Sept. 20, 1938. H. A. SOULIS 2,130,747

SYSTEM AND APPARATUS FOR HANDLING FREIGHT

Filed Dec. 19, 1933 3 Sheets-Sheet 1

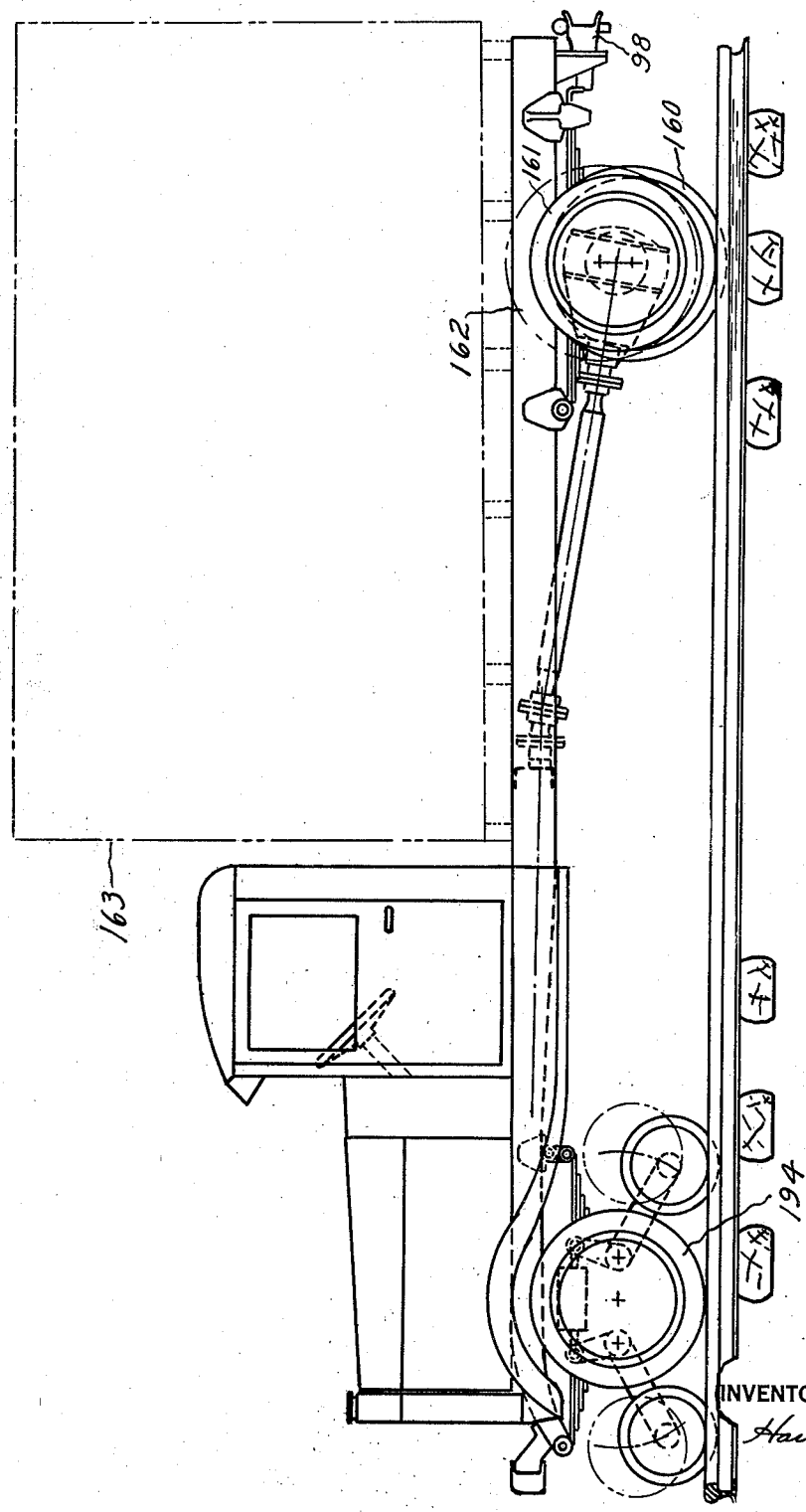


Fig 1

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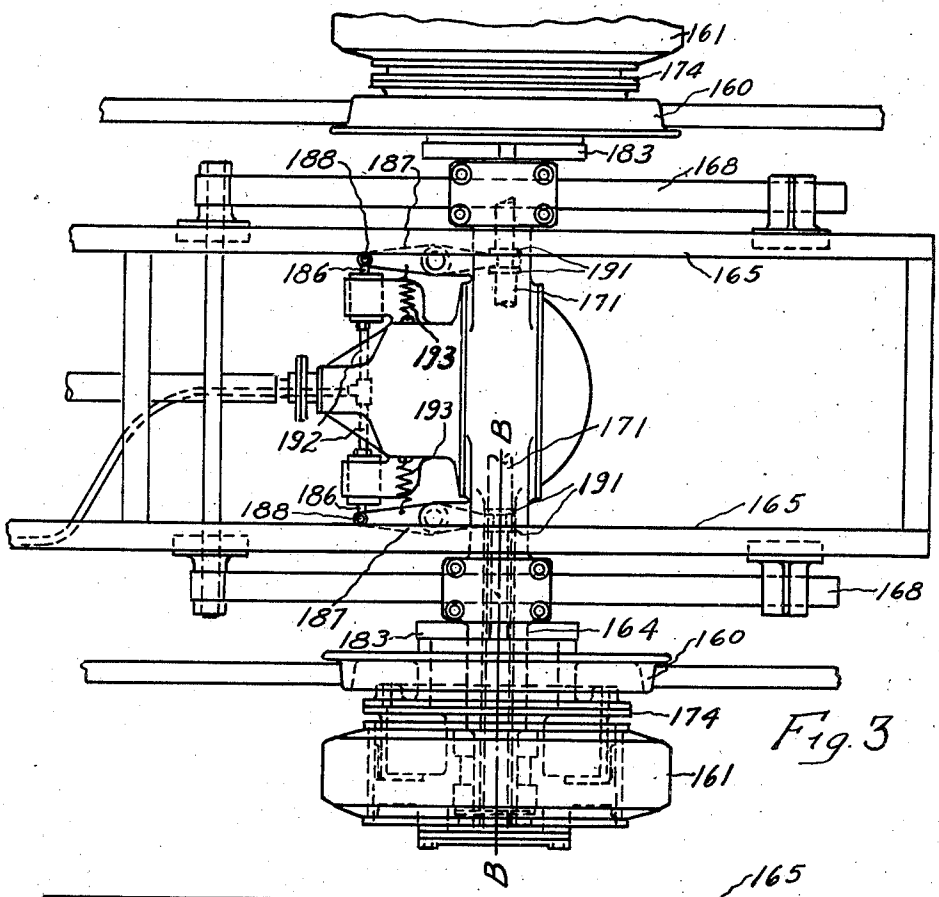


