

Dec. 17, 1968

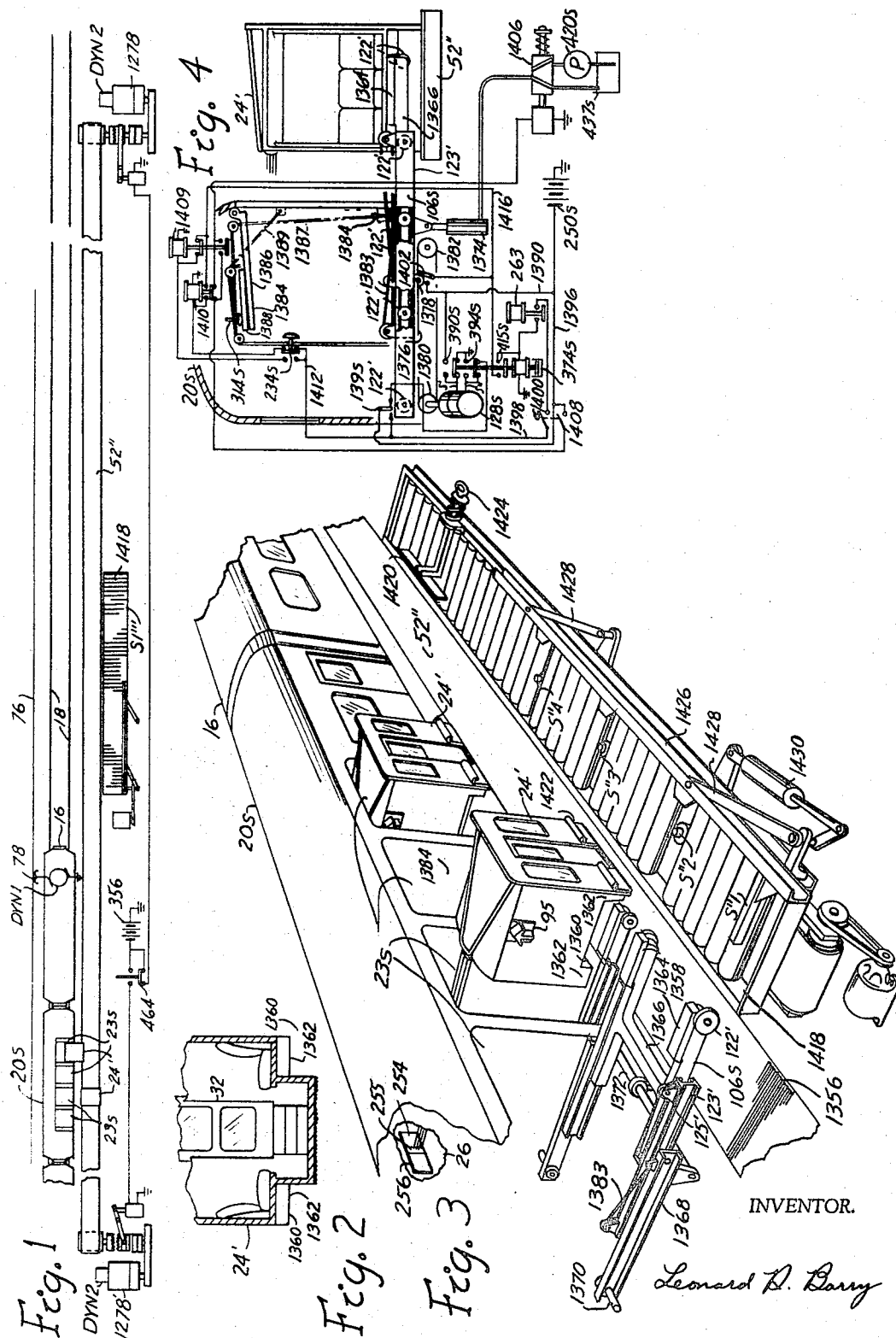
L. D. BARRY

3,416,684

TRANSFER DEVICE

Filed Jan. 9, 1967

4 Sheets-Sheet 1



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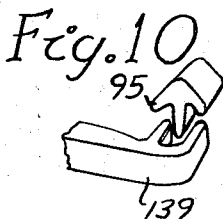
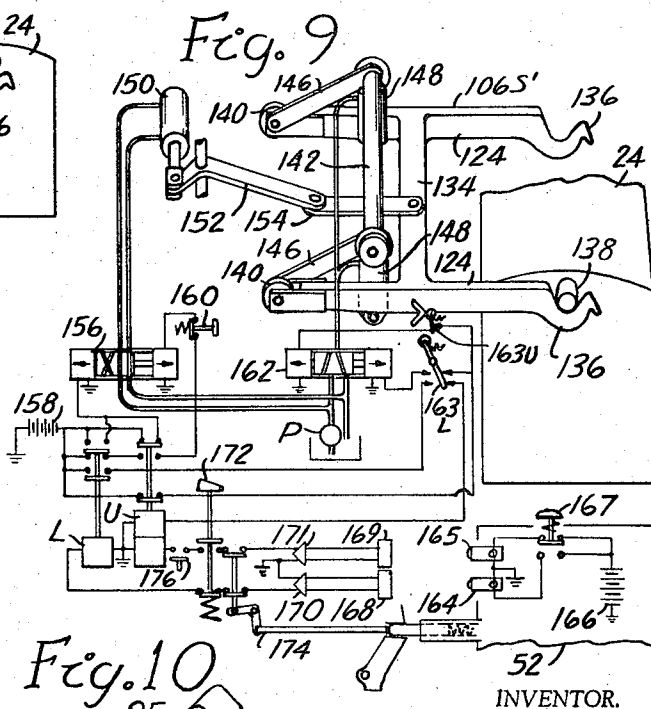
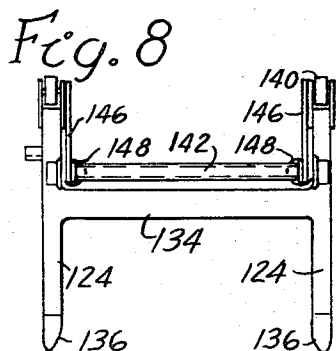
