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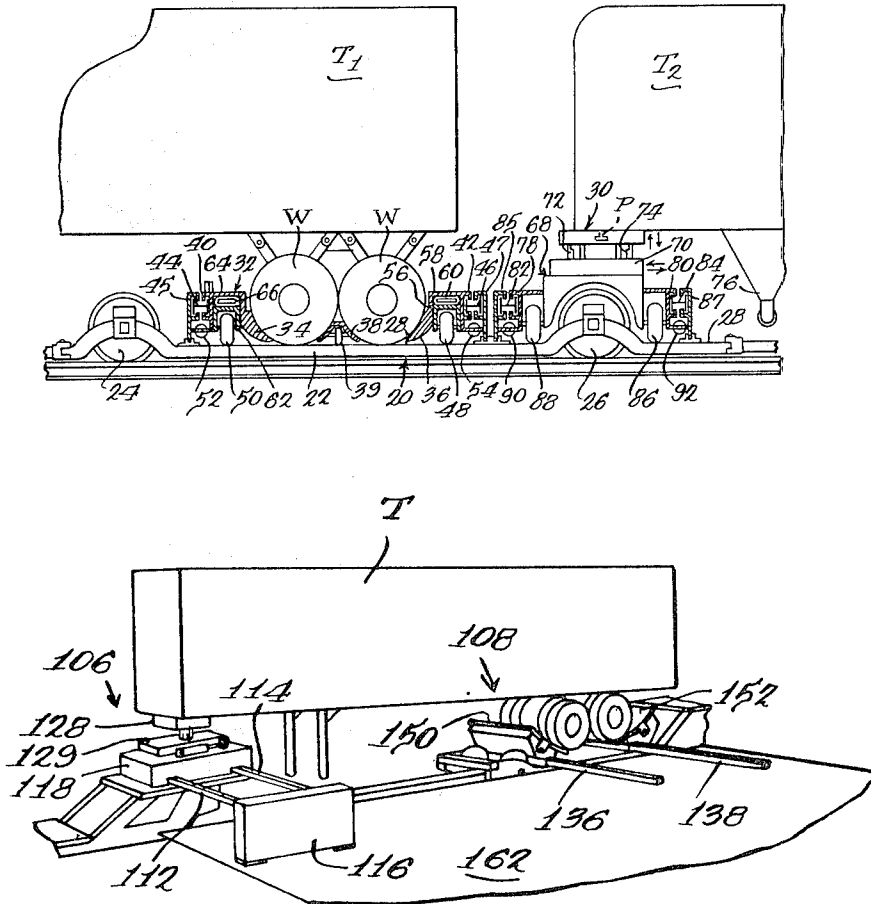
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[54] **APPARATUS FOR PIGGYBACK RAIL TRANSPORTATION**
 6 Claims, 15 Drawing Figs.

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 105/159, 214/38D, 214/516
 [51] Int. Cl..... **B61d 3/00,**
 B65j 1/14
 [50] Field of Search..... **105/366,**
 368 (B), 159, 4; 214/38.8, 515, 516

ABSTRACT: An improved piggyback rail truck of a dropframe design having one platform for supporting the wheels of a highway trailer and a second platform for supporting the nose of another trailer and including automatic mechanism for loading and unloading a trailer from the side of a piggyback train comprised of such rail trucks.



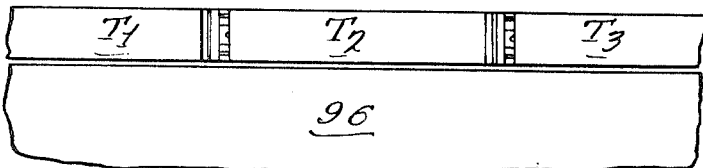
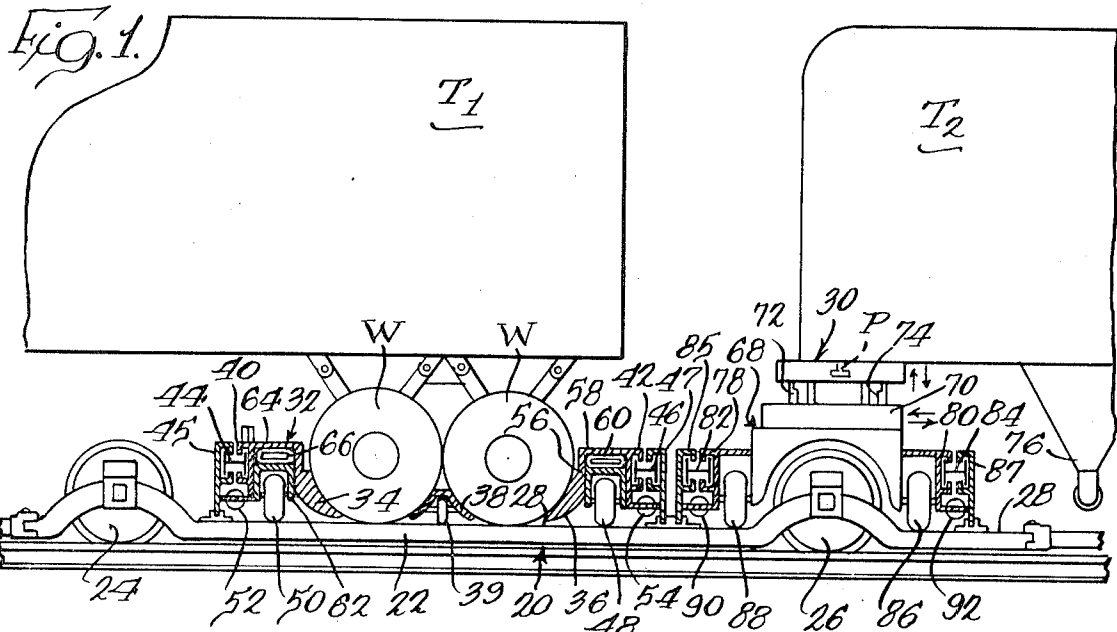


Fig. 2.

