a lower floor 341, an upper floor 342, a pair of longitudinally extending sidewalls 344, and a roof 346. The opposite ends of the body 340 are open but are provided with straight end surfaces 348 and inclined end surfaces 349 for mating with the adjacent ends of the front car 311 and the support car 370. In cross section, the body 340 is essentially like the body 140, but it will be seen from FIG. 14 that the length of the body 340 is only such as to accommodate two of the automobiles 350 upon the floors 341 and 342 thereof.

The support car 370 includes a body 371 supported by a pair of rail wheels 372 mounted on an axle 373 carried by the body 371. The adjacent end of the centrill 330 is pivotally connected to the body 371 by a pivot 375. Also pivotally connected to the body 371 is a second centrill 380 which is pivotally thereon as at the support car 376 through a coupling portion 384 formed on the centrill 330.

In order to assure correct steering of the support car 370, and specifically the wheels 372 thereof on curved sections of a railway track, a biecting linkage has been provided which insures that the longitudinal axis of the axle 373 is at the same angle between the adjacent centrills 330—380. More specifically, there is provided on the forward end of the centrill 330 a pair of spaced-apart fingers 305 defining a slot 383 therebetween, and there is provided on the rear end of the centrill 330 a finger 336 extending into the slot 385 and between the fingers 386. The fingers 336 and 386 in cooperation with the pivots 375 and 376 insure that the longitudinal axis of the axle 373 always bisects the angle between the longitudinal centerline of the centrill 330 and 380 when the train is on a curved portion of the associated railway track. The biecting linkage is in effect a pair of meshing gears which causes the centrills 330 and 380 to rotate through the same angle, but in opposite directions, relative to the frame 371 and the axle 373.

During the transportation of the loaded automobile-carrying bodies 340, it is preferred that the weight thereof be not supported directly upon the centrill 330, but rather upon the adjacent railway cars, such as the front car 311 and the support car 370 as illustrated in FIG. 17. To this end, interconnecting and cooperating support surfaces are provided on the ends of the body 340 and the adjacent cars 311 and 370. More specifically, the front car 311 carries a support shelf 318 extending along the rear end thereof, and the support car 370 carries support shelves 375 respectively on the front thereof and on the rear thereof. The body 340 at each end thereof carries support structure 347 which is in the form of a cutout portion receiving therein the support shelves 318 and 375, respectively, whereby the weight of the body 340 is supported via the support shelves 318 and 375 on the front car 311 and the support car 370, respectively. It will be appreciated that it also will be desirable to provide like structure on the body 140 and the associated railway cars in the transportation system described above.

Finally, it is pointed out that the tail car 356 on the rear unit 355 is supported at the front thereof by a standard truck 357 provided with two sets of rail wheels 358 and is supported at the rear thereof by a single pair of rail wheels 359. Also, the rear of each of the lounge cars 320 is provided with a support 362 like the support 316 of the front car 311, whereby the rear of each of the lounge cars 320 can cooperate with the adjacent forward end of a centrill 330 for coupling the intermediate unit 350 to the rear of the front unit 310, and for coupling the rear unit 355 to the rear of the intermediate unit 350, thus to provide a complete railway train.

The combination railway and passenger automobile transportation system 300 will also incorporate therein a loading area, such as the loading area 350 described above together with all of the auxiliary equipment station thereon including the centering mechanisms 260, the turning mechanisms 270, the hydraulic motors 280, the hydraulic lift motors 285 and 295 and the lift mechanism 290.
Referring now to FIG. 19 of the drawings, there is illustrated another combination railway and passenger automobile transportation system 400 made in accordance with and embodying the principles of the present invention. As illustrated, the system includes a railway train formed of a lounge car 420, a first passenger automobile-carrying body 410, a support car 401, a second passenger automobile-carrying body 410 and a second lounge car 420, all arranged in tandem relationship and comprising the intermediate unit of a longer railway train. In the system 400, only standard trucks are used for supporting each of the cars named, the support car 401, for example, being supported upon a standard truck 402 provided with the usual two pairs of rail wheels 403. The body 410 may of the construction of the body 140 described above and as illustrated each of the bodies 410 is supported between one end of a support car 401 and the adjacent end of a lounge car 420.