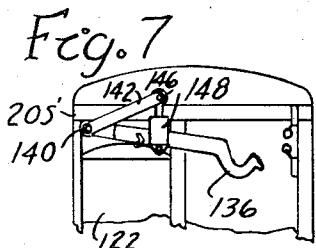
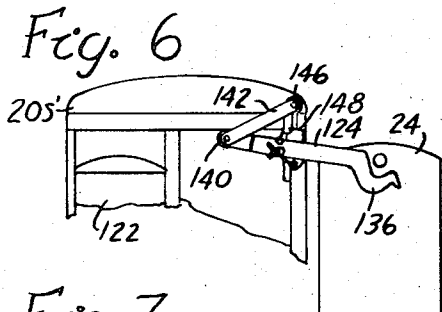
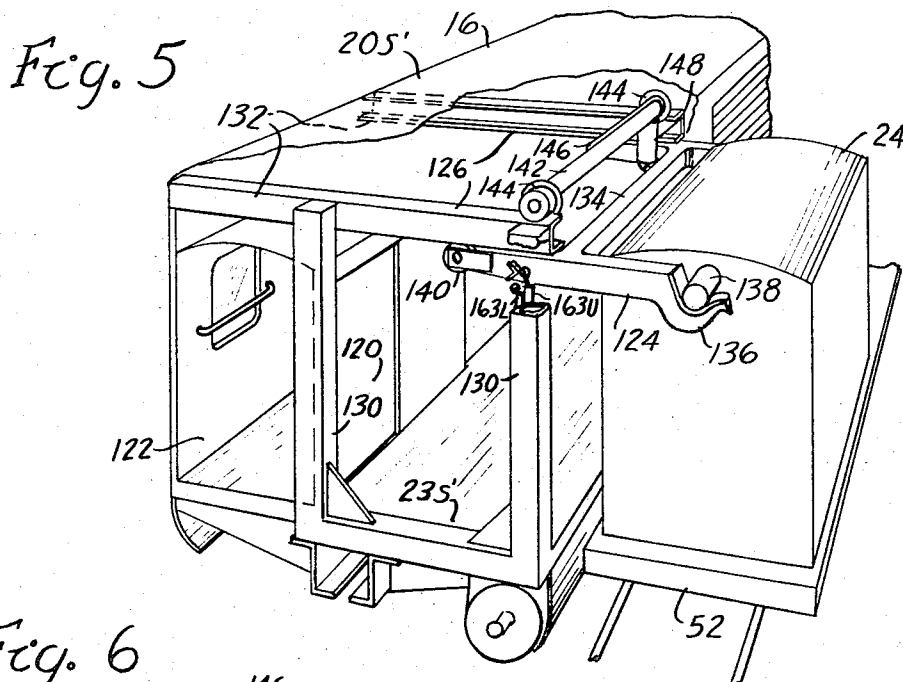
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3,416,684

TRANSFER DEVICE

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4 Sheets--Sheet 2



INVENTOR.