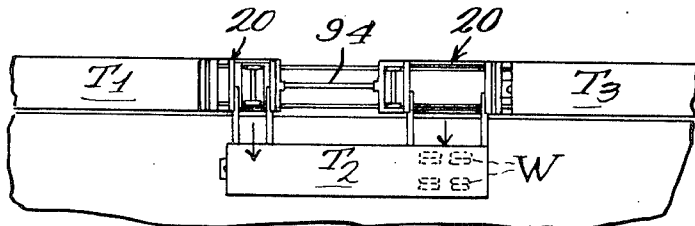


Fig. 3.

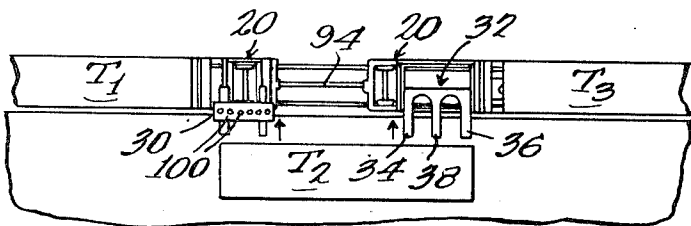


Fig. 4.

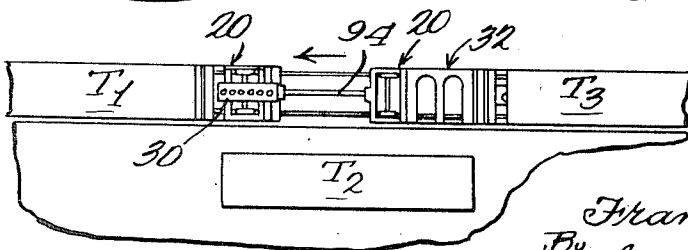