In order to be able to use only standard trucks, such as the trucks 402, in the railway train of the system 400, it is necessary that some type of decoupling arrangement be provided, the type of decoupling provided in FIG. 19 being a separable lounge car body, the lounge car 420 being formed of a front body section 421 and a rear body section 422. The front body section 421 is mounted on a standard front truck 423 supported upon the usual two sets of rail wheels 424, while the rear body section 422 is supported upon a standard rear truck 425 supported by two sets of standard rail wheels 426. The front body section 421 carries interlocking structure 427 and the rear body section 422 carries interlocking structure 428, the structures 427 and 428 cooperate detachably to connect the body sections 421 and 422 for the coupling and decoupling purpose. In all other respects, the transportation system 400 of FIG. 19 is like the transportation systems 100 and 300 described above.

There is illustrated in FIGS. 20 and 21 of the drawings yet another modification of the transportation system of the present invention, there being shown therein a combination railway and passenger automobile transportation system 500 which also uses only standard trucks for supporting the several cars thereof. There is illustrated in FIG. 20 the intermediate unit of a train useful in the system 500, the unit illustrated including the rear half of a support car 530 a passenger automobile-carrying body 510, a lounge car 520, another passenger automobile-carrying body 510 and the front section of a support car 530, all connected in tandem relationship. Each of the bodies 510 is pivotally mounted upon a center sill 515 by means of a pivot 516, each of the center sills 515 being supported by a lounge car 520 and an automobile-carrying body 510. The lounge car 520 includes a body 521 mounted upon two standard trucks 523, each of the trucks 523 being supported by the usual two sets of rail sets 524.

The significant difference in the transportation system 500 of FIGS. 20 and 21 resides in the novel construction of the support car 530 including a front frame 531 and a rear frame 532, the front frame 531 being mounted upon a standard truck 533 supported by two sets of rail wheels 535, and the rear frame 532 being supported upon a standard truck 534 supported by two sets of rail wheels 536. The front frame 531 carries a front connecting structure 537, while the rear frame 532 carries a rear connecting structure 538, whereby the connecting structures 537 and 538 detachably interconnect the frames 531 and 532 for the coupling and decoupling purpose. It will be understood that when the frames 531 and 532 are coupled to each other, they provide a rigid frame which is also rigid longitudinally and transversely of the associated railway track.

Although any desired type of structure may be mounted upon the support car 530, as illustrated, an auxiliary body 540 is pivotally mounted upon the rear frame 532 as by the pivot 541, a bearing pad 542 being provided on the front frame 531 to support the adjacent end of the auxiliary body 540. It is to be understood that the auxiliary body 540 is a passenger automobile carrier and as such includes a storage section open at both ends and formed by a bottom floor and a top floor and longitudinally extending end walls, the size of the body 540 being such as to accommodate a single automobile therein and in general alignment with the automobiles supported on the upper floor of the adjacent automobile-carrying bodies 510. The incorporation of the auxiliary automobile-carrying body 540 in the train of the transportation system 500 also necessitates a modification in the loading area 550 associated therewith, which modification is illustrated in FIG. 21 of the drawings. The loading area 550 includes a loading platform 551 having a loading ramp 552 of the usual type to cooperate with the automobile-carrying bodies 510 when in the loading positions thereof. Likewise, there is provided an unloading platform 553 provided with unloading ramps 554 which cooperate with the adjacent ends of the automobile-carrying bodies 510. In addition, there has been provided an auxiliary ramp 556 communicating with the loading platform 551 and an auxiliary ramp 557 communicating with the unloading platform 553, the ramps 556 and 557 having the longitudinal axes thereof disposed at angles of approximately 45° with respect to the longitudinal axes of the platforms 551 and 553 and the associated railway track. Consequently, when the body 540 is pivoted about its pivot 541 to the position illustrated in FIG. 21, the automobile therein may be unloaded by driving directly onto the ramp 557, while an automobile on the platform 551 can be loaded thereto by being driven thereon across the ramp 556. It will be understood that the platforms 551 and 553 as well as the associated ramps 552 and 554 are in fact double-decked, whereas the double-deck features 555 are provided for each of the automobile-carrying bodies 510; the ramp 556 and 557 only need be single-decked, namely, the upper deck, whereby to provide a transfer position 558 having a single deck in lateral alignment with the upper deck of the transfer positions 555.

The transportation system 500 is in all other respects like the transportation systems 100, 300 and 400 described above.