Leonard R. Barry

Dec. 17, 1968

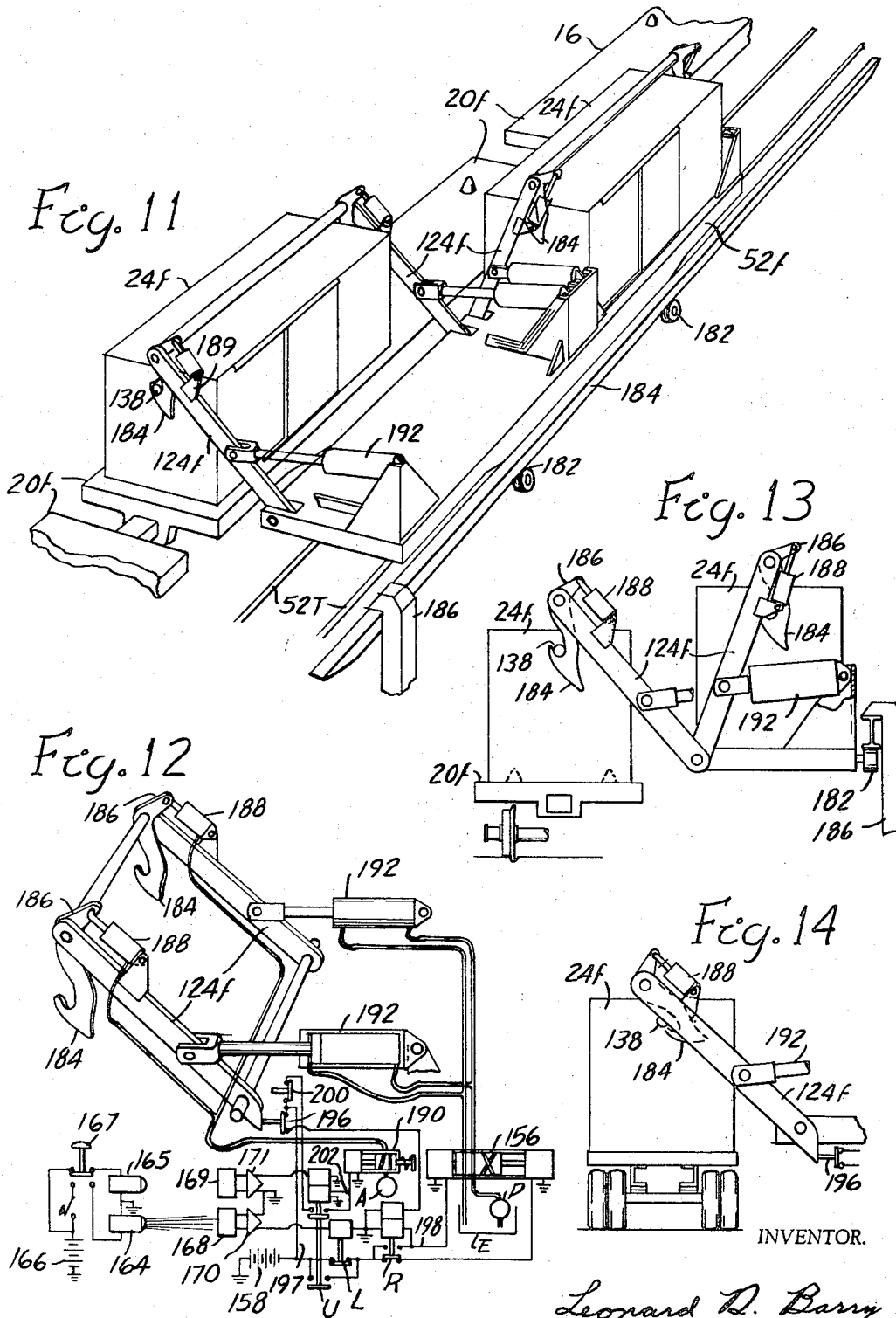
L. D. BARRY

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TRANSFER DEVICE

Filed Jan. 3, 1967

4 Sheets-Sheet 3



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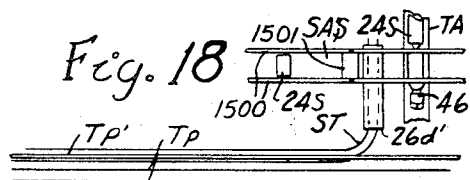
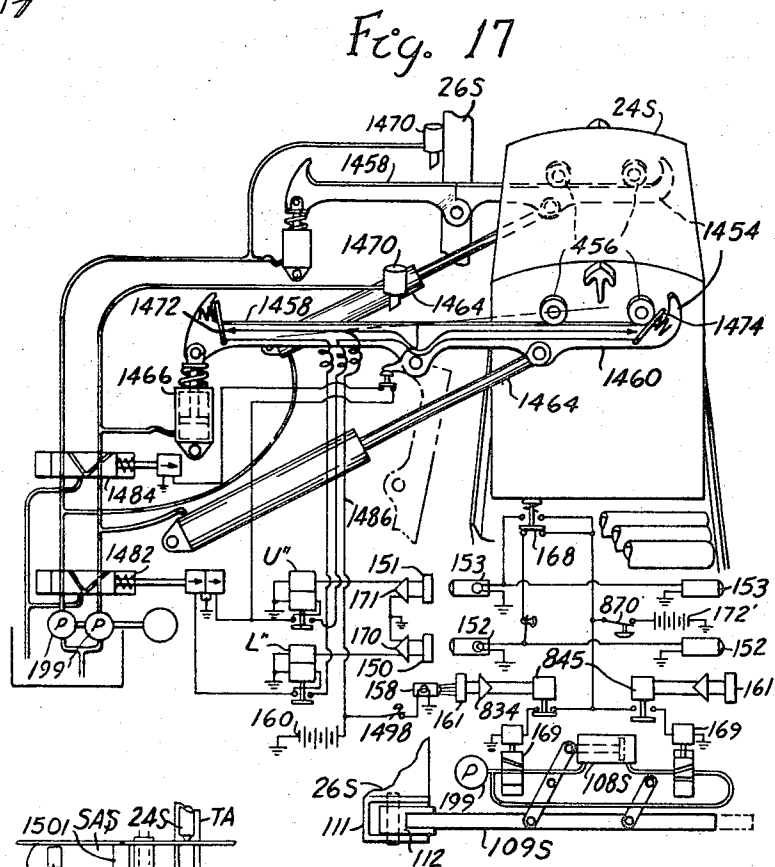
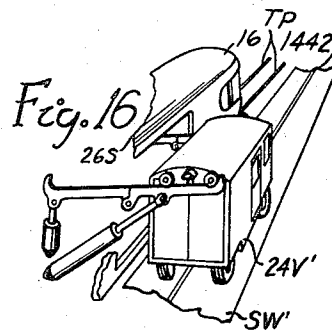
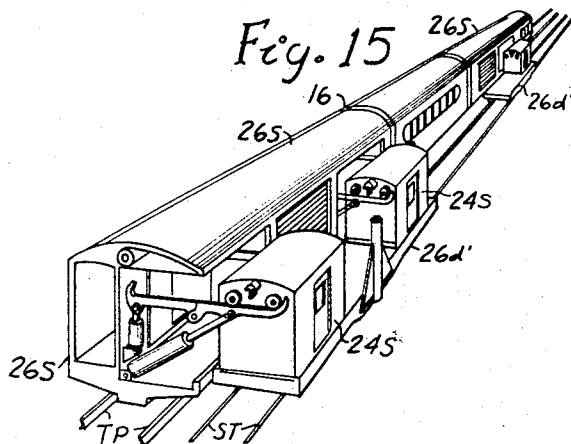
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3,416,684

TRANSFER DEVICE

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4 Sheets-Sheet 4



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3,416,684

TRANSFER DEVICE

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Continuation-in-part of applications Ser. No. 422,988,
Jan. 4, 1965, which is a division of Ser. No. 714,453,
Jan. 27, 1958. This application Jan. 9, 1967, Ser.
No. 607,962

8 Claims. (Cl. 214—516)

ABSTRACT OF THE DISCLOSURE

This is a side transfer device for a cargo or transfer container especially suited for loading and unloading railway cars while moving in a train. The transfer mechanism includes two parallel transfer arms fully supported by one vehicle only, to extend therefrom to transfer the container to or from the vehicle and controls for operating the device to transfer when alignment is made for transfer. The arms are pivotally mounted at one end on the vehicle and extensible from a side of the vehicle to lift, lower and transfer the container from that side of the vehicle. There are two arms, one for supporting each end of the container. The arms have lifting ends which interfit with a portion of the container to prevent the container from jumping off of the arms during transfer. The arms are controlled by light beams directed at photoelectric cells on the transfer vehicle when in alignment for transfer.