Fig. 3

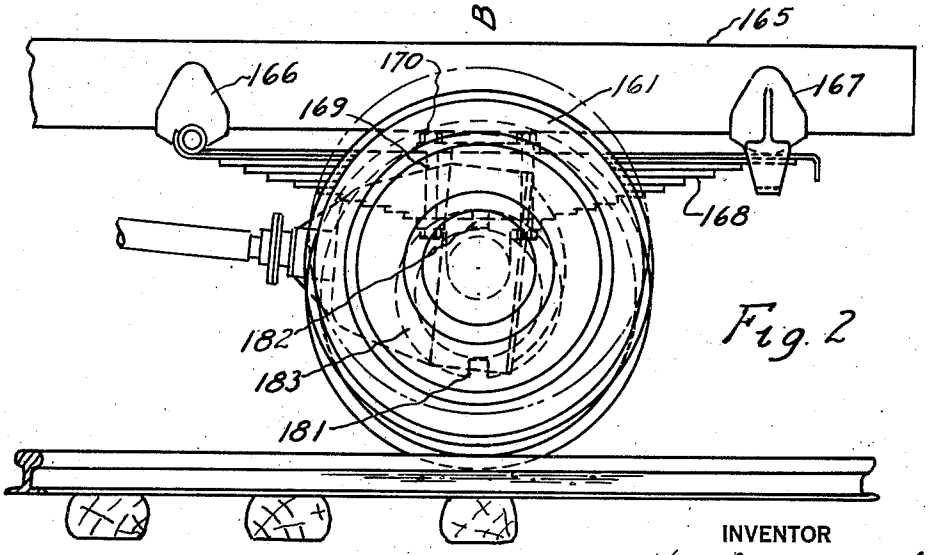


Fig. 2

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SYSTEM AND APPARATUS FOR HANDLING FREIGHT

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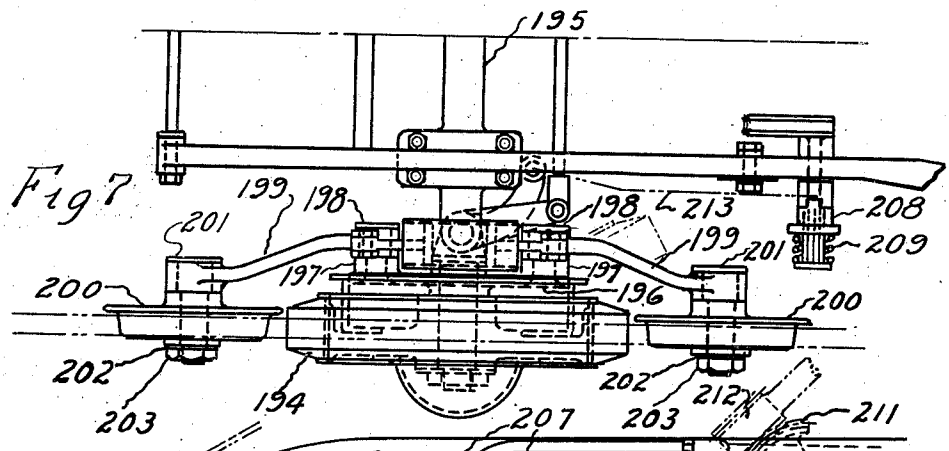


Fig 7

Fig 6

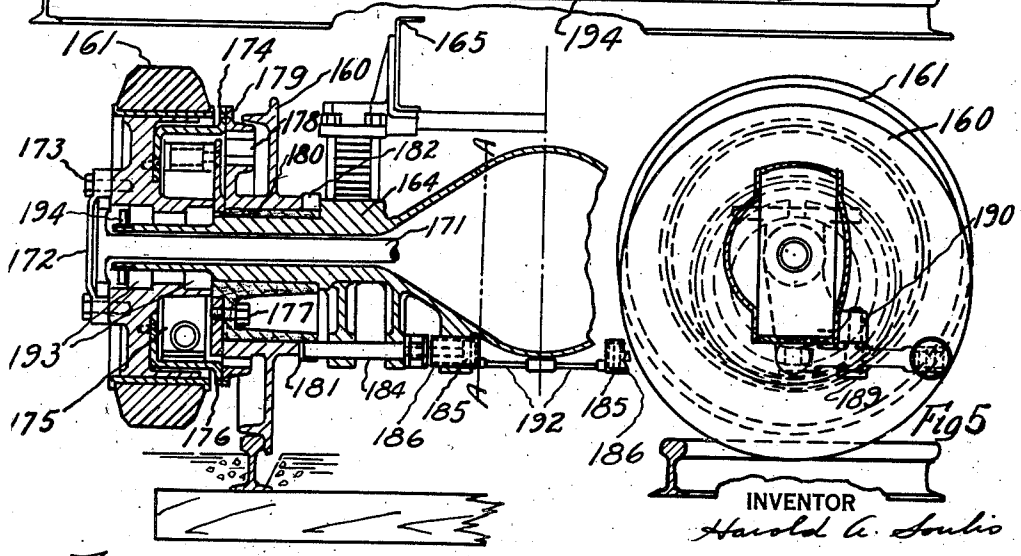


Fig 4

Fig 5

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Patented Sept. 20, 1938

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UNITED STATES PATENT OFFICE

2,130,747

SYSTEM AND APPARATUS FOR HANDLING FREIGHT

Harold A. Soulis, Easton, Pa.

Application December 19, 1933, Serial No. 703,048

16 Claims. (Cl. 105—215)

My invention relates to handling and conveying goods, particularly in less than car-load lots. While the invention is particularly applicable to shipment of goods in less than car-load lots, it is not to be limited to such use.

Consider the situation of a shipper who wishes to send a consignment of goods or materials in less than car-load lot by the way of a carrier having a fixed track, that is, a railroad running between definite stations. The goods must first be transported to the station and then delivered to the agent of the carrier. The carrier must then provide a car into which the goods may be loaded, such car being stopped at the station of the carrier nearest the consignee. There the goods are taken from the car and then they are delivered by cartage to the consignee.

In addition to the excessive amount of handling and the cost of various operations, there is the added disadvantage of opening a car to remove a part of the load. This is conductive to confusion and subjects the carrier to likelihood of loss by theft. Furthermore, the benefit of high speed rail movement between stations is not obtained due to the fact that a great deal of time is lost at the stations or rail heads because of the shifting and spotting of cars so that they may be unloaded at the station warehouse or platform.