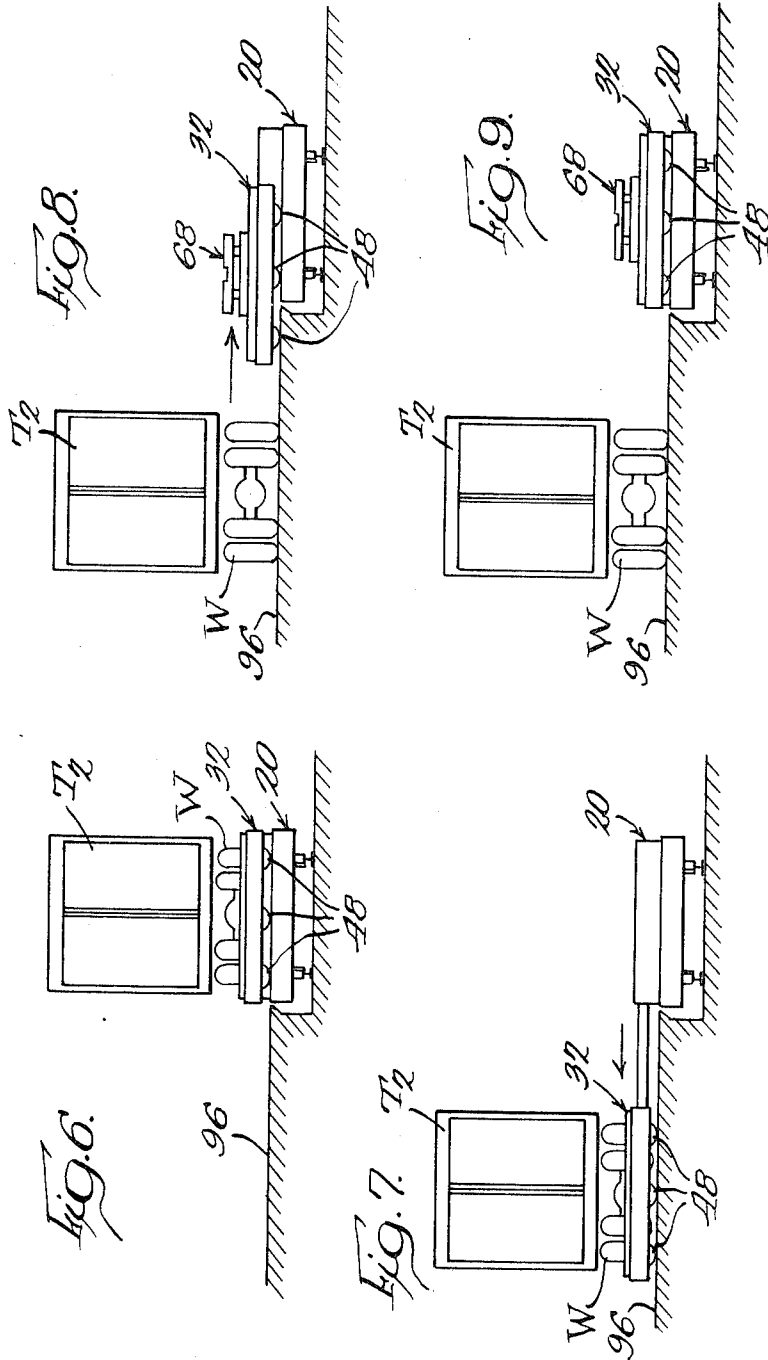
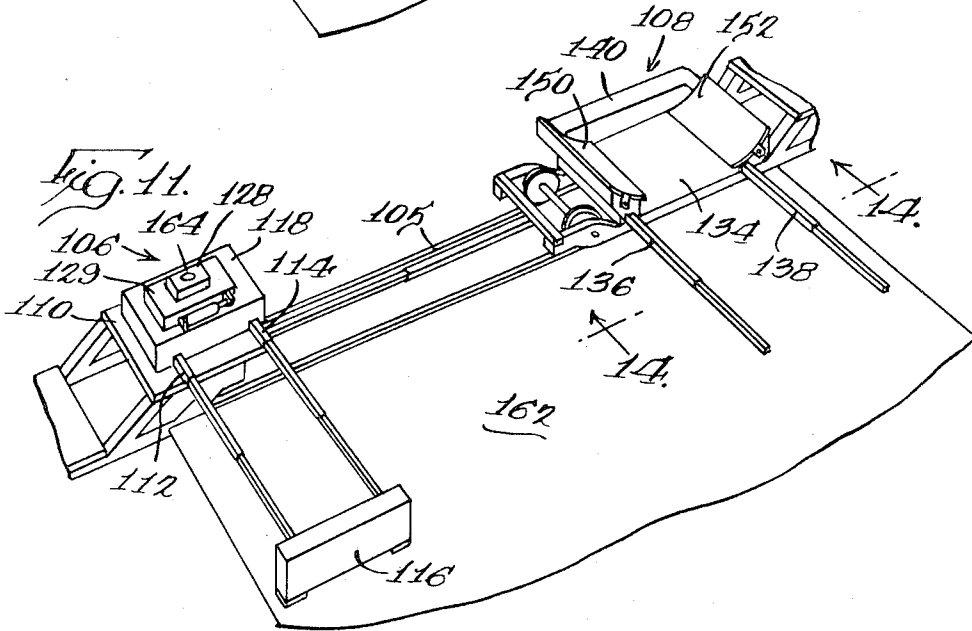
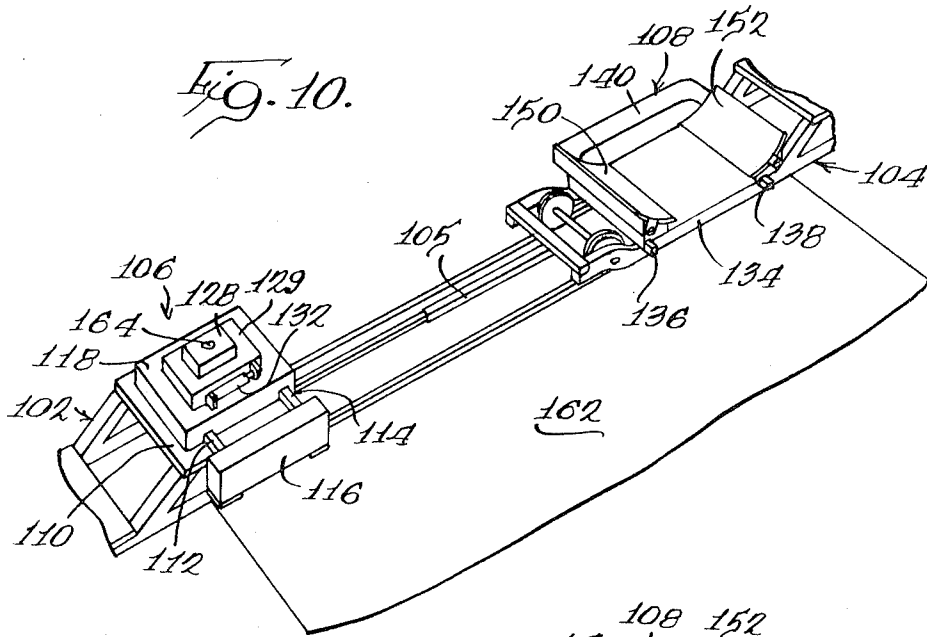