This invention relates to a container transfer device especially for mounting on a vehicle for transferring containers to and from the vehicle horizontally.

This is a continuation-in-part of my application Serial No. 422,988, filed January 4, 1965, now Patent No. 3,297,182, which was divided out from my application Serial No. 714,453, filed January 27, 1958, now abandoned and this is also a continuation-in part of my application Serial No. 591,369, filed October 14, 1966.

It is an object to provide a simple and dependable transfer device which can automatically engage and disengage the load and which is easy to align with the load without manually guiding or hooking hooks.

This invention comprehends a contained transfer device for mounting on a vehicle and completely supported on the vehicle for extending, engaging, and lifting the container substantially vertically off an adjacent vehicle or support and for carrying the container onto the supporting vehicle.

It is a further object that the device have extending arms connected to work together to lift opposite ends of the container together and carry the container onto the supporting vehicle with movement which in plan is linear relative to the supporting vehicle. It is an object to provide a transfer device for working between vehicles traveling at speed and which have relative vertical movements from oscillations and road. It is therefore an object that both ends of the container be lifted at the same time and the transfer device with container completely supported by only one vehicle preventing vertical movements between the vehicles from rocking the container as it is transferred.

Other and further objects will be pointed out hereinafter or should become apparent to those skilled in the art from consideration of this invention as described with reference to the accompanying drawings wherein:

FIGURE 1 is a plan view of a side-loading container transfer system.

FIGURE 2 is a sectional view lengthwise through a side-loading passenger container.

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FIGURE 3 is a perspective view of a side-transfer car in process of transferring containers to and from a paralleling conveyor and showing a selective loading conveyor.

FIGURE 4 is a cross-sectional view of the side transfer car engaging a container for loading, together with a schematic diagram of the circuits for operating the loader.

FIGURE 5 is a sectional perspective through a passenger container car at the end of a container berth cut away to show the preferred transfer device extending therefrom engaging a container for transfer.

FIGURES 6 and 7 are central sections through the car of FIGURE 5, the transfer device being shown extended engaging a container in FIGURE 6 and retracted empty in FIGURE 7.

FIGURE 8 is a top view of the transfer device of FIGURES 5-7.

FIGURE 9 is a schematic diagram of the controls for the transfer device of FIGURES 5-8.

FIGURE 10 is a perspective view of a variation of the engaging end of the transfer device of FIGURES 5-9 about to engage a double hook on the end of a container.

FIGURE 11 is a perspective view of a station car with two freight container transfer devices thereon one shown transferring a container between a parallel running vehicle and the station car.

FIGURE 12 is a schematic of the controls for a device of FIGURE 11.

FIGURE 13 is an end view of the cars of FIGURE 11.

FIGURE 14 is a partial end view of a transfer device of FIGURES 11-13 in fully extended position with hooks held open after setting the container on the trailer bed shown.

FIGURE 15 is a perspective view of a train with side-transfer cars in process of transferring containers to and from parallel running vehicles.

FIGURE 16 is a perspective view of side transfer of a truck between the train and a parallel way.

FIGURE 17 is a partial cross-sectional view of parallel running side transfer cars with lift mechanism transferring a container and circuits shown schematically for operating the transfer mechanism and coupling.

FIGURE 18 is a plan view of a side and vertical loading transfer station.

Referring to the drawings and in particular to FIGURES 1-4, train 16 includes one or more side transfer cars 20s, having one or more side transfer berths 23s each for holding a transfer container 24' for side transfer. Containers 24' are suited for use with cars 20s and parallel running vehicles 52'', herein shown as a belt-over-roller conveyor 26 running parallel to track 18, on which is train 16, and transports containers 24' to align for transfer with train 16. The belt of conveyor 52'' preferably has saw-toothed grooves which interfit with transverse grooves on the bottom of container 24'. Conveyor 52'' is driven from either end by motors 1278' through speed reduction, electric brake and clutch means arranged in a usual manner.

An extendible and lifting transfer mechanism or elevator, rack 106s, in each berth 23s has arms 1358 which it engages into recesses 1360 at each end of container 24' under seats 159'. Rack 106s holds the container in the berth, lifts it slightly when removing it, then lowers it to vehicle 52'' and returns. Rack 106s also extends from the side of cars 20s into recesses 1360 of a container 24' aligned therewith, lifts the container from the vehicle 52'' and draws it into its berth. Containers 24' have depending end pieces 1362 each side of each recess 1360. Arms 1358 each have a raised portion, preferably a spring mounted vertically guided table 1364, which fits into the recess 1360 between end portions 1362 to sup-

port each end of a container 24' and which insures that the container will not slide from arms 1358.

Rack 106s comprises a horizontally positioned H-frame 1366, the legs of which have outboard rollers 122' which roll on an intermediate guide 123', one parallel each leg of the H-frame outward therefrom. Guides 123' are preferably made up from I-beam and have a track 125' on each channel for rollers 122'. Guides 123' are also supported on rollers 122' rotatably secured to lift channels 1368 pivoted on the same axis to the frame of car 20s at point 1370 and connected by bar 1372 below the H-frame and guides 123'. A lift cylinder 1374, trunnion mounted to the frame of car 20s, supports bar 1372 to lift channels 1368, guides 123', rack 106s, and any container thereon. Each guide 125' is extended and retracted by a cable 1376 both ends of which are connected to a depending lug 1378 on the guide 125'. Cable 1376 runs transversely on car 20s about traction drum 1380 on the far side from loading and about takeup pulley 1382 on the transfer side. Drum 1380 is reversibly driven by gearmotor 128s to whose output shaft drum 1380 is secured for turning. The H-frame is operated by a cable 1383 in the form of a loop passed over a pulley on each end of an intermediate guide 125' and is anchored to the H-frame and to channel 1368 on opposite runs.