There is illustrated in FIGS. 22 and 23 of the drawings, a railway car 600 having incorporated therein conventional trucks and conventional couplers, which railway car 600 is useful in the transportation systems of the present invention including the transportation systems 100, 300, 400 and 500, described above. As illustrated, the railway car 600 includes a narrow center sill 601 having a width substantially less than the gauge of a standard railway track and supported at the opposite ends thereof upon a front truck 602 and a rear truck 603, the truck 602 and the truck 603 being of standard construction and supported by two sets of wheels 604 and 605, respectively. Producing a railway car 600 having an automobile-carrying body 610, the car 600 is propelled, and to this end is provided with a front motor 606 mounted upon the truck 602 and a rear motor 607 mounted upon the rear truck 603. A standard front coupling 608 is mounted on the front truck 602 and a standard rear coupling 609 is mounted on the rear truck 603, whereby the car 600 can be coupled into standard trains and operated upon standard gauge railway tracks therewith and as a part thereof.

Mounted upon the center sill 601 is an automobile-carrying body 610, the body 610 including a lower floor 611 having the opposite ends thereof terminated adjacent to the associated trucks 602 and 603, an upper floor 612 extending longitudinally thereof and over and beyond the associated trucks 602 and 603, a pair of longitudinally extending sidewalks 614 and a generally horizontal roof 615. It will be noted that the body 610 is pivotally mounted upon the center sill 601 at the pivot 625 for pivotal movement between a running position wherein the longitudinal axis thereof is aligned with the longitudinal axis of the center sill 601 and a loading position wherein the longitudinal axis thereof is disposed at an acute angle with respect to the center sill 601. The upper floor 612 divides the body 610 into a lower storage section 631 which accommodates therein three automobiles 630 extending longitudinally thereof in front-to-rear relationship, and an upper storage section 622 accommodating therein four automobiles 630 extending longitudinally thereof in front-to-rear relationship. The lower storage section 621 terminates at lower end.
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623 spaced a short distance away from the adjacent trucks 602 and 603, while the upper storage section 622 terminates at upper ends 624 disposed laterally beyond the outer ends of the adjacent trucks 602 and 603. As may be seen in FIG. 23, the ends 624 include straight end surfaces 618 and inclined end surfaces 619 for cooperation with adjacent cars in an associated train.

The cross-sectional configuration of the body 610 between the lower ends 623 is identical to that of the body 140, i.e., is identical to that shown in FIG. 3. The ends 623 and 624 are open so that automobiles have access therethrough to the storage sections 621 and 622 as the case may be, but the lower passenger walkway terminates in stairways 616 and 617 disposed to the front and rear, respectively, and leading upwardly to a corridor which communicates with the adjacent open end 624 and the adjacent end of the upper passenger walkway.

From the above, it will be seen that there have been provided several combination railway and passenger automobile transportation systems which fulfill all of the objects and advantages set forth above. There further have been described several specialty cars useful therein including special coupling and truck structures, as well as loading and unloading stations forming a part thereof.

While there have been described what are at present considered to be certain preferred embodiments of the invention, it will be understood that various modifications may be made therein and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What I claim is:

1. A combination railway and passenger automobile transportation system comprising: a stretch of railway track; a railway train adapted to run on said stretch of railway track and including a front car and at least one intermediate car and a tail car, said intermediate car including first and second truck structures carrying first and second frames respectively, said first and second frames extending toward opening other and being detachably interconnected selectively to provide a draft connection therebetween and to permit decoupling thereof, centersills interconnecting the rear of said front car and the adjacent one of said first frames and interconnecting the front of said tail car and the adjacent one of said second frames, a plurality of bodies corresponding in number to the number of said centersills and each shiftably mounted with respect to the associated centerill for movement between a running position and a loading position, each body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalks and openings in the opposite ends thereof, whereby a passenger automobile may be driven onto and off of said floor through either opening of said body when said body is in the loading position thereof, a loading area including two platforms respectively disposed on the opposite sides of a section of said railway track and including a number of transfer positions therealong equal in number to the number of said centersills, and means for shifting each of said bodies between the running position thereof and the loading position thereof, the openings in said bodies being respectively disposed toward said platforms and respectively operatively associated therewith when said bodies are in the loading positions thereof, whereby a passenger automobile on either one of said platforms may be driven onto the floor of one of said bodies when it occupies one of the transfer positions at said loading area and is in its loading position, and whereby a passenger automobile occupying a loaded position on the floor of one of said bodies may be driven directly onto either one of said platforms when said body occupies one of the transfer positions at said loading area and is in its loading position.

2. The combination railway and passenger automobile transportation system set forth in claim 1, wherein said means detachably interconnecting said first and second frames fixedly interconnects said first and second frames to maintain said first and second frames in a fixed longitudinal alignment with respect to each other.

