

June 20, 1961

T. D. STEWART
RAILWAY CAR MOVER

2,989,007

Filed Oct. 28, 1958

7 Sheets-Sheet 1

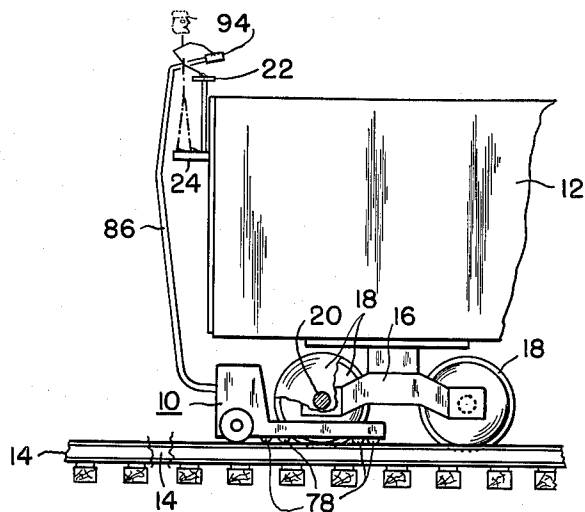
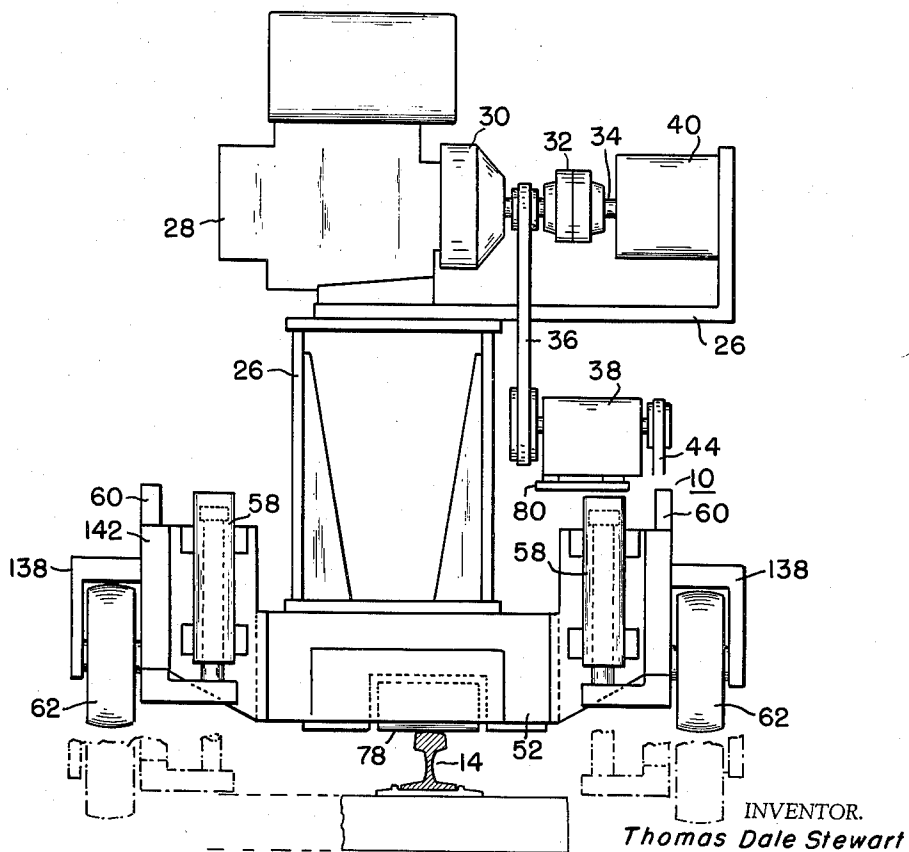


Fig. 1



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Fig. 3
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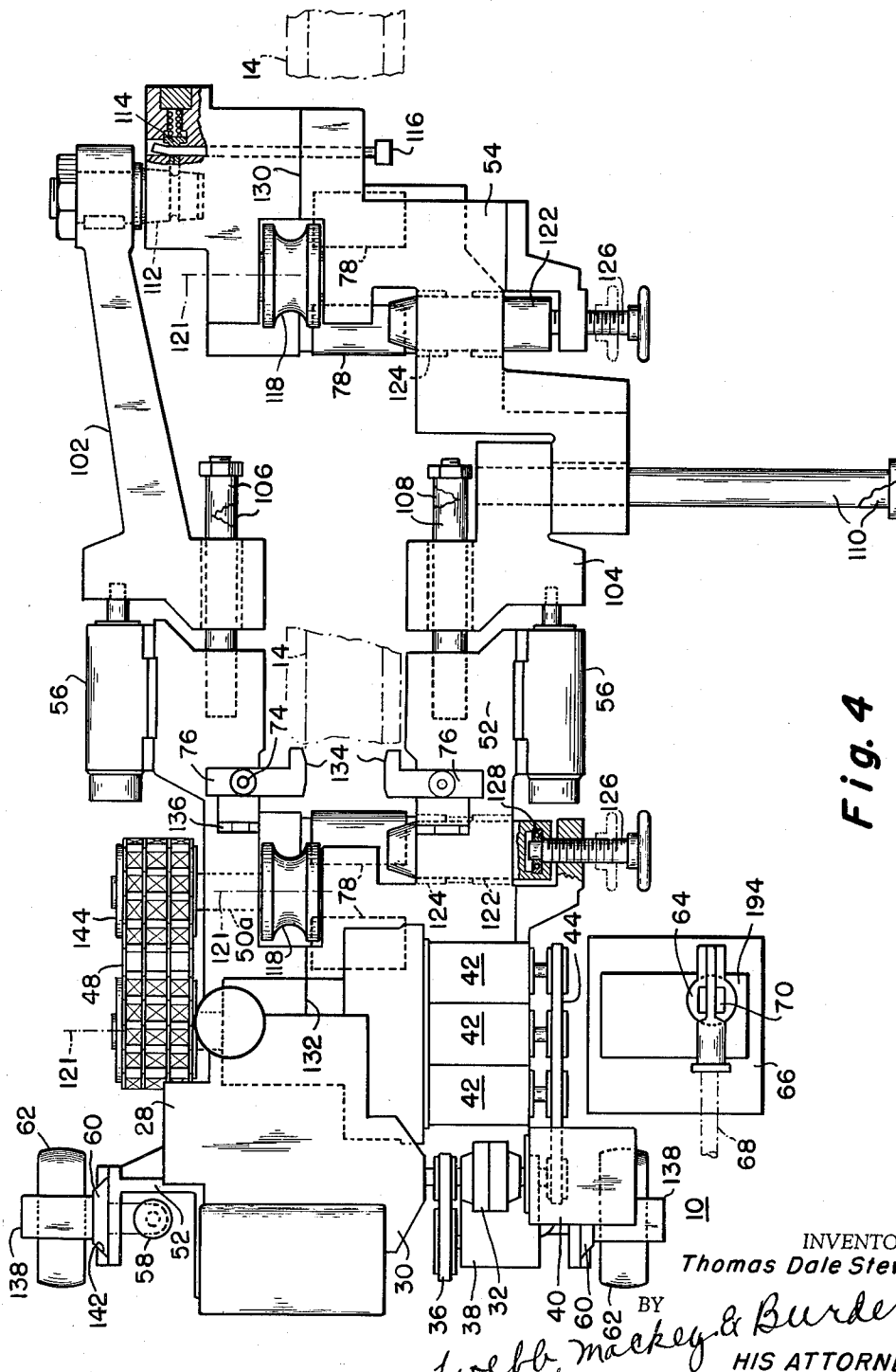