The outer side of each berth 23s is covered by a folding door 1384 to aid in streamlining the car, reduce heat transfer, and prevent rain and snow from entering the car. Door 1384 preferably has a lower portion or door 1385 and an upper door 1386. FIGURE 4. The lower door 1385 is hinged along its top edge to swing in and up against the upper door when pulled by rope 1387 secured to the top of spring latch 1388 secured to the inside of the lower door to latch door 1384 in closed position to the frame of car 20s. The upper door 1386 is hinged along its top edge to swing in and up to the top of the berth when pulled by rope 1389 secured to the inside middle of door 1386. Ropes 1387 and 1389 are run up over pulleys supported to the structure of car 20s above the berth and are operated by hand or other means.

Referring to FIGURE 4, motor 128s is driven from battery 250s to extend rack 160s when empty by a circuit from the positive of battery 250s, line 1390, front contacts 390s of reversing relay 374s, line s', armature of motor 128s, line s'', front contacts 3942 of relay 374s, in series to ground of battery 250s. Relay 374s is energized by a circuit from the positive of battery 250s, line 1396, left-hand contacts of limit switch 139s closed when rack 106s is fully retracted into car 20s, line 1398, operator's switch 1400, front contacts of relay 263, coil of relay 374s, in series to ground. Relay 374s closes a holding circuit from the positive of battery 250s, line 1390, limit switch 1403 opened when rack 106s is fully extended, front contacts 415a and coil of relay 374s, in series to ground. The lifting of relay 374s drives motor 128s to extend rack 106s. Relay 263 is energized by the alignment cell 255 as shown in FIGURE 21.

The head end of cylinder 1374 is connected through solenoid valve 1406 to the outlet of pump 420s or tank 437s according respectively to whether valve 1406 is energized or not. The circuit for valve 1406 is from the positive of battery 250s, contacts 1408 which are linked to close with switch 1400, front contacts of relay 1409 in parallel with back contacts of relays 1409 and 1410, coil of valve 1406, in series to ground. Relay 1409 is energized by a circuit from the positive of battery 250s, line 1396, left-hand contacts of limit switch 139s, line 1412, left-hand contacts of limit switch 234s closed when a container is positioned in the berth, the coil of relay 1409, in series to ground, and is held by a circuit from the positive of battery 250s, line 1390, limit switch 1402, line 1416, front contacts 1717 and coil of relay 1409, in series to ground. Relay 1410 is energized by a circuit including from line 1412, right-hand contacts of limit switch

234s opened when a container is positioned in the berth, coil of relay 1410, in series to ground, and is held by connection from line 1416 through its front contacts and coil in series to ground.

The side doors 1384 of the empty berths 23s on train 16 which are to be used in the next transfer and of the berths 23s having containers to be removed to conveyor 52'' are opened by an operator if transfer at the next station is desired. When a container 24' is aligned at speed with a berth 23a whose door is open, lamp 248s, mounted on the side of container 24' facing berths 23s, is directed to cell 255s mounted on partition 26, causing relay 263 to lift, left-hand contacts of limit switch 139s being closed, closing the circuit which lifts relay 394s to drive motor 128s to extend rack 106s. When rack 106s was returned empty, closing left-hand contacts of limit switch 139s and right-hand contacts of 234s, relay 1410 was lifted closing its holding circuit through limit switch 1402 and its front contacts. Cylinder 1374, being now connected to tank 437s, rests rack 106s at a level to extend arms 1358 under seats 159 of container 24'. When the rack is fully extended, limit switch 1402 is opened by lug 1378, dropping relay 1410 to energize the coil of valve 1406, to pressure cylinder 1374, to lift the container. The opening of limit switch 1402 also deenergizes relay 374s, which has a dashpot to drop slowly. When relay 374s closes its back contacts, after the container is lifted, motor 128s is driven to retract rack 106s, bringing the container into car 20', opening right-hand contacts of limit switch 139s to stop motor 128s when the container is fully within car 20s and closing left-hand contacts of limit switches 139s and 234s, picking up relay 1409 to maintain cylinder 1374 pressured while power is on. The rack is held in by the worm drive of motor 128s or any other means.

When one container is aligned to be loaded onto train 16 containers to be removed can be transferred. Accordingly relays 263 are connected in parallel on car 20s, each in series with the limit switch 314s closed when the door 1384 for that berth is fully opened and all in parallel across the outputs of the amplifiers for photo cells 255 (this circuit is not shown). Relays 263 for the full berths having doors 1384 open are then lifted, lifting relay 374s for each of these berths, driving motor 128s to extend rack 196s. Relay 1409 remains energized, maintaining valve 1406 in position to pressure cylinder 1374 holding arms 1358 up as the container is moved. Relay 1410 remains deenergized, since limit switch 139s opens its left-hand contacts before limit switch 234s closes its right-hand contacts preventing the closing of the pull-in circuit for relay 1410. When rack 106s is fully extended, limit switch 1402 is opened, dropping relay 1409, which deenergizes valve 1406, exhausting cylinder 1374 to lower the container onto carrier 52''. When relay 374s closes its back contacts after time delay to allow the container to be lowered, motor 128s is reversely driven to return rack 106s, which is supported on the outer wheels 122' of H-frame 1366 which roll on the belt of conveyor 52'' as tables 1364 clear the bottoms of the projections 1360 which face train 16. When rack 106s is retracted into train 16 the right-hand contacts of limit switch 139s are opened, stopping motor 128s. The rack is now ready to extend when a container 24' is aligned therewith.

