United States Patent

[11] **3,540,381**

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[54] **LOCOMOTIVE WITH ELEVATABLE CHASSIS AND COUPLER**
9 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **105/75,** 105/26, 105/215, 214/715
[51] **Int. Cl.** **B61c 11/00,** B61c 15/04, B11f 5/40
[50] **Field of Search** 105/26, 26.1, 73, 75, 215; 214/750, 75

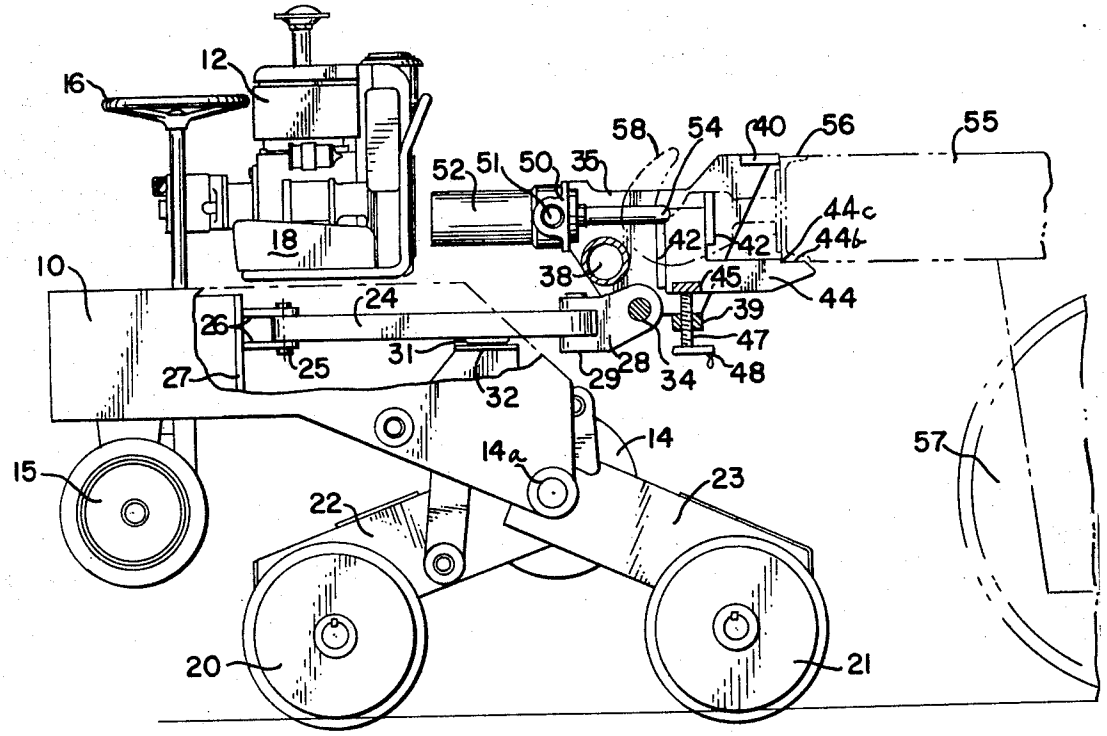
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3,198,137	8/1965	White	105/73X
3,232,241	2/1966	White	105/75

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ABSTRACT: The coupler includes a fluid pressure operated cylinder having the piston rod thereof supporting a draft ring, such ring being adapted for draft engagement with the draft hook of a European-type railway car. The coupler also includes abutment surfaces adapted for abutting engagement with the end sill adjacent the draft hook at locations above and below the same. Appropriate actuation of the above cylinder draws the coupler to the car as a rigid extension of the latter. The coupler is mounted on a railway traction vehicle or locomotive and means are provided for applying a lifting force to the coupler for transferring a portion of the weight of the car to the vehicle. The point of weight transfer between the car and the vehicle is spaced outwardly of the end sill thereby facilitating design and construction of a traction vehicle with respect to preventing tipping of the latter.