Fig. 4

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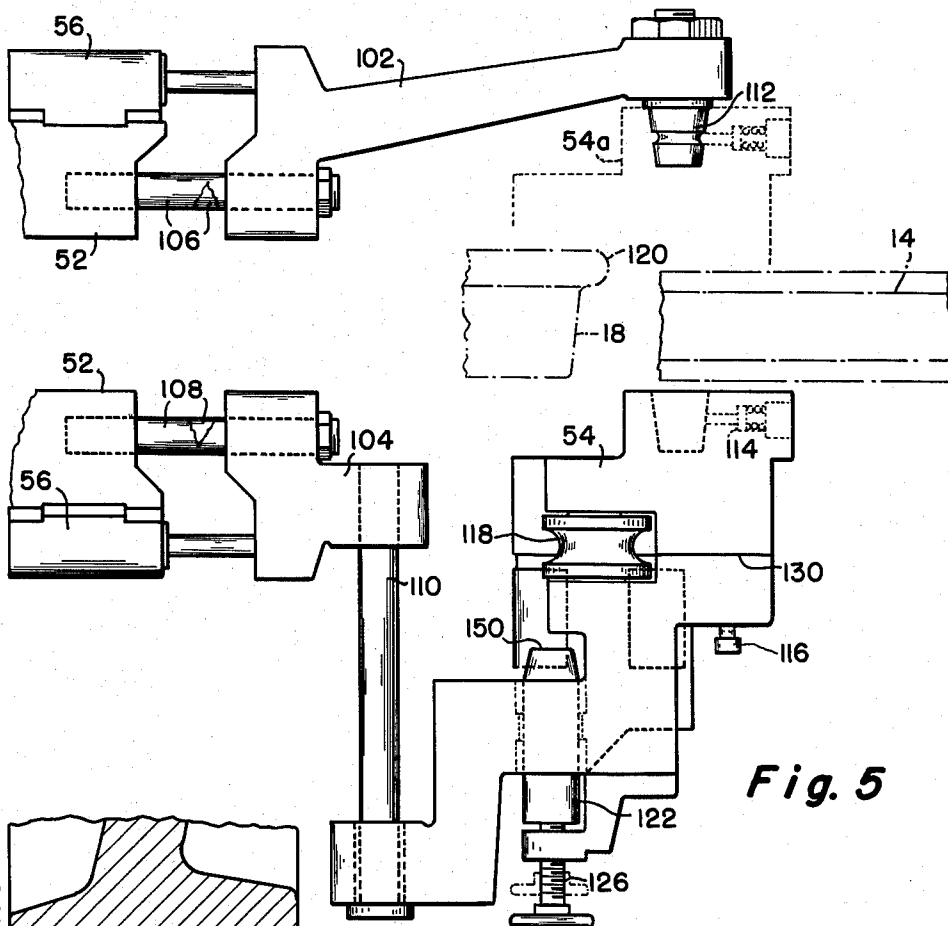