Fig. 5.

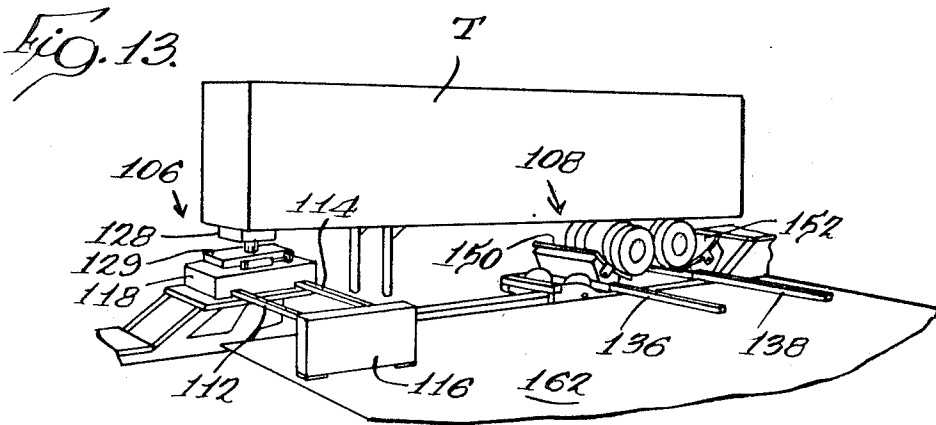
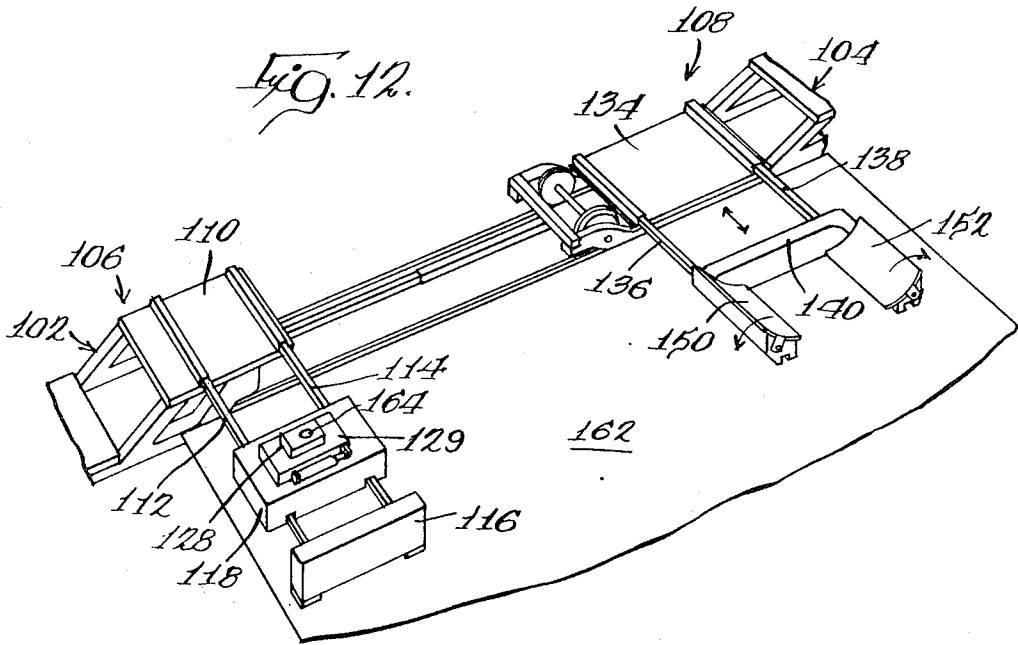
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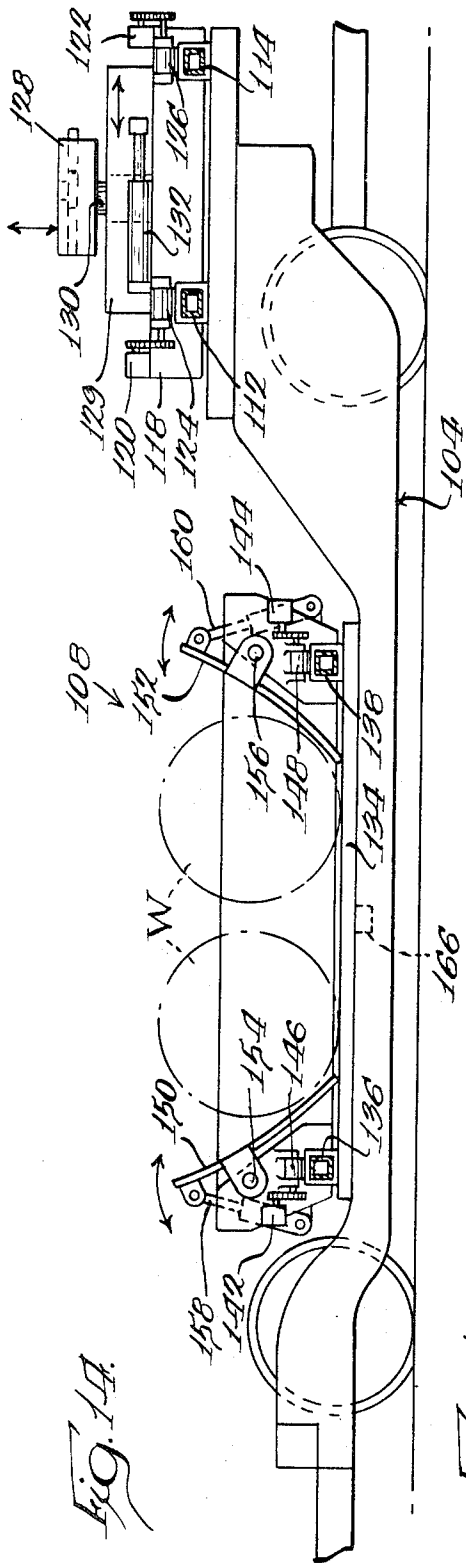


Fig. 14.