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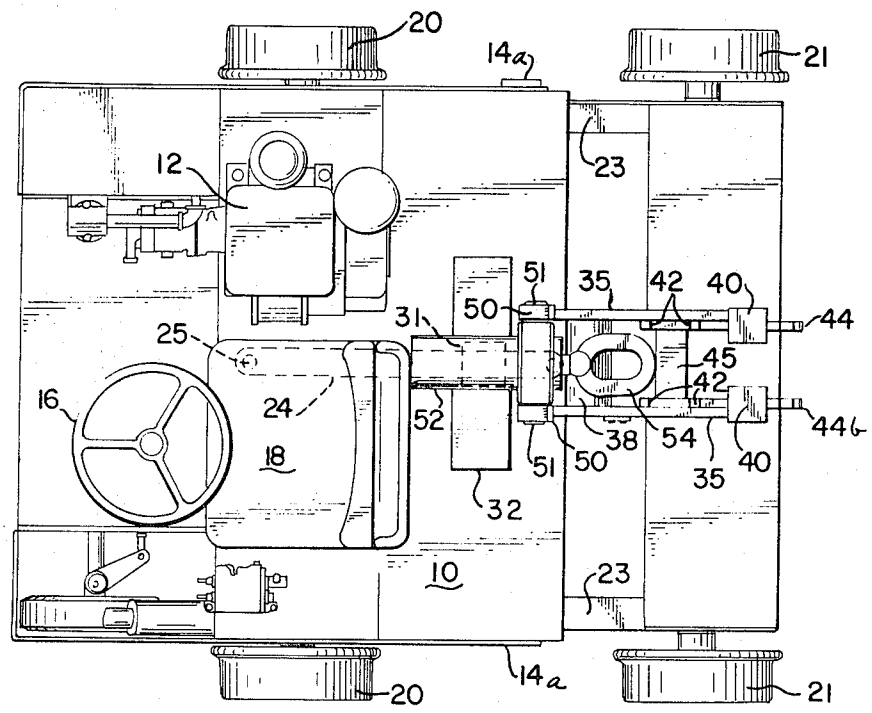