Fig. 5

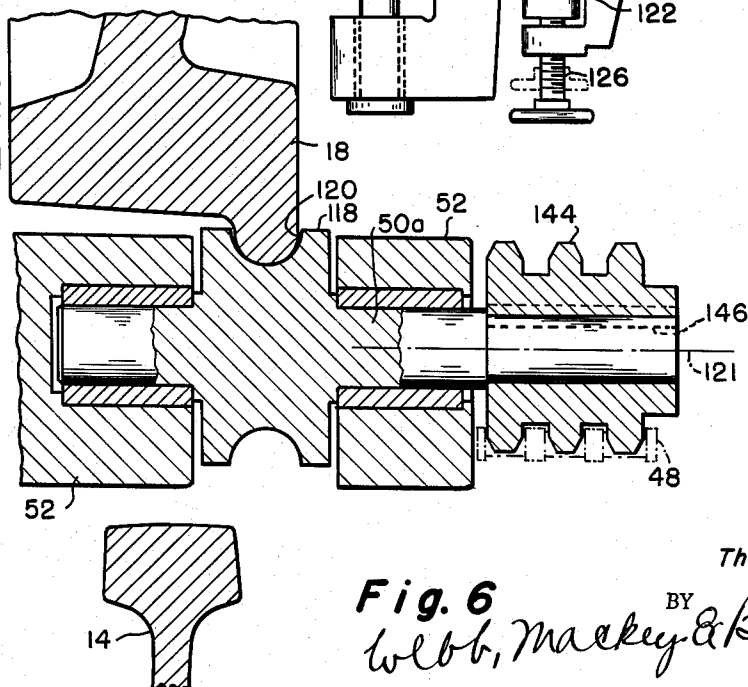


Fig. 6

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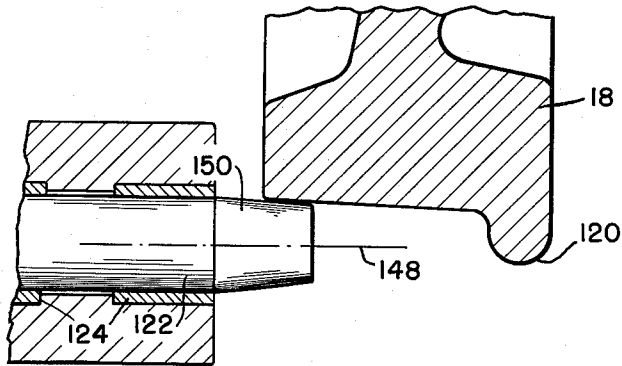


Fig. 7

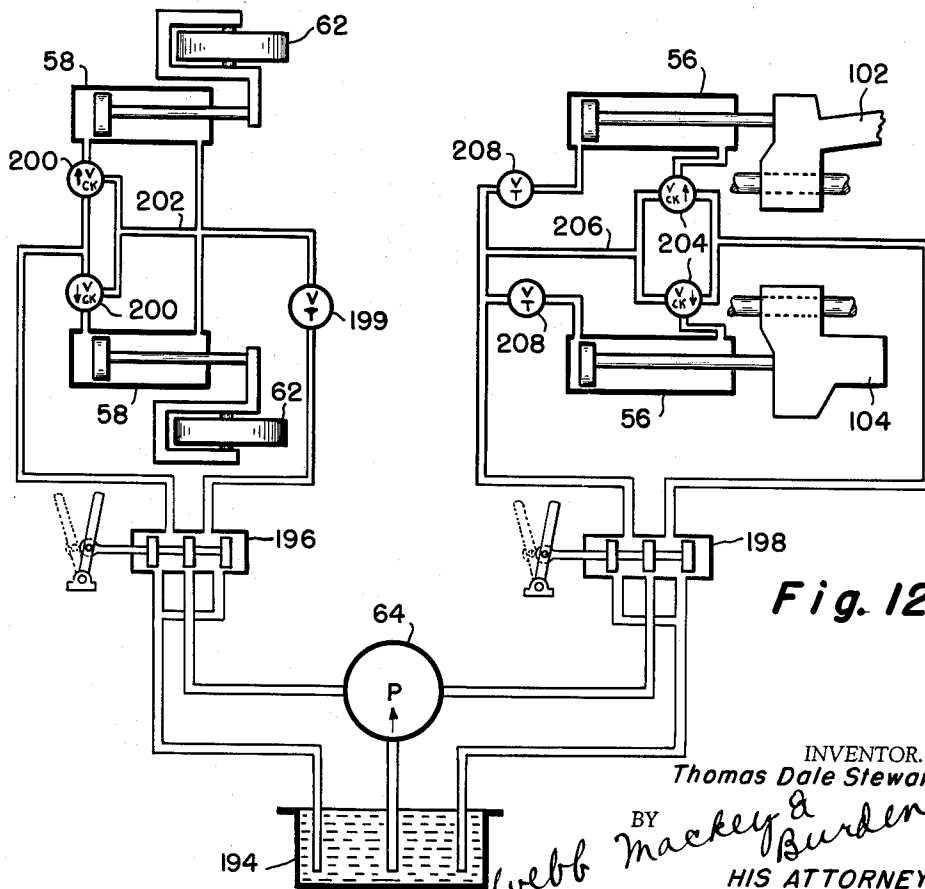


Fig. 12

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RAILWAY CAR MOVER

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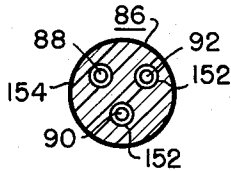