I am aware that there have been wheeled containers designed and built to coordinate with railroad shipments, but these wheeled containers have been constructed to operate with highly special railroad cars which are not adapted for general freight hauling and which offer difficult loading operations at the rail head.

There have been wheeled containers designed for highway operation that are transported over a rail system by being bodily loaded upon a railroad car. In this type of container the rolling means has not been designed to make combined highway and rail operation possible.

In my system of transportation, I have a wheeled container which has wheels for highway operation that retract to allow wheels for rail operation to contact the rails of a railroad system, and vice-versa. It is possible with my invention to convert the vehicle from a railroad operating vehicle, to a highway operating vehicle or vice-versa without special railroad equipment. A standard truck or tractor fitted with a pintle hook or a fifth wheel, familiar to those skilled in the art, being the motive power.

The preferred form of my invention comprises the provision of a railroad and highway vehicle having a compartment for goods, which vehicle is transported on its own wheels over a roadway and means to retract these road wheels to allow other wheels designed for railroad operation to be lowered to contact the rails of a railroad system and furnish means to transport the vehicle over a rail system and vice versa. To convert the vehicle from a railroad vehicle to a highway vehicle, the rail operating wheels are raised and the highway operating wheels are lowered. The object of having wheels for both highway and railroad operation, is to furnish means on the same vehicle to operate on its own wheels over a highway or over a railroad system.

According to one aspect of the present invention, the carrier, that is, the railroad, may take the goods from the door of the shipper to the door of the consignee. The goods are put into the custody of the carrier at the door of the consignor by delivering a wheeled container with the goods therein into the custody of the carrier. This wheeled container is then transported by the carrier over the roadway or street to the yard of the railroad system. The wheeled container has its road wheels retracted after it has been positioned over the rails and its operating wheels lowered so as to allow the container to operate as a rail vehicle. The container is then hauled to the station of the carrier adjacent the consignee. The container now has the road wheels lowered and the rail wheels raised, thus the vehicle is converted from a rail to a highway vehicle. The wheeled container is now rolled on its own wheels to the highway and the container unloaded at the door of the consignee.

It is understood that the wheeled container may pick up a number of shipments in one city or locality before being converted to a rail operating vehicle. The railroad transports the wheeled container to the city or locality to which the various shipments of goods are to be delivered. The container has its rail wheels retracted and the highway wheels lowered. The container is now coupled to a tractor or truck by means of a fifth wheel or a draw-bar. The tractor or truck hauls the wheeled container to the various receivers of the goods.

According to another aspect of the present invention, the carrier system may include rail, air and marine transportation in its system.

While I prefer the use of a container with retractable wheels as described, it is to be understood that it is within the scope of my invention to employ a vehicle with its own power, such as a truck with rail and highway wheels

which are adjustable to allow either the road or the rail wheels to be used, although I find that the wheeled container is more easily handled and is entirely satisfactory.

While I speak of taking the loaded wheeled containers from or to the premises of the shipper, it is to be understood that collection or distribution or transfer stations might be established at any convenient point or points.

Other objects and advantages from the utilization of my invention will doubtless present themselves as the description proceeds and I would have it clearly understood that I reserve unto myself all rights to the full range of equivalents, both in manner of practicing my invention and its use, to which I may be entitled under my invention in its broadest aspect. For the purpose of the present disclosure, I have elected to describe a certain preferred system and its modification. However, as previously pointed out, this is not to be interpreted as a limitation of the scope of my invention, which may be followed with equal success in use with other systems.

In the drawings, where like numbers in the several views represent similar parts:

Figure 1 is a side elevation in outline, of a motor highway truck, showing the general arrangement of wheels used in highway operation and the auxiliary wheels used when the truck is to operate on the rails of a railroad system.

Figure 2 is a side elevation of the rear axle of the motor truck shown in Figure 1.

Figure 3 is a plan view of Figure 2.

Figure 4 is a sectional view through B—B in Figure 3 and shows in detail, some of the parts used for positioning the flanged wheels used for supporting the rear of the truck, when operating the truck on the rails of a railroad system.

Figure 5 is a sectional view through A—A in Figure 4, and shows the locking means for retaining the flanged wheels in their lowered or raised position.

Figure 6 is a side elevation of the front axle of the motor truck shown in Figure 1.

Figure 7 is a half plan view of Figure 6.