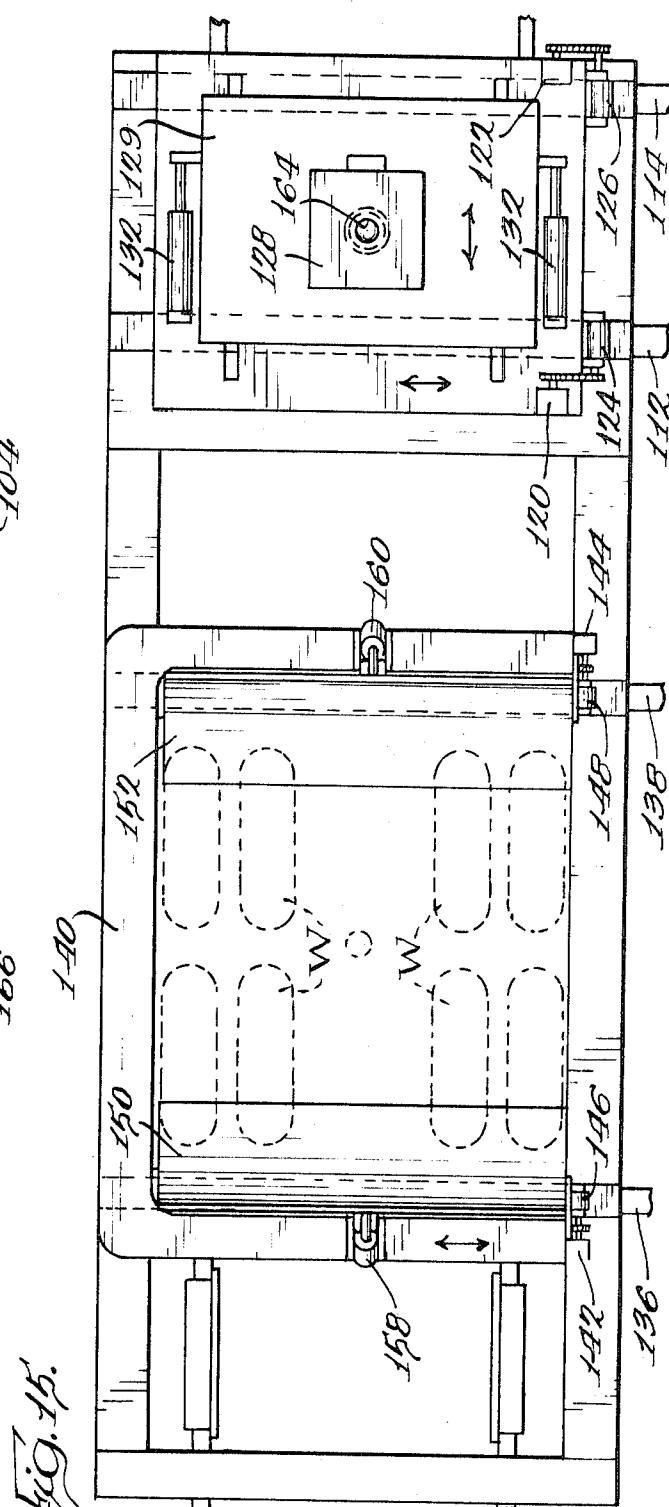


Fig. 15.

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APPARATUS FOR PIGGYBACK RAIL TRANSPORTATION

BRIEF SUMMARY OF THE INVENTION

The present invention relates to an improved type of piggyback train for transporting highway trailers without requiring removal of the bogie or wheel assembly from the trailer. In my copending application Ser. No. 759,465, filed Sept. 12, 1968, I have described a piggyback train comprising a plurality of elongated rail trucks connected together by tubes or beams or the like, and each of the rail trucks is provided with two platforms, one of which supports the wheels of one highway trailer and the other of which supports the nose of another trailer.

In accordance with the foregoing design, the highway trailer itself serves as a bridge between two adjacent rail trucks, and thus the usual railway car body is eliminated. Another feature of the foregoing rail truck is that the platform which supports the wheels of the highway trailer is located at a substantially lower level than the platform which supports the nose or kingpin of an adjacent trailer. The lower one of the two platforms is preferably disposed beneath the level of the axes of the rail truck wheels, whereby a highway trailer supported thereon is disposed relatively close to the railroad tracks thus requiring substantially less clearance than conventional piggyback cars. For a more complete description of an elongated dropframe piggyback rail truck of the foregoing type, reference may be had to the above-identified copending application, Ser. No. 759,465.

It is an object of the present invention to provide automatic loading and unloading mechanism for use with an elongated rail truck of the foregoing type.

More specifically, it is an object of the present invention to provide mechanism for use in conjunction with an elongated dropframe piggyback rail truck for automatically loading and unloading highway trailers from the side of a piggyback train.

The foregoing and other objects and advantages of the invention will be apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an elongated dropframe rail truck equipped with automatic loading and unloading mechanism constructed in accordance with the present invention;

FIGS. 2-5 are schematic top plan views of the mechanism of FIG. 1 showing the sequence of unloading a highway trailer from a piggyback train;

FIGS. 6-9 are schematic end elevational views corresponding to the sequential unloading steps shown in FIGS. 2-5;

FIGS. 10-13 are schematic perspective views of an alternative embodiment of the present invention showing the sequential steps of unloading a highway trailer from the side of a piggyback train, the trailer itself being shown only in FIG. 13;

FIG. 14 is a side elevational view of a rail truck looking substantially in the direction of the arrows 14-14 of FIG. 11; and

FIG. 15 is a top plan view of the rail truck of FIG. 14.

Now, in order to acquaint those skilled in the art with the manner of making and using my invention, I shall describe, in conjunction with the accompanying drawings, certain preferred embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is shown in FIG. 1 a rail truck 20 which is of a dropframe type having a main frame 22 supported for rolling movement on conventional track by a pair of forward wheels 24 and a pair of rear wheels 26. Because of the dropframe design of the rail truck 20, there is provided a lower platform or deck 28 which is disposed below

the horizontal axes of the wheels 24 and 26, and an upper platform 30 disposed above the axes of the wheels. A trailer wheel cradle 32 is generally E-shaped (see FIGS. 1, 4 and 5) and comprises a pair of outer legs 34 and 36 and a central leg 38, the latter being supported by one or more wheels 39. As best shown in FIG. 1, the outer legs 34 and 36 are adapted for positioning forwardly and rearwardly of the wheels W of a trailer T, while the center leg 38 is adapted for positioning intermediate to the wheels of the trailer.

The trailer wheel cradle 32 comprises a unitary member which in addition to the leg members 34, 36 and 38 also includes a front telescoping guide arm 40 and a rear telescoping guide arm 42. The front guide arm 40 is movable in a telescoping manner along with a slidable I-beam 44, while the rear guide arm 42 is movable in a telescoping manner along with a slidable I-beam 46. The I-beams 44 and 46 are slidable along respective fixed guide brackets 45 and 47 which are stationarily mounted to the rail truck 20. In addition, the trailer wheel cradle 32 is mounted on six rubber-tired wheels, there being provided three inline rear wheels 48 (see FIGS. 6-9) and three inline front wheels 50. The axes of the wheels 48 and 50 extend longitudinally relative to the rail truck 20 so as to permit the wheel cradle 32 to roll back and forth in a transverse direction between the platform or deck 28 of the rail truck and a paved siding alongside the tracks, as will be described more fully hereinafter.

FIG. 1 further shows a double-acting hydraulic cylinder 52 connected between the guide arm 40 and the rail truck 20 for moving the wheel cradle 32 between a loaded position and an unloaded position, there being provided a second hydraulic cylinder 54 between the rail truck and the second guide arm 42. It will further be noted the wheels 48 are disposed in a wheel bracket 56 which is slidable upwardly and downwardly in a wheel housing 58 which is integral with the wheel cradle 32. An inflatable air bag 60 is disposed within the wheel housing 58 above the wheel bracket 56 for controlling the vertical position of the wheel cradle 32. In a similar manner, the wheels 50 are disposed in a wheel bracket 62 which is a slidable upwardly and downwardly in a wheel housing 64 which is integral with the wheel cradle 32. An inflatable air bag 66 is disposed within the wheel housing 64 above the wheel bracket 62 for controlling the vertical position of the wheel cradle 32, it being understood that the two air bags 60 and 66 are intended to be operated together to raise and lower the wheel cradle 32 while maintaining the same in a substantially horizontal position.