Referring to FIGURES 5-10 for a variation which eliminates the recess pockets and has more stability in transfer by engaging the container above its center of gravity, railway passenger express or mail car 20s' has one or more container berths 23s' along one side separated by partition 120 from aisle 122 along the other side, and an overhead container transfer mechanism having two transverse arms 124 spaced apart either above or so as to straddle container 24. Each arm 124 runs on a track 126 transverse in the car and supported on upright framing 130 at each end of the berth. The rails

of the track are shown as channel 132 run the full width of the car, though a T-bar turned legs in on each side of the berth may be preferred to reduce the height and weight. Arms 124 are aligned and connected by tubular member 134 integral therewith. The outer end of each arm 124 has a hook 136 formed as part thereof for engaging the end of a trunnion pin 138, FIGURE 5, or as shown in FIGURE 10, a hand 139 of two fingers shaped to engage hook 95 on the end of the container can optionally be provided. The inner end of each arm 124 has a roller or wheel 140 engaging to run on the bottom of track 126. An upper shaft or tube 142 has a wheel 144 on each end for rolling along rails 132 thereover. A bar 146 is pivotally connected inward of each wheel to an inward extension of the shaft of wheel 140. A lift cylinder 148 is pivotally connected between shaft 142 and arms 124 preferably one adjacent each arm 124 to work in unison to lift and lower the arms pivoting on the axis of wheels 140 to respectively engage and lift or set down a container when the arms are extended. The two arms 124 are moved out and in the car to transfer a container by any suitable means such as shown in FIGURE 4 or preferably by a cylinder 150 pivotally connected between the frame of car 20s' and the short arm of bell crank 152 pivotally secured to the frame of car 20s' between rails 132 to swing horizontally above the container berth and whose longer arm is linked by bar 154 to cross member 134 to push the arms out or pull them in accordingly as the head or rod end of cylinder 150 is pressured respectively.

Opposite ends of cylinder 150 are connected reversibly to pressure, pump P, and to exhaust through double-solenoid reversing valve 156. Connection is made from the positive of battery 158, top front contacts of relays Land U in parallel, left hand coil of valve 156 to ground of battery 158, to extend the transfer device. Connection is made from the positive of battery 158, back contacts of relays L and U, normally closed limit switch 160 opened when the transfer device is fully retracted within the car, right-hand coil of valve 156, all in series to ground, to return the transfer device into the car.

The rod ends of lift cylinders 148 are connected by hose together to pump P or exhaust through double-solenoid valve 162. Connection is made from the positive of battery 158, lower front contacts of relay L, normally open lower limit switch 163L closed when arms 124 extend lower or are lowered extended, right-hand coil of valve 162, in series to ground, to shift valve 162 to the right to connect pressure to the rod ends of cylinders 148 to lift arms 124 only when extended to engage and lift a container. Connection is made from the positive of battery 158, lower front contacts of relay U, normally open upper limit switch 163U closed when the arms are extended and lifted, left-hand coil of valve 162, in series to ground, to shift valve 162 to the left to lower, set down and disengage the container.

Relays L and U when energized control respectively loading and unloading of car 20s' and are preferably controlled by lamps 164 and 165 on the station, vehicle 52, or on the container 24'. Lamp 164 is lit by a circuit across battery 166 through normally open contacts of limit switch 167 closed by a container to be loaded. Lamp 165 is lit by a circuit across battery 166 through normally closed contacts of limit switch 167 closed when the spot is empty. Lamps 164 and 165 are directed to shine on photoelectric cells 168 and 169 on car 20s' when aligned for transfer. Cells 168 and 169 are connected to amplifiers 170 and 171 respectively in a usual way. The output of amplifier 170 is connected across the coil of relay L in series with normally closed contacts of limit switch 172 closed when the berth is empty, and preferably where used coupling switch 174 closed when coupled for transfer. The output of amplifier 171 is connected across the closing coil of relay U in series with contacts 176 selectively closed by any means when the container is to be

removed, normally open contacts of limit switch 172 closed by a container in the berth, and coupling switch 174 where used. Relay U has a holding circuit from the positive of battery 158, normally closed contacts on the lower limit switch 163, holding coil of relay U, to ground, to hold relay U closed after limit switch 172 opens the closing circuit.

When carrier 52 is coupled to car 20s' with a container aligned with an empty berth on car 20s' lamp 164 shines on cell 168, lifting relay L, shifting valve 156 to the left, connecting the head and rod ends of cylinder 150 respectively to pressure and exhaust, extending the transfer arms 124, which are in lowered position from the previous transfer. Arms 124 extend hooks 136 under pin 138, close lower unit switch 163L in full extended position, shifting valve 162 to the right, pressuring the rod ends of lift cylinders 146, lifting arms 124, which lift the container off the station vehicle, opening contacts of switch 167 which were closed by the container, extinguishing light 164, dropping relay L, reversing valve 156 through back contacts of both relays L and U, reversing cylinder 150, returning arms 124 with container to within car 20s', opening limit switch 160, deenergizing the right-hand coil of valve 156 and closing normally open contacts of limit switch 172.

When the container on car 20s' is aligned with an empty spot and coupled for transfer and contacts 176 are closed manually or otherwise to indicate the container is to be removed, lamp 165 energizing cell 169 lifts relay U which closes its holding circuit and top contacts, shifting valve 156 to the left, extending arms 124 with the container, engaging top limit switch 163U when fully extended, shifting valve 162 to the left, exhausting cylinders 148 through restriction to lower the container at a desired speed to station, car or platform, engaging lower limit switch 163, opening the holding circuit for relay U, which drops, closing back contacts, shifting valve 156, returning arms 124 to within car 20s' in lowered position as shown in FIGURE 7.