A preferred form of my invention is shown in detail in Figures 1 to 5 wherein a motor truck is equipped with flanged wheels for operation on the rails of a railroad system and wheels to operate over a highway. Of course, as will be obvious, from the description, my invention may be applied with equally satisfactory results to a trailer or a semi-trailer. The truck is equipped with a body shown at **163** which may be used to contain freight for haulage over the rails of a railroad system. The motor truck is of a construction well known to those skilled in the art, except for the provision of the wheels to adapt it for the dual forms of service. At **160** in Figure 1 is shown the flanged wheels for operation on the rails of a railroad system, while at **161** is shown the wheels used for operation on a highway. When the highway operating wheels **161** are used to support the rear end of the truck, flanged wheels **160** take a position shown at **162**, allowing the highway operating wheels **161** to contact the roadbed of a highway system. The arrangement of the wheels on the truck rear axle is better shown in Figures 2, 3, 4 and 5 where **160** is the flanged wheel for rail operation and **161** are the wheels for highway operation. The axle **164** has the regular gear type differential drive, well known to those skilled in the art. Axle **164** is attached to truck frame **165** by springs **168** as by brackets **166** and pins **167**. The spring **168** may be attached to the axle **164** by bolts **169** and nuts **170**. At the outer ends of axle **164** are shown the highway supporting wheels, which are mounted on bearings **193** and held in place by nuts **194**. The highway operating wheels **161** are driven by shafts **171** which are keyed to cap **172** which is held to wheel **161** by screws **173**. Shaft **171** connects the gear driving parts. At **174** are shown flanged brake drums which are fixed to driving wheel **161**, while at **175** is shown, in outline, a hydraulic brake shoe arrangement. It is understood that these brakes may be of any conventional brake design and need not necessarily be of the hydraulic type. Brake shoes **175** are carried on brake spiders **176** which are attached to eccentric bushing **180** by bolts **177**. At **178** are shown gear teeth which mesh with the teeth in the internal gear **179** which is fixed to brake drums **174**. Flanged wheel **160** is mounted on eccentric bushing **189** which has a bearing on axle **164**. At **181** and **182** are shown slots in the flange **183** of the eccentric bushing **180**. These slots are approximately 180 degrees apart and serve to hold the rail operating flanged wheels **160** in a raised or in a lowered position, when lock pin **184** is inserted in one or the other of these slots. Pin **184** is operated in and out of these slots **181** and **182** by hydraulic operated pistons **185**, working in cylinders **186**. Pistons **185** have piston rods **186A** attached to lever **187** through pins **188**. Lever **187** is fulcrumed on pin **189** which is screwed into boss **190**, integral with the axle **164**. The opposite end of lever **187** is fitted between flanges **191**, integral with lock pin **184**. The fluid to operate these hydraulic pistons is fed through tubes shown at **192** from a central power source, such as is well known to those skilled in the art. The flanged wheels **160**, as shown, are in position to support the rear end of the truck on the rails of a railroad system and to place highway operating wheels **161** in position to support the load, the brakes **175** being applied so as to produce a braking effort on the drums **174**. The pressure on the fluid is removed, by turning a cab control valve, from the hydraulic pistons **185** to allow the springs **193** to pull the lock pins **184** from the slot **181**. Power is now applied through shaft **171** to rotate the wheels **161**. Since the brake shoes **175** are carried by brake spider **176**, which is attached to eccentric bushing **180**, the application of power will rotate wheel **161** and carry shoes **175** with brake spider **176** and eccentric bushing **180** rotating the eccentric bushing 180 degrees so as to carry the rail flanged wheels **160** in an arc which will always keep the gear teeth **178** in mesh with the gear teeth of internal gear **179**. When the rail operating flanged wheel **160** has traveled through approximately forty-five degrees, lock pins **184** are forced against the face of flange **183**, by the application of pressure through the cab control valve, so that when the flanged wheels **160** are moved to approximately 180 degrees, the lock pin **184** will drop into the slot **182**, holding the flanged wheels **160** in their raised position, to allow the highway operating wheels **161** to support the rear end of the truck. Obviously, with the brake shoes **175** released and lock pin **184** in the slot **182**, the rear wheels of the truck will be ready to operate on a highway. A reverse operation will again place the flanged rail operating wheels **160** in their lowered position ready for supporting the rear of the truck on the rails of a rail system. The tractive effort is applied to the rail