FIG. 1

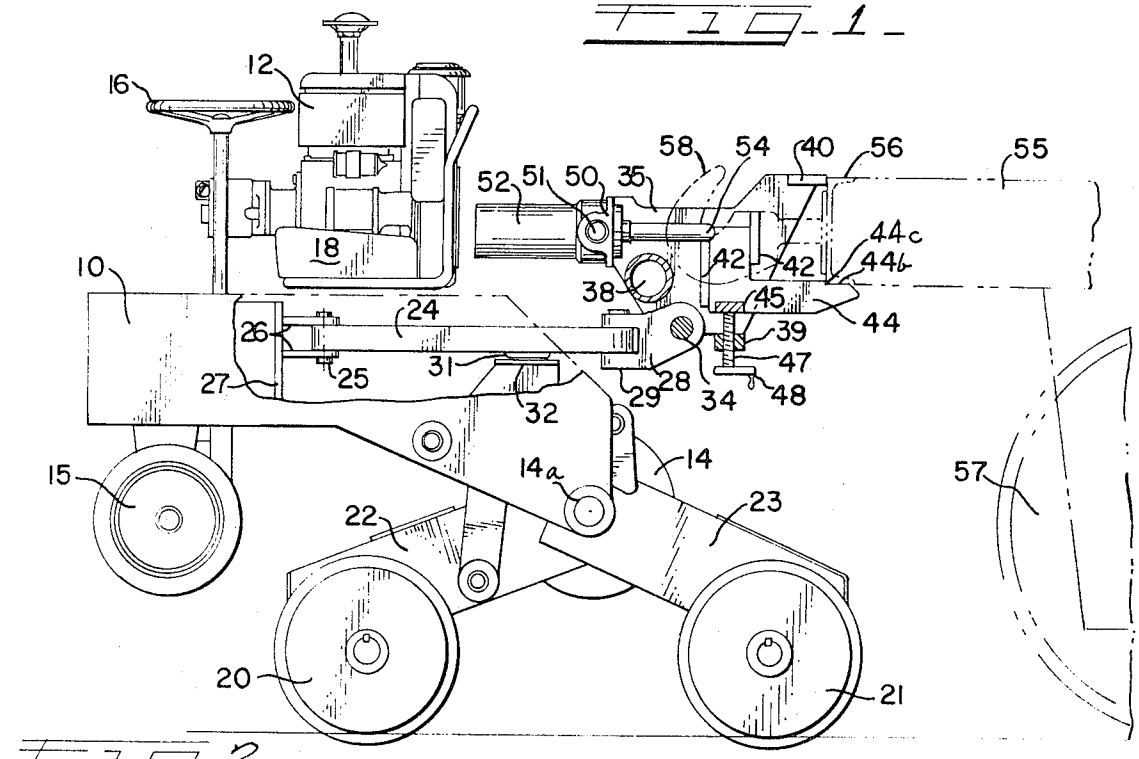
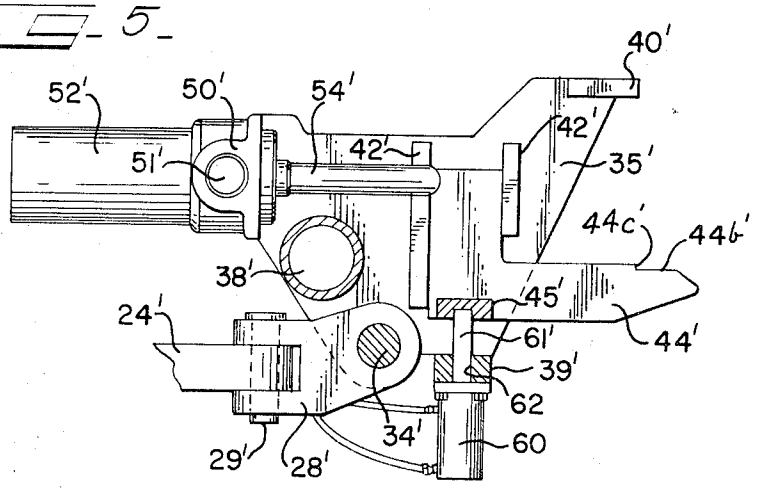