Fig. 8

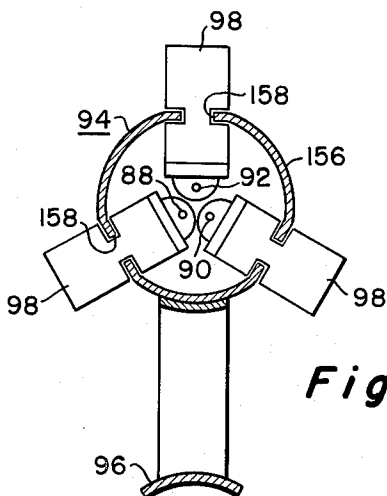


Fig. 9

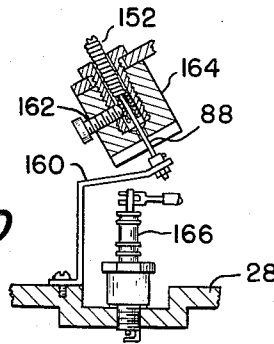


Fig. 10

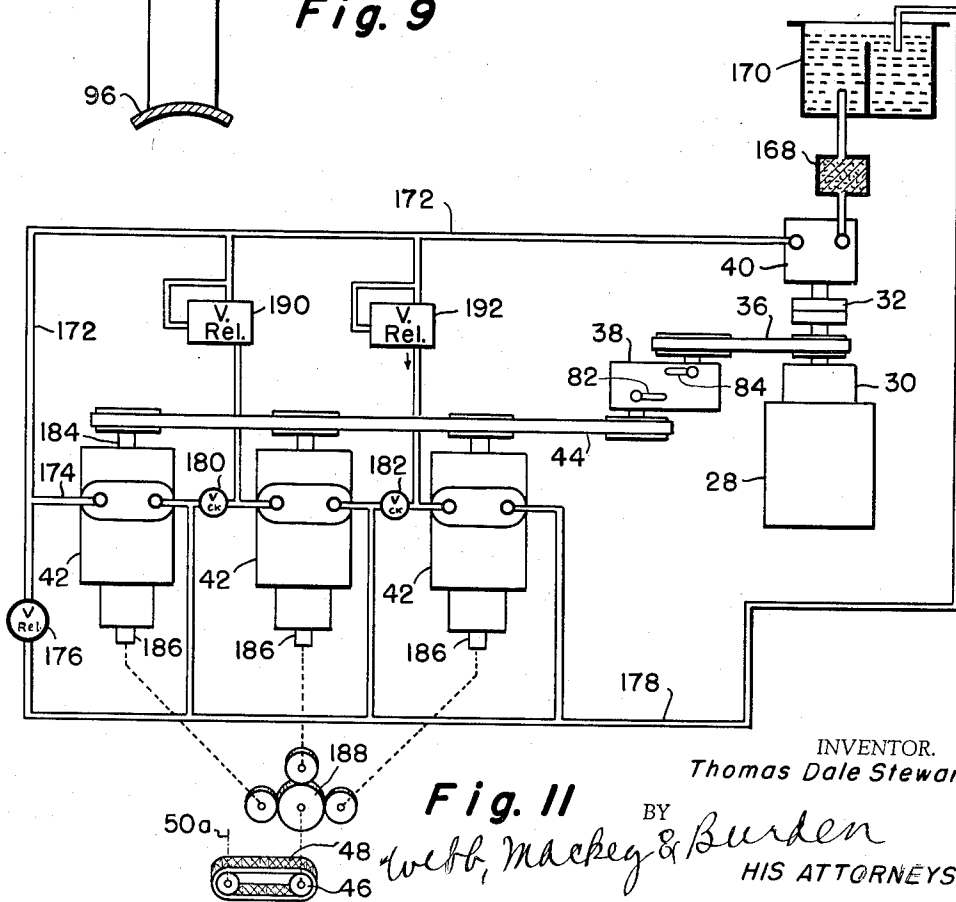


Fig. 11

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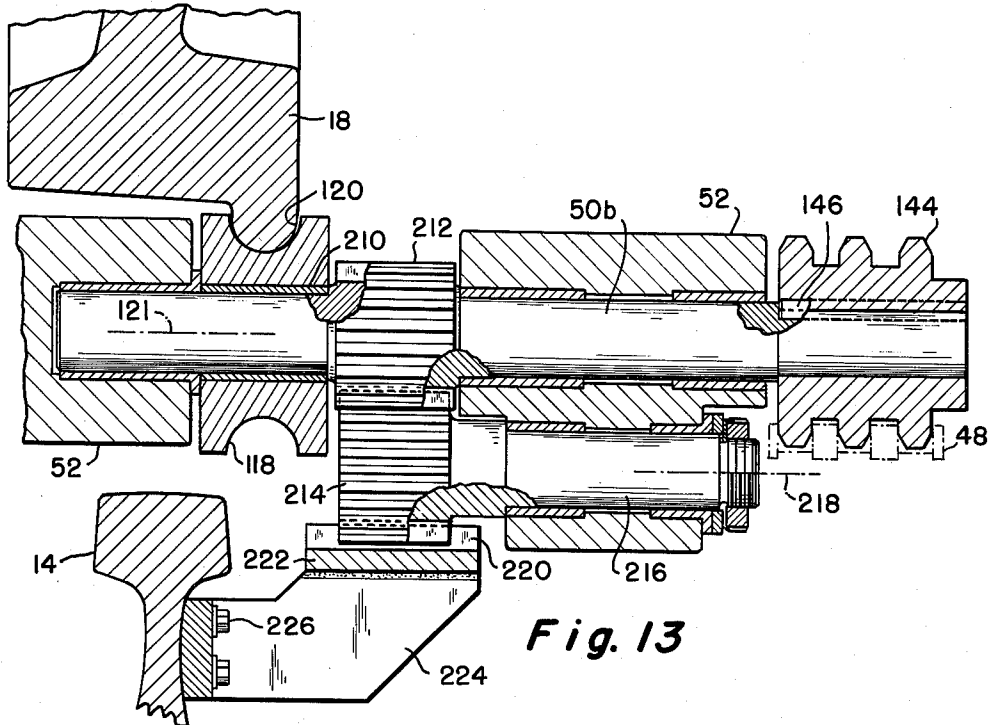