operating flanged wheel 160 through gear teeth 178 to the rail operating flanged wheels 160, by reason of their constant mesh with internal gear 179. At the front motor truck axle, shown in Figure 1, are wheels 194 for supporting the front of the truck on a highway and upon the rails of a railroad system. Wheels 194 have a bearing on the front axle 195 while at 196 is a brake spider 196 which is attached to axle 195. Bosses 197, cast integral with brake spider 196 have shoulder pins 198 riveted to spider 196 through bosses 197, after first fitting levers 199 over the shoulder pins 198. Levers 199 have flanged wheels 200 attached to them at their lower ends, by shoulder pins 201 and washer 202, held in place on the shoulder pin 201 by nut 203. Levers 199 are fulcrumed on shoulder pins 198 and are lowered by application of pressure on the pistons 204, which are fitted into cylinder 205 fixed to brake spider 196. Pistons 204 have piston rods 206 which are attached to the upper end of the lever 199 by means of pins 216. To raise the flanged wheels 200, pressure is removed from the fluid acting on the pistons 204, by means of a cab control valve and springs 207 will raise the wheels. In operation, the dog 208 which is held in place by the spring 209 is removed so as to allow the lever 210 to turn free of gear 211 and worm 212. Lever 210 is connected to the steering arm by a drag link indicated at 213. With the flanged wheels 200 in their lowered position the supporting wheels 194 are prevented from running off of the rails and the flanged wheels 200 will steer the front wheels 194 so as to follow the contour of the rails of the railroad system. As will be seen from this description the motor truck will operate equally as well on a highway as on the rails of a railroad system. Flanged wheels 200 may be lowered far enough to remove some or all of the weight of the front of the motor truck from wheels 194. However the principal object of the flanged wheels 200 is to guide the wheels 194 over the rails of a railroad system. At 98, on the motor truck, is a coupling for attaching the draw bar eye to another wheeled container as a trailer, the conversion of the latter being effected as in the truck, it being manifest, however, that in the trailer, the changeover would be accomplished in response to the tractive effort applied thereto by the truck or other propelling vehicle. The motor truck with or without attached trailer when equipped with the retractable wheels described, may operate to pick up several shipments of goods at the door of several shippers and be driven over the highway to the nearest railroad station and placed in the proper position over the rails of a railroad system so that the rail operating wheels can be lowered to a functioning position and the station agent or other railroad official despatches the truck at the proper time. The truck is now driven to a station nearest the point of the consignee and the rail operating wheels are raised, allowing the highway operating wheels to be lowered to a functioning position, so that the vehicle may be driven over the highway to the consignee, without loss of time in handling of the shipment due to the necessity of transferring the load from one vehicle to another.

In operation of the non-power type wheeled containers are hauled by a railroad locomotive, or a motor truck as shown in Figure 1, over the rails from one station to another distant station of a railroad and backed to appropriate stub tracks. At this point, if the vehicles are of the non-power type a tractor fitted with proper couplings or the like, may pick up the vehicle for highway haulage or movement about the freight yard. I do not intend to be limited to the specific modes of embodying the invention which I have shown, since as will be evident there may be a combination of two or more forms thereof without departing from the spirit of the same.

I believe I am the first to provide broadly, a system for making it possible for the railroad to take goods from the door of the shipping station and deliver them to the door of the receiving station in a vehicle embodying highway operating wheels and rail operating wheels adapted to be raised or lowered, so as to permit the vehicle to operate over the highway or over a rail system on its own rolling means. The system also makes it possible for a marine carrier to take the goods from the door of the shipping station and deliver them to the door of the receiving station, when these two are connected by water. The system also makes it possible for rail and marine facilities to be combined to transport a shipment of goods.

I do not intend to be limited to the details shown or described.

I claim:

1. In a vehicle, comprising a frame and axles and highway operating wheels and flanged rail operating wheels, said flanged rail operating wheels being mounted on eccentric bushings having a bearing on said axles, said flanged rail operating wheels having a gear integrally attached, said highway operating wheels having a brake drum fixed thereto and brake shoes mounted therein, said eccentric bushing having a brake backing plate mounted thereon and said brake shoes having a pivotal connection on said brake backing plate and means for conditioning the eccentric bushings to turn through an arc sufficient to raise said rail operating flanged wheels and lower said highway operating wheels, or to lower said rail operating flanged wheels and raise said highway operating wheels, when said brake shoes are forced against the said brake drum, when torque is applied to said highway operating wheels.