FIG. 2

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FIG. 5



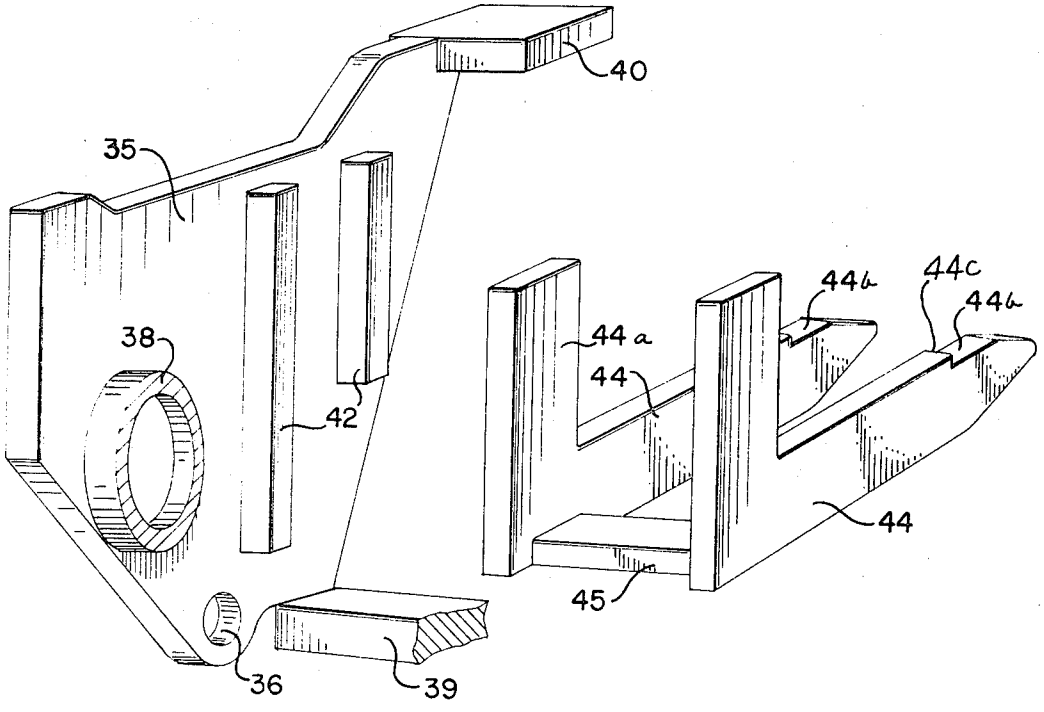


FIG. 3

FIG. 4

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LOCOMOTIVE WITH ELEVATABLE CHASSIS AND COUPLER

BACKGROUND OF THE INVENTION

Lightweight traction vehicles for moving railway cars in shops, yards and sidings are well known in the art. For example, these vehicles are shown in Bock et al. U.S. Pat. No. 2,718,195, Bock et al U.S. Pat. No. 2,718,197, Ames U.S. Pat. No. 2,721,522, Morey U.S. Pat. No. 2,722,897, and White, Jr. U.S. Pat. No. 3,198,137, all assigned to the assignee of the present application. These traction vehicles each include a coupler adapted for coupling and lifting engagement with the coupler of a railway car. The traction vehicles include power means, usually hydraulic means, for lifting the coupler on the traction vehicle in order to transfer a portion of the weight of the car to the vehicle thereby permitting the latter to develop a tractive effort greatly in excess of the tractive effort attributable to the weight of the vehicle itself.

The aforementioned traction vehicles are adapted for use with American-type railway cars. As is known to those skilled in the art, European-type railway cars differ from American-type cars in that the former are equipped with buffers and a centrally disposed draft hook all supported from the end sill of the car. In U.S. Pat. No. 3,232,241 to White, Jr., also assigned to the assignee of this application, several forms of coupling means are shown for coupling a traction vehicle to a European-type car thereby to transfer a portion of the weight of the latter to the traction vehicle. The forms of coupling mechanism shown in this White Patent engage the buffers and/or the end sill to transfer weight from the car to the vehicle. As is pointed out in White U.S. Pat. No. 3,232,241, it is necessary to apply the lifting force to the end sill of the car if a substantial weight transfer is to be brought about, as neither the buffers nor the draft hook on such cars are strong enough to transfer an appreciable lifting force.

The forms of coupling mechanisms shown in the White Patent under consideration have been generally satisfactory. However, in the form of coupler shown in that patent which engages the end sill of the railway car, the point of weight transfer between the car and the vehicle is adjacent the end sill. Therefore, one of the rail axles of the traction vehicle must be located adjacent or preferably inwardly of such end sill to prevent dangerous tipping of the traction vehicle. In contrast with American-type railway cars, the end rail wheels of European-type railway cars are located quite near the end of the car. Accordingly, when using the aforementioned coupling construction, it is in some instances difficult to mount the one pair of rail wheels on the traction vehicle at a position which will prevent tipping and still provide sufficient clearance between the adjacent rail wheels on the railway car.

The present invention eliminates this problem by providing a unique coupler which engages the end sill of a European-type railway car in a manner such that the point of weight transfer is located outwardly beyond the end of the car thereby making it easy to locate such point between the traction vehicle rail axles and yet have adequate clearance between the rail wheels on the traction vehicle and the rail wheels on the railway car.

OBJECTS OF THE INVENTION

A primary object of the present invention is the provision of a new and improved coupling apparatus for coupling engagement of a traction vehicle with a European-type railway car.