Referring to FIGURES 11-14 for a side transfer device preferred for freight containers 20f. Station track 52T runs parallel railway track 18 and truck drive or other vehicle way for vehicles to receive and deliver containers 20f set thereon, and along storage for container 20f. Each station vehicle on track 52T has a transfer device for each container spot and preferably outboard rollers or wheels 182 secured to the frame of car 52f to run under an I-beam rail 184 run parallel track 52T along where transfers are to be made. Rail 184 has up-tapered ends and is supported on columns 186 at height for rollers 182 to engage the bottom thereof when the transfer device is extended with a container over the opposite edge of the car to keep the car stable, FIGURES 11 and 13.

The transfer device has two parallel arms 124f spaced to straddle the ends of a container 24f. One end of each arm is pivotally secured to the frame of car 52f along the side opposite rollers 182 and preferably below bed or container bottom level as shown. The outer and upper ends of arms 124f each pivotally support a hook 184 and are connected preferably by a tube 186 having a shaft in each end on which hooks 184 are secured in alignment to swing together in holes in the ends of arms 124f.

Hooks 184 are cut from plates in a shape to cam open and latch on trunnions 138 or other extensions central on each end near the top of each container 24f. One or both hooks 184 on each transfer lift has a lever 186 extending from the top and a cylinder 188 pivotally connected between the lever and a bracket 189 extending up from arm 124f to open and hold the hooks open when the container is set off carrier 52f. The head ends of cylinders 188 are connected through solenoid valve 190 to a low pressure air supply A.

Arms 124f are operated by cylinders 192 each pivotally connected between an arm 124f and a bracket 193 secured to and extending up from the bed or frame of car 52f to

swing the arms to transfer a container to or from the station car. Opposite ends of cylinders 192 for each transfer device are connected oppositely and alternately by solenoid valve 156 to either an air or hydraulic pressure supply, pump P, and exhaust or tank E according as

Cylinders 192 for each transfer device are controlled by valve 156 to extend the lift from the station vehicle and retract to transfer a container. Connection for controlling valve 156 is from the positive of battery 158, front contacts of relays L and U in parallel, back contacts of relay R to right-hand solenoid of valve 156 to connect pressure from pump P to the head end of cylinders 192 to extend the transfer device as shown in FIGURE 12.

When cylinders 192 are fully extended an arm 124f closes limit switch 196, completing a circuit from the positive of battery 158, line 197, limit switch 196, top coil of relay R, in series to ground, lifting relay R, closing a circuit from the positive of battery 158, front contacts of relays L and R, line 198, left-hand solenoid of valve 156, all in series to ground, shifting valve 156 to the left to pressure the rod ends and exhaust the head ends of cylinders 192 through orifice to return the arms at the desired speed. A holding circuit for relay R is closed from line 198, bottom coil of relay R, to ground, to prevent reversal of valve 156 after limit switch 196 opens when arms 124f start to swing back in.

Lamps 164 and 165 are placed on the side of car 20f to shine on respectively cells 168 and 169 on station vehicle 52f when aligned for transfer. Lamps 164 and 165 are connected across battery 166 through respectively normally open and normally closed contacts for limit switch 167 (as in FIGURE 9) to control respectively loading and unloading of the station vehicle. Cells 168 and 169 are connected to respective amplifiers 170 and 171 across the outputs of which are respectively connected the coil of relay L and closing coil of relay U. The holding coil of relay U is connected from the positive of battery 158, line 197, normally closed limit switch 200 opened by arm 124f in resting position with hook 184 central over the station vehicle, front contacts of relay U, line 202, and holding coil of relay U in series to ground. The head ends of cylinders 188 are connected together to exhaust or to air pressure supply A through spring returned solenoid valve 190 according as the solenoid of valve 190 is deenergized or energized respectively. The pressure of supply A will open hooks 184 only when unlatched. The solenoid of valve 190 is connected between line 202 and ground to be energized with relay U to connect pressure to cylinders 188 but will swing hooks 184 back up out of latching position only when hooks 184 are relieved of the container.

When container 24f is to be set off from the station car 52f relay U is lifted, reversing valve 156, connecting pressure to the head ends of cylinders 192, extending arms 124f, closing limit switch 196, closing the holding circuit for relay U and energizing the solenoid of valve 190 to shift to connect pressure to the head ends of cylinders 188. When the container is set down off the side of the station vehicle arms 124f continue down releasing hooks 184 from trunnions 138 to swing open with the pressure in cylinders 188 to position shown in FIGURE 14. When limit switch 196 is closed, relay R is lifted, reversing valve 156, reversing cylinders 192 to return the empty arms 124f over the station car 52f, opening limit switch 200, dropping relays U and R and deenergizing valves 190 and 156.

Referring to FIGURES 15-18, train 16 includes one or more side transfer cars 20S having one or more side transfer berths STB each for holding a container 24S for side transfer. The station vehicle or container supporting carrier 26d' runs on track ST'' parallel both track Tp' and Tp (FIGURE 18) to serve for both vertical and side transfer.

A transfer mechanism is provided at each berth on car

26S and preferably has a track 1454 traverse to the car extendible therefrom to straddle container 24S or 24V' and engage rollers 1456 secured near the top on each end of container 24S. Each rail of the track has an inner arm 1458 and an outer arm 1460 hinged on a pin 1462 secured to the frame of car 26S. A cylinder 1464 is pivotally connected between the outer arm and the frame of car 26S to swing the arm in and out. A cylinder 1466 of larger bore than 1464 is pivotally secured between the inner end of arm 1458 and the frame of car 26S to support the inner arm and control the tilt of track 1454 to run container 24S in an out of car 26S. Upsweeping curves on the ends of track 1454 gently stop the container at ends of travel. Latch cylinders 1470 have a latch taper on their rod ends to latch the container in car 26S. Limit switches 1472 and 1474 are on arms 1458 and 1460 at respectively the inner and outer ends of track 1454 to be closed when the container is thereat. Two positive displacement pumps 1476 are connected on the shaft of motor 1478. Hydraulic connection is made from tank 1430 to the inlet of each pump 1476 and from the outlet of each pump separately through solenoid valve 1482 teed to the head of each cylinder 1464 and extending separately through valve 1484 teed to the head end of cylinder 1464 and to the rod end of latch cylinder 1470 separately for each track rail.