3. The combination railway and passenger automobile transportation system set forth in claim 1, wherein a passenger lounge is mounted on said frames.

4. The combination railway and passenger automobile transportation system set forth in claim 1, and further comprising an auxiliary body pivotally mounted on one of said frames for pivotal movement between a running position and a loading position, said auxiliary body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalks and openings in the opposite ends thereof, whereby a passenger automobile may be driven onto and off of the floor of said auxiliary body through either open end thereof when said auxiliary body is in the loading position thereof adjacent to one of said transfer positions.

5. The combination railway and passenger automobile transportation system set forth in claim 5, wherein said auxiliary body accommodates only one passenger automobile therein.

7. A railway train for the railway transportation of both passenger automobiles and passengers thereof, said railway train comprising: a front unit and at least one intermediate unit and a rear unit, said front unit including a front car and a first intermediate car and a first support section arranged in tandem relationship, centersills interconnecting said first support section and the front of said first intermediate car and the said first support section, each of said intermediate units including a second support section and a second intermediate car and a third support section arranged in tandem relationship, centersills interconnecting said second support section and the front of said second intermediate car and interconnecting the rear of said first intermediate car and the said second support section, said rear unit including a tail car, means for coupling said first support section and the adjacent one of said second support section, and means for coupling the front of the tail car to the adjacent one of said third support sections, and a plurality of bodies corresponding in number to said centersills and each shiftably mounted with respect to the associated centerill for movement between a running position and a loading position, each body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalks and openings in the opposite ends thereof, whereby a passenger automobile may be driven onto and off of said floor through either open end of said body when said body is in the loading position thereof.

8. A railway train for the railway transportation of body passenger automobiles and the passengers thereof, said railway train comprising a front unit and at least one intermediate unit and a rear unit, said front unit including a front car and a first support car and a first intermediate car arranged in tandem relationship, centersills interconnecting and supported by the rear of said front car and the front of said first support car and interconnected and supported by the rear of said first support car and the front of said first intermediate car, said intermediate unit including a second support car and a third support car and a second intermediate car arranged in tandem relationship, centersills detachably interconnecting and supported by the rear of said first intermediate car and the front of said associated one of said second support cars and interconnected and supported by the rear of said second support car and the front of said third support car and interconnected and supported by the rear of said third support car and the front of said second intermediate car and the front of said fourth support car and a tail car arranged in tandem relationship, centersills detachably interconnecting the rear of said associated one of said second intermediate car and the
front of said fourth support car and interconnecting the rear of said fourth support car and the front of said fifth support car and interconnecting the rear of said fourth support car and the front of said tail car, and a plurality of bodies corresponding in number to said centersills and each shiftably mounted with respect to the associated centersill for movement between a running position and a loading position, each body having a substantially boxlike configuration including a substantially horizontal floor and a generally horizontal roof and a pair of upstanding sidewalls and openings in the opposite ends thereof, whereby a passenger automobile may be driven onto and off of said floor through either open end of said body when said body is in the loading position thereof.

9. The railway train set forth in claim 8, wherein the ends of said centersills detachably connected respectively to the rear of said first intermediate car and to the rear of said second intermediate car carry thereon auxiliary wheels for engaging the associated railway track when said centersills are detached respectively from said first intermediate car and second intermediate car.

10. The railway train set forth in claim 8, wherein the adjacent ends of the pair of centersills connected to one of said support cars are pivotally mounted thereon, and bisecting linkage interconnects the adjacent ends of said centersills to maintain the transverse axis of said support car bisecting the angle between said centersills on curved sections of the associated railway track.

11. The railway train set forth in claim 8, wherein each of said bodies is pivotally mounted on the adjacent one of said centersills and in the running position thereof has the longitudinal axis thereof in longitudinal alignment with the associated centersill and in the loading position thereof has the longitudinal axis thereof disposed at an angle with respect to the longitudinal axis of the associated centersill.

12. The railway train set forth in claim 8, wherein said front car and said support cars and said intermediate cars and said tail car have support structure thereon cooperating with support structure on said bodies to support the weight of said bodies and the contents thereof when said bodies are in the running positions thereof.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,584,534 Dated June 15, 1971
Inventor(s) Veljko Milenkovic

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 17, Claim 1, line 39, delete "opening" and insert
--- each ---.

Signed and sealed this 2nd day of November 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR. ROBERT GOTTSCHALK
Attesting Officer Acting Commissioner of Patents