Another object of the present invention is the provision of a coupling apparatus of the type described which shifts the point of weight transfer between the car and the traction vehicle to a point spaced outwardly of the end of the car thereby facilitating design and construction of a railway traction vehicle which will not tip and which will maintain adequate clearance with the wheels of the railway car.

Still another object of the present invention is the provision of coupling apparatus of the type described, wherein such apparatus includes an adjustable jaw for rigid clamping engagement of the coupler with the end of the railway car.

These and other objects and advantages of the invention will become apparent from the following specification disclosing a preferred embodiment shown in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a traction vehicle including one embodiment of the present invention;

FIG. 2 is a side elevational view of the traction vehicle showing the same coupled with a railway car (shown fragmentarily in phantom lines) by the coupling apparatus of the present invention, certain parts being broken away and shown in section for better illustration of the invention;

FIG. 3 is an enlarged, fragmentary, perspective view of a portion of the coupling apparatus;

FIG. 4 is a perspective view of the adjustable jaw forming part of the coupling apparatus; and

FIG. 5 is a partial side elevation and partial section of a modified form of the coupler.

DESCRIPTION OF A PREFERRED EMBODIMENT

A lightweight traction vehicle on which the coupling apparatus of the present invention may be mounted includes a chassis or frame **10** supporting an internal combustion engine **12**. The chassis mounts a centrally located rear road wheel **14**, and a front pair of road wheels **15**, the latter being steerable from a steering wheel **16** mounted in front of an operator's seat **18**. It will be understood the vehicle includes suitable power transmission means (not shown) for driving the rear road wheel from the internal combustion engine.

A traction vehicle has a forward pair of rail wheels **20** and a rear pair of rail wheels **21** mounted respectively from pairs of arms **22**, **23**. These arms are mounted about the rear road wheel axis **14***a* for swinging movement between upper and lower positions. The traction vehicle includes power means, preferably hydraulic cylinders (not shown), engaged with the arms **22**, **23** through suitable linkage for swinging the rail wheels between a lower position illustrated in FIG. **2** and an upper position (not shown) wherein the rail wheels will be elevated above the road wheels permitting the latter to support the traction vehicle for roadway travel. The axles supporting the rail wheels **20** and **21** are driven, as by means of chain drives from the road wheel axle **14***a*, the latter being driven from the internal combustion engine.

The coupling apparatus according to the present invention includes a horizontally disposed arm **24** pivotally mounted at one end thereof to a vertically disposed pin **25**, the latter being supported in apertures in a pair of ear plates **26** which are secured to a chassis plate **27**. The other end of the arm **24** is received in a bifurcated portion of a lug **28** and pivotally mounts the latter by means of a vertically disposed pin **29** received in aligned apertures in the arm and in the lug. The arm **24** has a plate **31** secured thereto, which plate is slidably supported on the upper surface of a horizontally disposed slide plate **32**, which plate is suitably mounted from the chassis **10**. It will be understood the arm **24** is mounted for swinging movement in a horizontal plane about a vertical axis defined by the pivot pin **25**.

The lug **28** includes a horizontally disposed bore supporting a pin **34**, opposite ends of the latter being received in apertures formed in a pair of identical plates **35** defining a coupling member (one such aperture is illustrated in FIG. **3** and designated **36**). The plates **35** are secured in vertical, parallel spaced relation by a cross tube **38** and a crossbar **39**. Each plate **35** mounts an abutment block **40** for abutting engagement with the end sill of the European-type car in a manner to be explained hereinbelow. Each coupler plate **35** also includes a pair of vertically disposed, spaced guide bars **42**.

As best seen in FIG. **4**, the coupling apparatus includes a jaw assembly including a pair of identical jaw plates **44** secured together in parallel spaced relation by a crossbar **45**. Each jaw plate **44** has a vertically extending portion **44***a* slidably mounted between one of the pairs of guide bars **42**

thereby mounting the jaw plates **44** for vertical reciprocal movement relative to the coupler plates **35**. Each jaw plate **44** has a cutout portion defining surfaces **44***b* and **44***c* arranged for engagement with the end sill of the railway car as will be explained below.