The transfer device is controlled by unload and load lamps 152 and 153 on vehicle 26d'. Lamp 152 can be on the container. Lamps 152 and 153 are connected through respectively back and front contacts of limit switch 168 across battery 172 to shine on cells 150 and 151 respectively when the berth on car 26d' is full and empty and aligned with car 26S for transfer. The output of cells 150 and 151 is connected to amplifiers 170 and 171 whose output is connected across relays L' and U' respectively. Valve 1482 connects pressure to the head ends of cylinders 1464 when energized by a circuit from the positive of battery 160, line 1486, normally closed limit switch 1472, front contacts of relay L'', left-hand coil of valve 1482 in parallel with hold coil of relay L'', to ground of battery 160, to extend the outer arms to lift the container and raise it to roll into car 26S. Limit switch 1472 is opened when the container is in, deenergizing valve 1482, which exhausts cylinders 1454 to tank to return arms 1460. Valve 1482 is also energized by a circuit completed from line 1486, normally closed contacts of limit switch 1474, front contacts of relay U'', line 1488, right-hand coil of valve 1482 in parallel with hold coil of relay U'', to ground, to extend the outer arms. Valve 1482 connects pressure separately to the head ends of cylinders 1486 to raise arms 1460, completing a circuit from line 1488, limit switch 1490 closed by an outer arm when raised parallel the inner arm, solenoid of valve 1484, to ground, to pressure cylinders 1466 and 1470 respectively to tilt the track and lift the latches to run the container out and to set it down when the outer arms are retracted by opening of limit switch 1474. The tandem pumps and valving synchronizes the cylinders of each rail to lift and tilt together.

The parallel running vehicles are preferably coupled before transfer by a double latch coupling 111 secured on the bottom along the side of car 26S and a coupling pin 109S mounted on parallel arms 1494 to swing in a transverse vertical plane on car 26d' out to engage the coupling 111 on either side when approaching alignment. Pin 109S is positioned by air cylinder 108S pivotally connected between an arm 1492 and the frame of car 26d'. Each end of cylinder 108S is connected to air tank 199 through a valve 169 when energized or to exhaust when deenergized to shift the piston of cylinder 108S from center to either end according to which valve 169 is energized. Valves 169 are each energized by a circuit from the positive of battery 172', ramp switch 870, front contacts of relay 845 and coil of valve 169 for that side, to ground. Lamp 158 on car 26S is connected through switch 1498 across battery 160 to shine on photoelectric cell 161 when

approaching alignment. The output of cell 161 is connected across amplifier 834 whose output is across the coil of relay 845 for that side of the car to lift the valve 169 to pressure cylinder 108S to shift pin 109S to that side of the car to engage latch coupling 111. Switch 870 is closed along the transfer run by rail 868, FIGURE 18, and is dropped when the station vehicle is to uncouple.

Referring to FIGURE 18 for a simple station plan, railroad track TP runs parallel beside station track ST', and monorail track TP' runs over the station track along the transfer run so that one or more station vehicles 26d' can service side transfer cars 26S in train 16 and at other times service monorail trains for transfer of containers 24S therebetween. The station track turns beyond the transfer run and runs parallel a truck drive TA along side of the storage yard. One or more cranes 1500 run at right angles over track ST', drive TA, and over storage spots SAS, and each has a crane 1501 for transferring containers 24S between truck 46 on drive TA, storage spots SAS, and station cars 26d'. Such a station plan is generally applicable to the variations of this invention described except that in the variation FIGURES 11-14 the crane is either omitted or the containers set off from the station vehicle before being picked up by the crane.

Having thus described a few of the many possible variations and applications of this invention it should be understood that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense, further I contemplate to cover by the appended claims all variations and parts which fall within the true spirit and scope of this invention.

I claim as my invention:

1. In combination, a railway car, a transfer container, means for supporting said container in relation to said car for side transfer thereto, a transfer mechanism for transferring said container to or from said car, said mechanism being fully supported by and secured to said car throughout its transfer operation with the container, said mechanism having two substantially parallel arms spaced apart, support means for said container on the ends of said arms, lift means on the ends of said container to be automatically engaged and disengaged by said support means, power means for extending and retracting said arms from the side of said car to transfer said container fully supported thereon, and lifting means for controlling said arms and support means to automatically engage and disengage said container for transfer to and from said car.

2. In a combination as in claim 1, said arms being

substantially horizontal telescoping boom means operating substantially horizontal and retracting to a position within said car and carrying said container within the plan boundary of said car for hauling thereon.

3. In a combination as in claim 1, control means for automatically operating said device to load and unload when aligned for transfer.

4. In a combination as in claim 1, said lift means being wheels on each end of said container, said arms being hinged to swing vertically out and up under said wheels to form a track therefore.

5. In a combination as in claim 1, said arms being pivoted to the frame of said car on one side thereof, said last means being cylinder and pressure means connected to swing said arms up and down on said car to lift and lower the container for transfer.

6. In a combination as in claim 1, said container having trunnions on each end near the top (which are said lift means), said support means being a hook on the end of each arm for engaging with said trunnion.

7. In a combination as in claim 4, said arms being near the top of said container straddling the container, at least two said wheels being on one end of the container spaced apart to stabilize the container from tipping on said track.

8. In a combination as in claim 1, a track transverse on said car at each end of the container, said arms having under-running wheels at one end for running under said track, means connecting said arms together parallel to move together, said lifting means comprising over-running wheels on said track and lift cylinder and pressure means therefore, said cylinder means being connected between a central portion of said arms and said over-running wheels to support and lift said arms.

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