Still referring to FIG. 1, the upper platform 30 is designed to receive the kingpin P of a second trailer T₂ and thereby support the nose of the latter trailer. Thus, there is provided a trailer nose cradle 68 above which is mounted an intermediate platform or carriage 70, and the previously described kingpin platform 30 is supported above the carriage 70 and is movable vertically relative thereto on a pair of hydraulic cylinders 72 and 74. The platform or fifth wheel plate 30 is movable vertically for purposes of moving the nose of the trailer T₂ between an elevated position as shown in FIG. 1 and a lowered position in which the trailer is supported on its landing gear 76, as will be explained more fully hereinafter.

The purpose of the intermediate platform or carriage member 70 is to provide for longitudinal adjustment of the position of the kingpin platform or fifth wheel plate 30 in order to accommodate the precise location of the kingpin P. In other words, for trailers of a given size, the precise distance between the bogie or wheel assembly at the rear of the trailer and the kingpin at the forward end thereof will vary, and thus it is desirable that the carriage 70 be adjustable forwardly and rearwardly a limited amount relative to the kingpin cradle 68. If desired, a longitudinal cushioning apparatus can be associated with the carriage 70 for cushioning the kingpin platform or fifth wheel plate 30 against shocks.

The kingpin cradle 68 includes a front telescoping guide arm 78 and a rear telescoping guide arm 80 which together with the cradle form a unitary assembly. The front guide arm

78 is movable in a telescoping manner along with a slidable I-beam 82, while the rear guide arm 80 is movable in a telescoping manner along with a slidable I-beam 84. The I-beams 82 and 84 are slidable along respective fixed brackets 85 and 87 which are stationarily mounted to the rail truck 20. In addition, the kingpin cradle 68 is mounted on a plurality of rubber-tired wheels, there being provided at least two inline rear wheels 86 and at least two inline front wheels 88. The axes of the wheels 86 and 88 extend longitudinally relative to the rail truck 20 so as to cooperate with the wheels on a corresponding trailer wheel cradle 32 in permitting a trailer to be loaded on a rail truck 20 or unloaded therefrom, as will be described more fully later herein.

The double-acting hydraulic cylinder 90 is connected between the guide arm 78 and the rail truck 20 for moving the kingpin cradle 68 between a loaded position and an unloaded position, there being provided a second hydraulic cylinder 92 between the rail truck and the second guide arm 80. It will be noted that the wheels 86 and 88 need not be movable vertically relative to the kingpin cradle 68 since vertical movement of the platform 30 is provided by the hydraulic cylinders 72 and 74.

The operation of the foregoing apparatus of FIG. 1 will now be described in conjunction with the schematic views of FIGS. 2-5 and 6-9. It will first be noted in FIGS. 2-5 that there are shown a pair of elongated rail trucks 20 interconnected by a connecting rod or push-pull tube 94, and it will be understood that the present invention contemplates the use of a plurality of such rail trucks 20 interconnected by connecting rods 94 so as to make up a unit train for piggyback transportation of highway trailers, as is described more fully in my copending application Ser. No. 759,465. It will further be noted that there is shown in FIGS. 6-9 a paved unloading platform 96 which parallels the railway tracks at a level approximately the same as the height of the rail truck platform or deck 28, i.e., approximately 18 inches above the track. As a result, it is possible for the trailer wheel cradle 32 and the kingpin cradle 68 to roll from the rail truck deck 28 directly to the paved unloading platform 96.

Referring now to the sequence of unloading a highway trailer from a piggyback train of the type described herein, and having in mind the specific components described in connection with FIG. 1, it will be seen that FIGS. 2 and 6 show a trailer T_2 in a loaded position on the train, the trailer being located alongside the paved unloading platform 96. It will be understood that in such a position the kingpin platform 30 is raised so that the trailer landing gear 76 is supported above the connecting rod 94, and the air bags 60 and 66 are inflated so that the trailer wheel cradle 32 is in a raised position thereby supporting the trailer wheels above the rail truck deck 28 and above the surface of the unloading platform 96.

In order to initiate an unloading operation, the two hydraulic cylinders 52 and 54 are actuated to move the wheel cradle 32 to the position shown in FIGS. 3 and 7, and the two hydraulic cylinders 90 and 92 are actuated in unison therewith so as to move the kingpin cradle 68 to the position shown in the latter two FIGS. During such movement, the rubber-tired wheels 48 and 50 of the trailer wheel cradle 32, and the wheels 86 and 88 of the kingpin cradle 68, roll from the rail truck deck 28 to the paved siding 96. It will also be understood that such movement is controlled by the fixed beam members 44 and 46 which cooperate with the guide arms 40 and 42, and by the fixed beam members 82 and 84 which cooperate with the guide arms 78 and 80.

When the trailer T_2 has been moved to the position shown in FIGS. 3 and 7, the nose end of the trailer is lowered through operation of the hydraulic cylinders 72 and 74 which cause lowering of the kingpin platform 30 until the trailer landing gear 76 engages the ground surface 96. At the same time, the air bags 60 and 66 are deflated so as to lower the wheel cradle 32 thereby lowering the three leg members 34, 36 and 38 until the trailer wheels W engage the ground surface, it being understood that the latter three leg members are designed so

that they will still be spaced slightly above the ground surface after the trailer wheels W are firmly supported on the ground. In this connection it should be noted that if it is desired to utilize an additional wheel such as shown at 39 for the purpose of supporting the center leg 38 of the cradle 32, then means must be provided for retracting such wheel when the air bags 60 and 66 are deflated.