Fig. 13

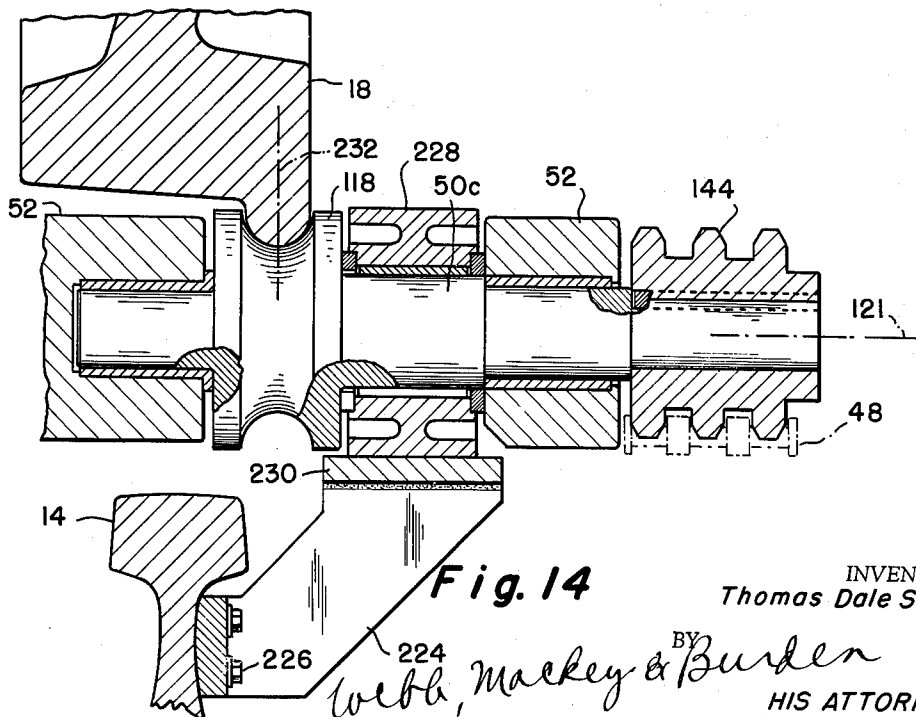


Fig. 14

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1

2,989,007

RAILWAY CAR MOVER

Thomas Dale Stewart, New Kensington, Pa., assignor to
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a corporation of Pennsylvania

Filed Oct. 28, 1958, Ser. No. 770,103

26 Claims. (Cl. 105-90)

The present application relates generally to a railway car mover and more particularly to a self-propelled traction device adapted for moving wheeled railway cars of a type in which each of the two flanged wheels located at opposite sides to one another on the car are provided with a solid axle therebetween. This device has a hydraulic jacking or wedging action for holding and forcibly turning one of two such companion wheels and the associated end of the axle in a lifted position relative to their track rail, and the developed tractive effort exerted on the track is largely transmitted thereto by means of that solid axle and the wheel at its other end and into the opposite rail of the track.

Car mover devices are designed to provide a very useful function in commercial plants, along coal mine sidings, and at dockside sites wherein railroad cars must be shifted about from time to time in the loading and unloading operation. Shipping companies can find especial use for them in their car shifting operations not only adjacent but actually on shipboard where the cars to be shipped or to be debarked are required at times to be shifted about in the holds of the company ships. Thus, portability of the car mover is essential.

Prior mover devices which utilize a jacking-type action for somewhat similar purposes to the aforesaid have the general disadvantage of being difficult and tedious to remove and to install, irrespective of whether power-operated or manually-operated and in the former case, they are rarely if ever truly portable machines inasmuch as electric motors are the usual power source requiring provision for the conventional off-on power switch and the electrical power cord at each location and also some form of straight gear drive to produce proportionately slower output shaft frequency than what the fixed motor running frequency is.

The present car mover materially reduces or largely overcomes the foregoing disadvantages, employing a captive prime mover thereon reversibly coupled to the load by, and introducing its tractive effort through an infinitely variable ratio transmission, thus rendering the device truly portable and productive of a very flexible range of self-sustaining operation.

The selected car wheel to which I preferably apply my device for purposes of hydraulically wedging it into the aforesaid lifted position is the right rear wheel of the car, and I provide an extended length of control cable harness for controlling the prime mover and transmission from some removed point of open view such as the remote control point provided by the brake-operating platform or equivalent which is standard equipment on the usual railway car. From such vantage point in which he releases the car brakes, the operator is in a position of good visibility to inch the car along one way or the other or speedily advance same to other areas along the track under propelled power operation while conveniently remaining aboard the moving car. The operator not only stays accessible at all times to full power control but for safety's sake keeps also in full manual control of the brakes with which the car is equipped.

A feature of construction hereof consists in the provision of a wheeled carriage for the present device formed of frame members which are detachably joined together in at least one corner to effect easy opening and quick

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attachment re-joinder of the frame for expeditiously boxing in the car wheel to be lifted. Release of the referred-to hydraulic wedging action, accompanied by release of the frame joint noted enables the car mover device to be readily detached from a moved car and transported for application to the next car to be spotted. In all phases referred to, the manipulation and power control over the present car mover is handled as, and expressly designed for a one-man operation.

I have shown certain presently preferred embodiments of the invention in the accompanying drawings, in which:

FIGURE 1 is a fragmentary side view of a railway car to which the device of the present invention is shown applied;

FIGURE 2 shows a portion of FIGURE 1 in side elevation to enlarged scale;

FIGURES 3 and 4 are rear end elevational and top plan views of the device of FIGURE 1;

FIGURE 5 is a fragmentary plan view corresponding to FIGURE 4 but showing the parts in an open position;

FIGURES 6, 7, 8 and 9 are sectional views taken along the respective lines VI—VI, VII—VII, VIII—VIII, and IX—IX in FIGURE 2;

FIGURE 10 is a detail of an ignition grounding device for the engine of FIGURE 2;

FIGURES 11 and 12 are schematic diagrams of the transmission apparatus and the hydraulic cylinder apparatus respectively of FIGURE 2;

FIGURE 13 corresponds to FIGURE 6 of the preferred embodiment of the invention but shows one modification; and

FIGURE 14 shows another modification thereof.

More particularly in FIGURES 1, 2 and 3 of the drawings, the present car mover device generally indicated at 10 is shown applied to a freight railway car 12 of standard construction supported on two rails 14 of standard track. The car 12 has the usual front and rear wheel trucks of which the rear one 16 is particularly shown and which carry opposed pairs of standard flanged wheels 18, each pair being integrally connected by means of the usual solid axle 20 between wheels. These wheels are provided with the usual manually-operated brakes which are controlled through a brake hand wheel 22 located at some convenient point on the rear of the car 12 in association with the usual fixed brake-operating platform 24 or equivalent.