Referring to FIG. **2**, it will be noted that manually operated screw means are provided for raising and lowering the jaw plates **44** relative to the coupler plates **35**. To this end, a screw member **47** is threadingly engaged in a threaded bore provided in crossbar **39** at the midpoint thereof. The upper end of screw **47** is rotatably received in a blind bore (not shown) in the crossbar **45**. An arm **48** is mounted on the lower end of the screw **47** to permit manual rotation of the latter for raising and lowering the jaw plates depending on the direction of rotation of the screw member **47**.

As noted in FIGS. **1** and **2**, the coupler plates **35** mount trunnion members **50** rotatably receiving oppositely extending pins **51** connected with a cylinder assembly **52** for pivotally mounting the latter about a horizontal transverse axis defined by the pins **51**. The fluid operated cylinder **52**, which is preferably of the hydraulic type and associated with control means (not shown) operated from a station adjacent the operator's seat **18**, includes a piston rod (not shown) mounting a horizontally disposed draft ring **54** for draft engagement with a European-type railway car as will be explained herein.

Referring to FIG. **2**, the European-type railway car includes a frame or substructure **55** having an end sill or channel **56**. The end of the railway car including this end sill is supported from a pair of rail wheels **57**. The end sill **56** mounts a draft hook **58** which projects outwardly from the end of the car on the centerline thereof.

The operation of the coupling apparatus according to the present invention is as follows:

The traction vehicle is positioned adjacent the end of the railway car, and the coupler is tilted about the pin **34** for engagement of the draft ring **54** with the draft hook **58** on the railway car. The coupler can be manually tilted about the pin **34**. Of course, power means, such as suitable fluid operated cylinders, could be provided to tilt the coupler about the horizontal transverse axis defined by the pin **34**. During this engagement between the draft ring **54** and the railway car hook **58**, the ring **54** will at least be partially extended from the cylinder **52**. The lever **48** will be operated to adjust the jaw plates **44** as necessary for engagement of the surfaces **44***b* thereof with the lower flange of the end sill **56**. As is known to those skilled in the art, the height of such end sills varies considerably from car to car. Pressure is then admitted to the cylinder **52** for moving the hook **54** toward the cylinder **52** thereby to draw the coupler toward the railway car with the blocks **40** and the surfaces **44***c* in abutting engagement with the end sill **56** at a location thereon above and below the draft hook **58**, respectively.

It will be apparent that such actuation of cylinder **52** causes the coupler to act as a rigid extension of the railway car. For purposes of illustration only, in one embodiment according to the present invention the cylinder **52** is adapted to exert a pulling force in the order of 30,000 pounds. This causes a resultant force in the blocks **40** of 15,000 pounds and the same resultant force at the surfaces **44***c*, since the latter and the blocks **40** are equally spaced below and above the centerline which extends through the cylinder **52**.

A portion of the weight of the car is transferred to the traction vehicle by actuating the fluid pressure operated means associated with the arms **22** and **23** for raising the traction vehicle, this resulting in lifting of the coupling apparatus. In the embodiment of the coupler under consideration, a 5,300 pound lifting force is applied to the coupler through the pivot pin **34**. By reason of the geometry of the coupler, it will be realized this lifting force at the pin **34** will result in an increase in the force being applied by the blocks **40** and a decrease in the force being applied to the surfaces **44***c*. In this particular embodiment, the force at the blocks **40** is increased to approximately 23,700 pounds and the force at the surfaces **44***c* is reduced to approximately 5,500 pounds. When a pushing force in the order of 3,000 pounds is applied to the car from the traction vehicle, the force at the blocks **40** is decreased slightly to approximately 22,000 pounds and the force at the surfaces **44***c* is increased to approximately 10,000 pounds. When a pulling force in the same magnitude is applied to the railway car by the traction vehicle, the force at the blocks **40** increases to approximately 25,000 pounds and the force at the surfaces **44***c* decreases to approximately 1,000 pounds.