Once the trailer T_2 has been lowered so that it is supported on the paved siding 96, the hydraulic cylinders 52, 54, 90 and 92 are actuated in the opposite direction so as to retract the wheel cradle 32 and kingpin cradle 68 through the positions shown in FIGS. 4 and 8 to the fully retracted positions of FIGS. 5 and 9, after which the train may proceed.

It will be understood that the operation of loading a highway trailer onto a piggyback train is equally as simple as the unloading operation described hereinabove. When the wheel cradle 32 is moved outwardly beneath the wheels of a trailer to be loaded, the air bags 60 and 66 are deflated so that the cradle is in a lowered position. Similarly, when the kingpin cradle 68 is moved outwardly beneath the nose end of a trailer to be loaded, the kingpin platform 30 is disposed in its lowered position. When the foregoing cradle members have been positioned beneath the trailer wheels W and the kingpin P respectively, then the platform 30 is raised through operation of the cylinders 72 and 74 to lift the nose end of the trailer, and the air bags 60 and 66 are inflated to lift the rear end of the trailer, after which the two cradles may be withdrawn to their fully retracted positions in the manner described above.

It was mentioned above that the carriage 70 is preferably adjustable longitudinally relative to the nose cradle 68 in order to accommodate the precise location of the kingpin P. Such adjustability may be provided by any suitable actuating means such as a hydraulic cylinder or the like which is capable of moving the carriage 70 relative to the cradle member 68. Alternatively, or in addition thereto, the kingpin platform 30 may be provided with a plurality of spaced holes, as shown for example at 100 in FIG. 4, whereby a selected one of such holes may be used to receive the kingpin P depending upon the precise position of the latter.

If desired the apparatus of FIG. 1 may be modified by providing power means such as electric motors or the like for driving selected ones of the rubber-tired wheels 48, 50, 86 and 88, in which case such motors would serve to drive the cradle members 32 and 68 between the rail truck deck 28 and the paved siding 96. In accordance with a design of the latter type, it will be understood that the hydraulic cylinders 52, 54, 90 and 92 could be eliminated.

Reference is now made to FIGS. 10-15 which illustrate an alternative embodiment of automatic loading and unloading apparatus in accordance with the present invention. It will be understood from the earlier description herein that each rail truck comprises an upper kingpin platform and a lower trailer wheel platform. Thus, it will be noted that FIG. 10 shows two adjacent elongated dropframe rail trucks 102 and 104 interconnected by a connecting rod member 105. For purposes of illustration, there is shown only an upper kingpin platform assembly 106 of the rail truck 102, and a lower trailer wheel platform assembly 108 of the rail truck 104, which platforms cooperate to support a trailer T as shown for example in FIG. 13.

Referring to FIG. 11, and in particular to the kingpin platform assembly 106, there is shown a platform base 110 which mounts a pair of telescopic extendable rail members 112 and 114, and the outer ends of the two rail members are interconnected by a common foot member 116. The rail members 112 and 114 are extendable and retractable between the fully extended positions shown in FIG. 11 and the fully retracted positions shown in FIG. 10. The rails are movable between the foregoing positions automatically and may be operable in the manner of double acting hydraulic cylinders or by any other suitable mechanism.

A kingpin carriage 118 is mounted on the rails 112 and 114 for sliding movement therealong between a normal position as

shown in FIG. 11 and a loading position as shown in FIG. 12. FIG. 14 shows a pair of electric drive motors 120 and 122 for driving rollers or the like as shown at 124 and 126 for the purpose of moving the carriage 118 along the rails. FIG. 14 further shows a kingpin platform 128 carried above an intermediate platform member or carriage 129 on a hydraulic cylinder 130 which permits vertical movement of the platform 128, as will be described more fully hereinafter.

If desired, the intermediate carriage or platform 129 may be mounted for longitudinal sliding movement on the carriage 118, and there is shown a hydraulic cylinder 132 for effecting such movement. As described earlier herein, such movement of an intermediate platform or carriage beneath the kingpin platform will afford automatic adjustment of the position of the latter in order to accommodate the precise position of the kingpin on a trailer to be loaded, and if desired cushioning mechanism may be associated with the carriage 129 for cushioning against longitudinal shocks.

Reference is now made to the lower platform assembly as shown at 108 in FIG. 10. There is shown a platform base 134 which mounts a pair of telescopic extendable rail members 136 and 138, the rail members being extendable and retractable between the fully extended positions shown in FIG. 11 and the fully retracted positions shown in FIG. 10. The rails are movable between the foregoing positions automatically, and may be operable in the manner of double acting hydraulic cylinders or by any other suitable mechanism.

A U-shaped trailer wheel carriage member 140 is mounted on the rails 136 and 138 for sliding movement therealong between a normal position as shown in FIG. 11 and a loading position as shown in FIG. 12. FIG. 14 shows a pair of electric drive motors 142 and 144 for driving rollers or the like as shown at 146 and 148 for the purpose of moving the carriage 140 along the rails. FIG. 14 further shows a pair of trailer wheel supporting plates 150 and 152 which are pivotally mounted at 154 and 156 to the oppositely disposed legs of the U-shaped carriage member 140. The supporting plates 150 and 152 are movable by corresponding hydraulic actuating cylinders 158 and 160 between operative positions wherein the lower ends are raised sufficiently to lift the wheels W of a highway trailer off the ground or supporting surface and inoperative or release positions wherein the lower ends of the plates are lowered sufficiently to release the trailer wheels.

It will be understood that when the various rail members 112, 114, 136 and 138 are extended as shown in FIG. 11, they serve to support the respective carriages 118 and 140 together with a highway trailer member carried by the latter. Accordingly, the rail members when extended must be supported on a paved siding as shown for example at 162. It may therefore be desirable in some applications to provide each of the rail members with a foot at its outer end which will lower itself to the ground for support thereon after the rail member has been fully extended.