2. A vehicle capable of operation upon a highway or upon rails, as in a system of railroad trackage, comprising a frame, a set of flanged wheels for independently supporting the vehicle load from rails, a set of plain tread wheels for independently supporting the vehicle load in highway operation, a vehicle braking system, means for locating one or the other sets of wheels in position for supporting the load and mechanism actuatable in response to the tractive effort of the vehicle only when said braking system is operative to oppose such tractive effort to render the preselected set of wheels effective in supporting the load.

3. A vehicle for operating upon a highway or upon the rails of a railroad, including a load-receiving body, flanged wheels for carrying the load in rail operation, wheels for carrying the load in highway operation, a braking system common to both sets of wheels, for controlling the movement of the vehicle in operation means of connection between the respective sets of wheels and the vehicle body, said means including a rotatable wheel support and means for conditioning said support for rotative movement in response to tractive effort transmitted to the supporting wheels of said vehicle only when the brakes are applied thereto to transfer the load

from one set of wheels to the other, as may be predetermined.

4. A vehicle for operating upon a highway or railroad trackage, comprising a body, wheels for rolling upon a highway roadbed, wheels flanged for tracking upon railroad rails, a common support for the unlike wheels yieldably suspended from said body, braking mechanism for decelerating the movement of said vehicle when operating upon the highway or upon rails, and preselectable means actuatable in response to propelling effort transmitted to the supporting wheels of the vehicle in opposition to braking effort applied thereto through said braking mechanism in resisting such propulsive effort, to bodily actuate one or the other set of wheels into load-carrying position.

5. A vehicle having a body and two sets of wheels, one for functioning on the highway and the other for traversing the rails of railroad trackage, the latter wheels being flanged, a braking system for retarding and stopping the movement of the vehicle in highway or rail operation, said system including brake shoes and normally fixed brake shoe supporting media, and means preselectably actuatable to render said media movable in response to rotative effort transmitted to the wheels which are then functioning, in opposition to braking effort applied thereto, to dislocate such wheels from their functioning position and coincidentally locate the other set of wheels in position for functioning.

6. A vehicle for operating upon a highway or railroad trackage, having wheels adapted for highway operation and flanged wheels for traversing the rails of a railroad, a braking system for retarding and stopping the movement of the vehicle in highway or rail operation, said system including braking elements effective upon the wheels, means normally immovable relatively to said wheels for supporting said braking elements for movement into and out of braking positions and means actuatable at will to render said braking-element-supporting means movable when the braking elements are effective, to transfer the load to the highway wheels or the flanged wheels, as may be preselected, in response to tractive effort applied to the then functioning wheels in opposition to braking effort upon said wheels.

7. A vehicle for operating upon a highway or railroad trackage, having wheels adapted for highway operation and flanged wheels for traversing the rails of a railroad, a braking system for retarding and stopping the movement of the vehicle in highway or rail operation, said system including braking elements effective upon the wheels, means normally immovable relatively to said wheels for supporting said braking elements for movement into and out of braking positions and means actuatable at will to render said braking-element-supporting means and said braking elements movable with the wheels and means operative in response to the rotative effort transmitted to the then functioning wheels, when said supporting means and said braking elements are movable therewith, to urge the dissimilar type wheels into position to rollingly support the vehicle.

8. A vehicle for operating upon a highway or railroad trackage, having wheels adapted for highway operation and flanged wheels for traversing the rails of a railroad, a braking system for retarding and stopping the movement of the vehicle in highway or rail operation, said system including brake drums associated with the wheels and brake shoes effective thereon, fixed means for supporting said brake shoes for movement toward and from the brake drums in the normal functioning of the braking system, means actuatable to render said fixed means movable when the brake shoes supported thereby are engaged with the brake drums and means for transferring the vehicle load from one type of wheels to the other, in response to the rotative effort transmitted to the then supporting wheels when said fixed means are movable and the brake shoes carried thereby are engaged with the drums associated with the wheels.

9. A vehicle for operating upon a highway or railroad trackage, having wheels adapted for highway operation and flanged wheels for traversing the rails of a railroad, a braking system for retarding and stopping the movement of the vehicle in highway or rail operation, said system including brake drums associated with the wheels and brake shoes effective thereon, normally fixed means for supporting said brake shoes for movement into and out of engagement with said drums, means actuatable at will to render said normally fixed means movable and means for conditioning the vehicle for operation upon the highway or upon rails, when said normally fixed means are rendered movable, in response to effort to produce rotative movement of the then functioning wheels in opposition to the braking effort of the brake shoes upon the drums associated therewith.