It will be realized the force at the surfaces **44***c* must be maintained at some substantial value to prevent separation of the surfaces **44***c* from the end sill **56**. During both pushing and pulling with a lifting force being applied, it will be appreciated that the coupling apparatus acts as a rigid extension of the railway car such that the point of weight transfer is spaced outwardly of the end sill **56** and passes through the pin **34**. This point of weight transfer is well between the axles supporting the rail wheels **20** and **21** and adequate space remains between the rail wheels **21** and the car rail wheels **57**. In other words, the rear rail axle of the vehicle need not be positioned under or inwardly of the end sill **56** to locate the point of weight transfer between the rail axles of the traction vehicle. On the contrary, according to the present invention the rear rail axle of the vehicle may be spaced a considerable distance outwardly of the end sill without creating a tipping force on the vehicle during weight transfer.

During weight transfer by applying a lifting force to the coupling apparatus as just described, it will be appreciated the jaw surfaces **44***b* serve little or no function as far as such weight transfer is concerned. These surfaces facilitate proper positioning of the coupler relative to the end sill. Further, these surfaces act as a safety device to support the end of the car at the end sill should pressure to the cylinder **52** fail during weight transfer.

It will be appreciated the traction vehicle can readily negotiate curved track when coupled with a railway car in the manner just described. The two pivot axes defined by the pins **25** and **29** permit the coupling apparatus to shift in a horizontal plane to accommodate the lateral shifting movement between the traction vehicle and the adjacent end of the railway car.

A modified form of coupling apparatus is illustrated in FIG. **5**. The parts shown in FIG. **5** which correspond to the parts of the FIGS. **1**—**4** embodiment are indicated by the prime form of numeral. The modification according to FIG. **5** differs from the aforedescribed coupling apparatus only in the means for adjustably moving the jaw plates **44'**.

A small fluid pressure operated cylinder **60** is secured to the underside of the crossbar **39'** by suitable fastening means. The cylinder **60** includes a piston rod **61** which extends freely through a bore **62** in the crossbar **39'**. The upper end of this piston rod is received in a blind bore formed in the underside of the crossbar **45'**. It should be apparent that actuation of the cylinder **60**, which may be accomplished by suitable control means located adjacent the operator's seat **18**, will result in raising and lowering of the jaw plates **44'** for clamping engagement of the modified coupling apparatus with the end sill of a railway car.

It will be understood the coupling apparatus according to the present invention is not to be limited for use with the particular traction vehicle illustrated. For example, the coupling apparatus can be readily adapted for use with the traction vehicles shown in the above mentioned patents.

While the invention has been shown in but only one form, it will be obvious to those skilled in the art it is not to be so limited. On the contrary, the invention is susceptible of various forms of modifications without departing from the spirit and scope of the appended claims.

I claim:

1. Apparatus for coupling a traction vehicle to one end of a railway car thereby to transfer a portion of the weight of the car to the vehicle, wherein the car includes a structural member at said one end thereof supporting a draft connecting

element on the car centerline, said apparatus comprising, a coupling member supporting a draft member for movement relative thereto along a generally horizontal path which extends longitudinally of the car, said draft member being adapted for draft engagement with said draft element, said coupling member including generally vertical abutment surfaces rigid therewith and positioned for generally vertical abutting engagement with said structural member above and below the area of engagement between said draft element and said draft member, power means on said coupling member and engaged with said draft member for drawing said coupling member and said car together against said generally vertical abutment surfaces whereby the former is thereby adapted to serve as a rigid extension of the latter, and lifting means on said traction vehicle engaged with said coupling member for lifting the latter whereby the point of weight transfer between the vehicle and the car lies at a point outwardly of said one end thereof.

2. The apparatus according to claim 1 further defined by, a jaw adjustably mounted by said coupling member, said generally vertical jaw including said abutment surfaces which are located below the area of engagement between the draft element and the draft member, which jaw includes generally horizontal surfaces arranged for engagement with the underside of said structural member.