The operation of the foregoing apparatus as shown in FIGS. 14 and 15 will now be described in conjunction with the sequential views of FIGS. 10-13. FIG. 10 shows the apparatus in its retracted position, and as illustrated no highway trailer is supported thereon. In order to perform a loading operation the apparatus is lined up with a highway trailer parked parallel to the tracks on the siding 162. Thereafter, the rail members 112, 114, 136 and 138 are extended to the positions shown in FIG. 11. In order to more clearly illustrate the mechanism itself, no highway trailer is shown in FIGS. 10-12, but it will be understood that the rails 112 and 114 are extended beneath the kingpin at the nose of a parked trailer, while the rails 136 and 138 are extended so that one rail lies immediately forwardly of the trailer wheels while the other lies immediately behind the same.

It should be noted that during a loading operation as being described herein, the kingpin platform 128 will be in its lowered position, and the wheel-supporting plates 150 and 152 will be in their release positions. Thus, the motors 142 and 144 are operated to move the wheel-supporting carriage 140

out on the rails 136 and 138 to the position shown in FIG. 12, and at the same time the motors 120 and 122 are operated to move the kingpin carriage 118 out on the rails 112 and 114 to the position shown in FIG. 12. The kingpin carriage 118 includes an aperture 164 for receiving the kingpin of a highway trailer, and with the kingpin platform 128 positioned immediately beneath the kingpin of a trailer to be loaded, the platform is raised by means of the lift cylinder 130 so as to cause the trailer kingpin to be received in the aperture 164, after which the platform 128 is raised further to lift the nose end of the trailer off the ground. In addition, with the wheel-supporting plates 150 and 152 disposed forwardly and rearwardly of the wheels of a trailer to be loaded, the hydraulic cylinders 158 and 160 are operated to pivot the lower ends of the supporting plates upwardly thereby lifting the rear end of the trailer from the ground.

After a trailer to be loaded is supported above the ground or siding 162 on the kingpin carriage 118 and wheel carriage 140 as described above, the carriages are moved inwardly on the rails 112, 114, 136 and 138 to the positions shown in FIG. 13 thereby moving the trailer into a loaded position on the piggyback train, one end of the trailer being supported on one of the rail trucks 102 and the other end of the trailer being supported on the adjacent rail truck 104. Thereafter, the various track members are fully retracted to the positions of FIG. 10, after which the train may proceed. The unloading of a trailer from a piggyback train to a paved siding alongside the tracks is essentially the reverse of the foregoing. That is, the tracks 112, 114, 136 and 138 are extended, the carriages 118 and 140 are moved simultaneously along such tracks to their extended positions, the kingpin platform 128 is lowered and the wheel-supporting plates 150 and 152 are moved to released positions, thereby lowering the forward and rearward ends of the trailer to the ground so that it is supported on its landing gear and wheels. Thereafter, the carriage members 118 and 140 are retracted to the positions of FIG. 11, and finally the tracks are retracted to the positions of FIG. 10.

In some applications it may be found desirable to construct the entire trailer wheel assembly 108 so that it is capable of pivotal movement about a vertical axis as the piggyback train travels around a curve. In such a case, it will be understood that the trailer wheel platform base 134 as shown in FIG. 14 may be formed as a turntable which can be locked in the position shown during loading and unloading but is capable of pivotal movement about the pivot 166 when the train is in motion. In a similar manner, with reference to the embodiment of FIG. 1, the portion of the rail truck deck 28 disposed beneath the entire trailer wheel cradle 32 may be constructed as a turntable capable of movement about a vertical axis when the piggyback train is in motion.

I claim:

1. Automatic loading and unloading apparatus for use with rail cars for piggyback rail transportation of highway trailers, comprising, in combination, nose cradle means mounted on a rail car for supporting the forward end of a trailer, wheel cradle means mounted on a rail car for supporting the wheels of said trailer, said wheel cradle means including a pair of oppositely disposed wheel support members which are spaced apart to permit transverse movement of said wheel cradle means from the side of a trailer into an operative position relative to the wheels of the trailer with one support member positioned immediately forward of the trailer wheels and the other support member positioned immediately rearward of the trailer wheels, wheel cradle lift means for conjointly moving said pair of wheel support members in a generally vertical direction between a raised position wherein said wheels are supported by said support members and a lower position wherein said wheels are released by said support members, said nose cradle means and said wheel cradle means each being movable in a direction transverse to the longitudinal axis of said rail car between a first position wherein they are disposed on said rail car and a second position wherein they are disposed on a siding located to one side of said rail car, and

actuating means for simultaneously moving said nose and wheel cradle means between said first and second positions.

2. Apparatus as defined in claim 1 where said nose cradle includes a kingpin platform having means for receiving and holding the kingpin of a trailer to be supported.

3. Apparatus as defined in claim 1 including nose cradle lift means for raising and lowering the forward end of a trailer supported thereon.

4. Apparatus as defined in claim 1 where said nose cradle means and said wheel cradle means are each mounted on a plurality of wheels having axes disposed generally parallel to the longitudinal axis of said rail car whereby said nose and wheel cradles may be moved on said wheels between said rail car and said siding.

5. Apparatus as defined in claim 4 where said wheels are

equipped with tires which roll directly on a deck of said rail car and on said siding during transverse movement of said nose and wheel cradles, and drive means connected with selected ones of said wheels so that said nose and wheel cradles are self-powered.

6. Apparatus as defined in claim 1 where said nose cradle means includes a cradle base member, an intermediate carriage disposed above said cradle base member, said carriage being adjustably movable relative to said base member in a direction parallel to the longitudinal axis of said rail car, and a kingpin platform disposed above said carriage, said kingpin platform being movable vertically relative to said carriage.

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