10. A vehicle and means for converting the vehicle for operation upon a highway or railroad trackage, said converting means including wheels adapted for rollingly supporting the vehicle from a highway, flanged wheels for operating upon railroad trackage, a braking system including brake shoes for retarding and arresting the rolling movement of said vehicle along the highway or upon the railroad trackage and mechanism effective when said braking system is functioned under predetermined conditions, to permit the brake shoes to move with the wheels in the transfer of the vehicle load from the supporting wheels to the wheels of dissimilar type, in response to tractive effort applied to the supporting wheels, the reacting forces raising such wheels and coincidentally lowering the wheels of dissimilar type into position to carry the vehicle load.

11. A vehicle and means for converting the vehicle for operation upon a highway or railroad trackage, said converting means including wheels adapted for rollingly supporting the vehicle from a highway, flanged wheels for operating upon railroad trackage, a braking system including brake shoes non-rotatable relatively to said wheels for retarding and arresting the movement of said vehicle along the highway or upon the railroad trackage and mechanism embodying means to render said brake shoes movable with said wheels, effective to locate the type of wheels dissimilar to the wheels then functioning in vehicle supporting position, said mechanism operating solely in response to rotative effort transmitted to the wheels that are in functioning position in opposition to the braking effort transmitted thereto through said braking system, and means for rendering said mechanism inoperative during the travel of the vehicle along the highway or upon the rails.

12. A self-propelled vehicle having a power plant and two sets of wheels, one for functioning on the highway and the other for traversing the rails of railroad trackage, the latter being flanged,

means common to associated wheels of each set including a drive shaft and driven axle for transmitting torque thereto from the power plant to propel the vehicle along the highway or upon the rails, a braking system including brake drums and shoes engageable therewith for decelerating and stopping the movement of the vehicle when operating on either set of wheels and mechanism operable at will to render said brake shoes movable with the drums for transferring the vehicle load from the functioning set of wheels to the set of wheels of dissimilar type, solely in response to the delivery of propelling effort to the then supporting wheels from said power plant and through said torque transmitting means, in opposition to braking effort applied to and effective upon such wheels, by the functioning of said braking system.

13. A vehicle convertible for highway or railroad operation, having wheels for rolling along the highway and wheels flanged for tracking upon railroad rails, a braking system, including brake drums associated with the wheels and relatively movable brake shoes effective thereon for retarding and stopping the movement of the vehicle when operating on either set of wheels, mechanism interconnecting the unlike wheels actuatable for simultaneously shifting one set of wheels into supporting position and the other into non-supporting position, and means for rendering the brake shoes movable with the wheels to permit of the actuation of said interconnecting means to transfer the load from the supporting wheels to the other wheels, solely in response to tractive effort applied to the vehicle approximately in the direction of its longitudinal axis.

14. A vehicle convertible for highway or railroad operation, having wheels for rolling upon the highway and wheels flanged for tracking upon rails, a braking system, including brake drums fixed to the wheels, brake shoes, means for supporting said brake shoes for movement relative to said drums to decelerate and arrest the movement of said wheels in the normal operation of the vehicle in either form of service, means for shifting the load from one set of wheels to the set of dissimilar type by the relative movement of the two sets of wheels solely in response to the movement of the vehicle in the direction of its longitudinal axis, while the wheels are held against rotation on their axes, and means for rendering said support and said brake shoes movable with the wheels only during the shifting operation.

15. A vehicle for operating upon a highway or railroad trackage, including wheels for rolling upon a highway roadbed, wheels flanged for tracking upon rails, a common support for the dissimilar wheels yieldably suspended from said vehicle, means connecting said wheels capable of limited rotative movement under predetermined conditions, a braking system common to both sets of wheels, said system including brake shoes, and means for conditioning said means for such aforesaid movement when said brake shoes are effective upon one set of wheels, to transfer the load to the other set of wheels, in response to tractive effort communicated to the wheels from which the load is being transferred.

16. A vehicle for operating upon the highway or the rails of a railroad, having a body and two dissimilar sets of wheels, one for each form of service, braking means for decelerating and arresting the movement of the vehicle when in operation upon the highway or rails, yieldable suspension means between the wheels and said body, a common support connected to said suspension means, means capable of limited rotative movement under predetermined conditions connecting the dissimilar types of wheels, means for conditioning said rotatable means for movement and means for rotating said rotatable means relatively to said support, to urge one or the other type of wheels into supporting position, only when the braking system is effective upon the then supporting wheels, to restrain them from rolling upon the surface with which they are in contact, as in their normal operation.

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