The car mover device 10 has a motor stand 26 mounted to the carriage thereof and supporting a source 28 of prime power, preferably a small single-cylinder gasoline engine with spark ignition. Engine power drives a reduction gear 30 which through a conventional connection 32 is coupled to a transmission input shaft 34. An intervening, timing-type cog-belt 36 which is mounted on appropriate toothed pulleys known as timing belt pulleys further connects the reduction gear 30 to a speed control and reverse unit 38. A high pressure, positive displacement pump 40 (FIGURE 3) on the motor stand 26 is connected through hydraulic lines to a set of three hydraulic torque booster motors 42 which are controlled as to their speed and direction by means of a cog-belt 44 common thereto which is driven by the speed control and reverse unit 38. An overload slip-clutch can be provided as a precaution in the output shaft of the unit 38 to prevent the transmission of excessive torque. A satisfactory make of belt 36 and 44 is known as a Gilmer timing belt, made with rubber or neoprene or other flexible elastomeric backing carrying fabric faced teeth and manufactured by U.S. Rubber Company, New York 20, New York.

A common output member 46 from the torque booster

motors 42 has sprocket teeth connected through a drive sprocket chain and sprocket connection 48 to a traction drive output shaft 50a. The traction drive output shaft 50a hereinafter described in further detail is journaled for rotation in a main carriage frame member 52 to which a second frame member 54 is adjustably joined at the front for relatively extensible and contractive movement thereto by means of a pair of hydraulic cylinders 56 disposed one at each side of the main frame member 52.

The main frame member 52 has outrigger brackets at the opposite rear sides thereof carrying a pair of vertically disposed hydraulic cylinders 58 (FIGURE 3) which are connected for extensibly and retractively moving a pair of transport wheel slides 60. Each slide 60 carries a free-turning rubber-tired transport wheel 62 which is movable between the retracted position shown in solid lines in FIGURE 3 and a ground-engaging active position thereof indicated by dotted lines.

A hydraulic hand pump 64 (FIGURE 2) common to the pairs of cylinders 56 and 58 is supported by a pump stand 66 carried by the carriage member 52 and is fitted with hydraulic connections hereinafter described for delivering hydraulic fluid under pressure when the pump handle 68 thereof is manually raised and lowered to operate the pump plunger 70.

For use in transporting the device 10 to and from a point of application to a car 12 to be spotted in position, a swing-type handle 72 is provided at the front of the frame member 54 for maneuvering the device 10 on its transport wheels 62 after they are let down to the ground. The main member 52 additionally carries a pair of guide shoe control rods 74 which by means of operating handles 76 can be lowered to a level at which the guide shoes will engage opposite sides of the associated rail 14. These guide shoes center the device 10 in moving it lengthwise along a rail 14 independently of the transport wheels 62; in such instance, the main and second frame members 52 and 54 smoothly roll along the rail upon front and rear rollers 78 (FIGURES 2 and 3), the front pair of which is carried by the frame member 54 and a rear pair of which is carried by the main member 52.

The rear frame member 52 further carries a control stand 80 (FIGURES 2 and 3) for supporting the speed control and reverse unit 38, which unit carries an upstanding zero-maximum "zero-max." speed control lever 82 which pivots between two extremes of position controlling the torque boost motors 42 at an infinitely variable speed ratio. Another upstanding lever 84 pivoted to the unit 38 constitutes a forward-reverse "for.-rev." selector handle which determines the direction of rotation taken by the cog-belt 44 and likewise the direction of rotation taken by the torque boost motors 42.

A control harness cable 86 (FIGURES 1 and 2) contains a set of three Bowden slide wires, one constituting an on-off ignition control wire 88, another 90 being connected to operate the for.-rev. selector handle lever 84, and the third one 92 being connected to the zero-max. speed control lever 82. At its free end, the cable harness 86 carries a remote control device 94 provided with a hand grip 96 and carrying slidable positioning elements 98 which are connected for hand operation of the Bowden slide wires 88, 90 and 92 respectively. In this way, the operator from a remote vantage point such as from aboard the brake-operating platform 24 of FIGURE 1 can not only control the brake hand wheel 22 but also by conveniently inserting his hand indicated at 100 in a control carrying position on the back of his hand, he can thus manipulate the elements 98 with the opposite hand to control speed, direction, and stopping of the applied power from the source 28. The fingers of the hand 100 carrying the remote control remain free to operate the hand wheel.

In FIGURES 2, 4 and 5, the main frame member 52 is arranged to shiftably carry long and short parts forming the front forks 102 and 104 on the carriage frame,

and the second frame member 54 is carried by these front forks 102 and 104 in a manner to complete the frame for boxing in the desired car wheel 18. For this purpose, a pair of vertically spaced slide rods 106 individual to the long fork 102 is made rigid with the main member 52 in a parallel manner whereby the associated hydraulic cylinder 56 can move the fork 102 extensibly and retractively relative to the member 52. The short fork 104 is similarly supported by a vertically spaced pair of slide rods 108 which are rigid with the main member 52. A pair of laterally extending vertically spaced slide rods 110 is rigid with the short fork 104 for slidably carrying and forming a permanent joint to the frame member 54. A piston rod in the hydraulic cylinder 56 adjacent the short fork 104 is rigid with the latter to apply power for moving it in concert with the fork 102 controlled by the other cylinder 56. Their stroke is designed to accommodate the full range of railroad car wheel diameters from approximately 33" to 36" nominal diameter. The frame member 54 has a tapered socket receiving a grooved, tapered pin 112 carried at the front of the long fork 102 and held in said socket by means of a spring catch 114 seated in the groove. A plunger pull rod 116 has a diagonal cam surface at the inner end enabling the operator with a pull on the rod 116 to withdraw the plunger of the spring catch 114 from the groove in the pin 112 so as to open the joint at will.