3. Apparatus for coupling a traction vehicle to one end of a railway car thereby to transfer a portion of the weight of the car to the vehicle, wherein the car includes a structural member at said one end thereof supporting a draft connecting element projecting outwardly of said structural member on the car centerline, said apparatus comprising, a coupling member carrying a draft member for movement relative thereto along a generally horizontal path which extends longitudinally of the car, said draft member being adapted for draft engagement with said draft element, said coupling member including generally vertical abutment surfaces rigid therewith and positioned for generally vertical abutting engagement with said structural member above and below the area of engagement between said draft element and said draft member, power means on said coupling member and engaged with said draft member for drawing said coupling member and said car together against said generally vertical abutment surfaces thereby to adapt the former to act as a rigid extension of the latter, and arm means connected with said coupling member at a location thereon which is spaced substantially outwardly of said structural member, means mounting said arm means on said traction vehicle and other means on the vehicle for lifting the arm means.

4. The apparatus according to claim 3 further defined by, a jaw adjustably mounted by said coupling member, said jaw including said generally vertical abutment surfaces which are located below the area of engagement between the draft element and the draft member, which jaw includes generally horizontal surfaces arranged for engagement with the underside of said structural member.

5. Apparatus for coupling a traction vehicle to one end of a railway car thereby to transfer a portion of the weight of the car to the vehicle, wherein the car includes a structural member at said one end thereof supporting a draft connecting element projecting outwardly of said structural member on the car centerline, said apparatus comprising, a coupling member supporting a draft member for movement relative thereto along a generally horizontal path which extends longitudinally of the car, said draft member being adapted for draft engagement with said draft element, said coupling member including generally vertical abutment surfaces rigid therewith and positioned for generally vertical abutting engagement with said structural member above and below the area of engagement between said draft element and said draft member, power means on said coupling member and engaged with said draft member for drawing said coupling member and said car together against said generally vertical abutment surfaces thereby to adapt the former to act as a rigid extension of the latter, arm means mounting said coupling member for pivoting movement about a horizontal transverse axis, means on the traction vehicle for lifting said arm means, said horizontal pivot axis being located relative to said area of engagement between said draft element and said draft member such that upon lifting movement of said arm means said coupling member tends to rotate about such pivot axis in a direction which results in an increase in the bearing pressure between the structural member and the generally vertical abutment surfaces which are positioned above the area of engagement between said draft element and said draft member.

6. The apparatus according to claim 5 further defined by, a jaw adjustably mounted by said coupling member, said jaw including said generally vertical abutment surfaces which are located below the area of engagement between the draft element and the draft member, which jaw includes generally horizontal surfaces arranged for engagement with the underside of said structural member.

7. Apparatus for coupling a traction vehicle to one end of a railway car thereby to transfer a portion of the weight of the car to the vehicle, wherein the car includes a structural member at said one end thereof supporting a draft connecting element projecting outwardly of said structural member on the car centerline, said apparatus comprising, a coupling assembly including a draft member adapted for draft engagement with said draft element, said coupling assembly including generally vertical abutments adapted for generally vertical abutting engagement with said structural member above and below the area of engagement between said draft element and said draft member, which abutments cooperate with said draft member thereby adapting the coupling assembly to act as a rigid extension of the car, and support means on said traction vehicle in supporting engagement with said coupling assembly at a location thereon spaced substantially outwardly of said end of the car, and means on the traction vehicle for lifting said support means whereby the point of weight transfer between said car and said traction vehicle is spaced a substantial distance outwardly of said structural member.

8. The apparatus according to claim 7 wherein said support means is engaged with said coupling assembly by a pivot connection defining a horizontal transverse pivot axis.

9. The coupling apparatus according to claim 7 further defined by, a jaw adjustably mounted by said coupling assembly, said jaw including said generally vertical abutments which are located below the area of engagement between the draft element and the draft member, which jaw includes generally horizontal surfaces arranged for engagement with the underside of said structural member.