Each of the frame members 52 carries an individual grooved roller 118 adapted to engage the flange 120 of the car wheel 18 at the front and rear. The front one of the grooved set of rollers 118 is mounted for free turning movement on an axle establishing a fixed axis 121 whereas the rear roller 118 is fast to the traction drive output shaft 50a for rotation on a similar fixed axis 121.

Each of the frame members 52 and 54 further carries a free-turning beveled roller 122 journaled in a pair of spaced porous-metal bearing bushings 124 for rotation therein. A hand-wheel-operated roller adjusting shaft 126 is threaded in the adjacent frame member and is connected by means of an antifriction bearing 128 to each roller 122. For purposes of assembly, each of the frame members 52 and 54 is preferably a two-part casting, the parts of the second member 54 being bolted together along a line of separation indicated at 130 and the line of separation between the two parts of the main frame member 52 being indicated at 132. In this manner, the grooved rollers 118 are readily installed prior to bolting together the two casting parts so as to keep the rollers fixed in their vertical planes.

At their lower ends, the guide shoe control rods 74 carry shoes 134 disposed one at each side of the rail 14 for centered engagement therewith accomplished by manually rotating the handles 76 from their elevated support brackets 136 for an arcuate swing of 90° and then lowering the shoes 134 to a level alongside the top portion of the rail 14. These shoes 134 are otherwise retracted to their elevated inoperative positions.

Each transport wheel 62 in FIGURE 4 is carried by an axial supporting bracket 138 made fast to the adjacent slide 60 which has tapered opposite edges. That slide 60 moves vertically in fixed gib guideways 142 which lie in a vertical plane parallel to the axes of the hydraulic cylinders 58 for operating the transport wheels.

In FIGURE 3, the track engaging rollers 78 are disposed symmetrically in the vertical plane of the track rail 14, and the car mover 10 has a normal position centered on the top of the one rail 14. When the car mover is being moved along on a rail 14 to be positioned for attachment to a car wheel, the shoes 134 are kept down beside the rail to slide thereagainst and center the car mover. Otherwise, the shoes remain in a retracted position.

In the car wheel moving position of FIGURES 2 and 6, the wheel periphery of the car wheel 18 does not make

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flat surface contact with either grooved roller 118; but instead, the protruding flange 120 on the wheel 18 provides reentrant angle engagement with the groove in the roller to intensify their interface of contact against slippage. The two points of contact are in a plane laterally offset inwardly from the plane of the associated rail 14 and the car wheel 18.

Each grooved roller 18 is preferably forged integrally with its associated shaft, and in the case of the rear grooved roller 118 as viewed on the left in FIGURE 2 the integral axle 50a carries a traction drive sprocket 144. The sprocket 144 is made fast to an end extension of the shaft 50a by means of a key 146 and at the periphery it is in constant mesh with the traction drive chain 48. Thus, input torque applied by the engine source 28 is delivered through the sprocket-connected rear roller 118 to a point as far out as possible on the wheel 18, namely, at the outside diameter of its peripheral flange 120. This moment advantage in terms of leverage, coupled with the fact of interengagement as just noted and the fact that the roller augmented by the adjacent tapes on the free-turning roller 122 as described immediately following supports up to one-half of the load at the wheel, accounts for force application being carried out with a minimum of slippage and at maximum torque multiplication. Moreover, the grooved roller tends to maintain its high work capacity without being fouled with sleet, mud, or snow from the track, inasmuch as it is spaced at all times from direct or indirect contact therewith.

In FIGURES 2 and 7, the threaded adjusting shaft 126 is concentric with the bearing bushing 124 to establish a fixed axis 148 along which the conically tapered end portion 150 of each beveled roller 122 moves so as to wedge into engagement with the so-called flat portion of the car wheel 18. These two interfaces of engagement are noted to be at points adjacent to but opposite from the corresponding points of interengagement between the wheel flange 120 (FIGURE 6) and each grooved roller 118; that is to say, they differ by being on opposite sides of the plane of the wheel 18. The symmetry of these two pairs of points of contact in offsetting relationship to one another insures fixed balance of the device 10 within the vertical plane of the track rail 14 and car wheel 18. Then when considered collectively with the two tandem pairs of track rollers 78, the total rollers provide eight points of supporting contact between the top of the supporting rail 14 and the periphery of the supported wheel 18, in addition to any residual pressure of direct contact between the latter two.

In FIGURES 2 and 8, the cable harness 86 consists of an assembly of the parallel Bowden slide wires 88, 90 and 92, each of which is made of wire rope strands and which slides in a conventional helically wound guide conduit 152. The guide conduits 152 are individual metal parts molded in a common plastic body 154 holding them in the properly spaced apart relationship and at the same time imparting the proper flexibility to the cable harness 86.

In FIGURES 2 and 9, the remote control 94 consists of a tubular hollow case 156 in which the Bowden wire operating elements 98 are mounted in individual longitudinally extending slots 158 which are spaced 120° apart. In the embodiment illustrated, the ignition grounding wire 88 is moved by the associated element 98 between an off position at one extreme of travel of the latter and an on position at the opposite extreme. The for.-rev. wire 90 is moved from a neutral center position by the associated element 98 into the opposite extremes of travel of the latter corresponding to forward movement and reverse movement of setting for the transmission. The zero-max. connected wire 92 is moved by the element 98 from a zero-speed position at one extreme of travel of the latter into a maximum speed opposite extreme of travel and the range of adjustability therebetween represents selected

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speed positions for operating the torque booster motors 42 during constant running speed of the prime mover 28.

In FIGURES 2, 9 and 10, the ignition grounding wire 88 extends beyond the corresponding end of its metal guide conduit 152 to a point of connection with an ignition grounding spring leaf 160 which is secured by a set of screws to the cylinder head of the prime mover 28. The guide conduit 152 is secured in conventional way by a screw fastener 162 to an engine supported bracket 164 so as to firmly anchor the Bowden cable. Appropriate movement of the on-off ignition positioning element 98 of FIGURE 9 makes the spring leaf 160 deflect to ground the high tension, center-electrode terminal of an adjacent spark plug 166 in the engine so as to stop same; and when released, the spring leaf 160 immediately resumes its ungrounding solid line position of FIGURE 10.

In FIGURES 3, 4 and 11, the constantly operating pump 40 which is coupled at 32 to the prime mover reduction gear 30 is hydraulically connected through a filter 168 on its suction side to a hydraulic fluid reservoir 170 (FIGURE 11). A pressure line 172 supplies the pump output through a terminal branch 174 which under high speed running conditions in general, and always under low torque operating conditions, feeds the entire output to the torque booster motor 42 appearing on the extreme left in FIGURE 11. A relief valve 176 which is normally closed is arranged so as to open a return line 178 leading back to the reservoir 170 when the venting of excessive pressures is required in the line 172. Exhausted fluid from the left hand booster motor 42 feeds as required through a check valve 180 into the next booster motor from which exhausted fluid passes as required through another check valve 182 into the final booster motor and back through the return line 178.

One suitable make of the three motors 42 is type S-104 torque booster manufactured by Char-Lynn Company of Minneapolis, Minnesota and described in their booklet Form No. TA-257, although other known hydraulic transmission units may satisfactorily be employed. However, in that make and type, the basic mechanism which is commonly known as the gerotor thereof consists of inner and outer, lobed rotary pump elements of which the number of lobes or teeth on the inner and outer elements differs by one. Briefly, the outer element is fixed and the inner rotor revolves around same within the motor in a circular path after the general manner of planetary gearing. The speed control and reverse unit 38 in the illustrated embodiment is connected through the cog-belt 44 so as to rotate speed input shafts 184 provided of the booster motors 42 either forwardly or reversely or hold them stationary depending on the rotation desired of their gerotor-driven output shafts 186. A suitable form for the speed control and reverse 38 is a model 142 XR zero-max. made by Revco, Inc., Minneapolis, Minnesota, and the purpose thereof is to operate the rotary internal control valve sleeves, not shown, within the motors 42 so as to set the direction and speed controlling ports in proper relation to the output shafts 186 as they are driven.

It is essential that the cog-belt 44 maintain the rotary internal control valve sleeves referred to in absolute synchronism to keep the motors 42 precisely timed to one another for maximum concerted effort. The teeth on the belt 44 are accurately spaced apart and they mesh with axial grooves (of the same pitch, tooth width, and horsepower capacity) formed on the faces of the four identical toothed pulleys over which the belt 44 is trained according to FIGURE 11 and which are also appropriately known as timing belt pulleys. Preferably, the output toothed pulley of the unit 38 has adjustable securing means making it fast to the associated shaft of the unit 38 and of necessity the remaining toothed pulleys on the input shafts 184 each have set screws or other adjustable securing means making them fast to those shafts in precisely timed relation to one another. The three output

shafts 186 from the thus coordinated motors 42 mutually drive a sun and pinion gear cluster 188 in which the common sun is connected through the output sprocket 46 to drive the chain 48 and the traction drive shaft 50a.

Following is an example of the dimensions, speeds, and effective torque-multiplication ratios selected within the infinitely variable speed reducer transmission of the device 10 of FIGURES 1 and 11:

Spark ignition engine 28 -----	Briggs & Stratton, single cyl., 2¾ H.P., 4 cycle engine.
Gear ratio speed reducer 30 ----	6:1 reduction.
Sheave ratio for cog-belt 36 ----	1.66:1 reduction.
Sheave ratio for cog-belt 44 ----	1:1 ratio.
Pitch radius rear grooved drive roller 118 -----	1.5 inches.
Sprockets carrying drive chain 48 -----	1:1 ratio.
Pump 40 speed -----	600 r.p.m.
Car speed, max. -----	47.1 linear f.p.m.
Hyd. cyls. 56 -----	3½" stroke.
Hyd. cyls. 58 -----	3" stroke.
Planetary ratio, sun and pinion cluster 188 -----	1.5:1.
Effective gerotor planetary ratio of booster motor (internal) --	6:1 ratio.
Cable harness 86 -----	length—15 feet, diameter—½" O.D.
Overall dimensions of device 10 -	31" high, 56" long, 29" wide.
Total weight -----	300 lbs.
Max. linear speed @ 3600 engine r.p.m. -----	47.1 linear f.p.m.
Frame members 52 and 54 -----	aluminum castings.

In operation of the hydraulic system of FIGURE 11, the pressure line 172 makes available a continual flow of pressure fluid to the motors 42 which in their zero speed condition consume no fluid and which therefore enable the valve 176 to vent the pumped fluid directly into the return line 178 for recirculation. Under the low-torque operating conditions referred to, the left hand motor 42 rotates in the proper direction so as to consume all the high pressure fluid. Under high load conditions incident to starting a car against full static friction or otherwise, pump pressure in the line 172 builds up to a point at which it will operate a valve 190 which is set so as to be pressure operated and open at a pressure slightly less than 1000 p.s.i. for instance. A companion valve 192 may be set to operate at a point slightly above 1000 p.s.i. in which instance a substantial portion of the pressure fluid is bypassed by the two valves 190, 192 in a manner enabling one third to go to each motor 42 collectively and exert full torque on the sun and planet gearing 188.

As starting resistance of the load decreases with rising speed, the valve 192 will be the first one to close as the pressure in the line 172 drops and thereafter the two booster motors 42 still operating receive a proportionate share more (i.e., ⅓ more) of the pump output so as to run slightly faster. As line pressure further decreases due to decreasing load resistance, the valve 190 then closes and the full pump output is delivered to the left hand booster motor 42; this result of the entire oil volume going to one motor therefore produces maximum speed possible. Conversely, the pressure operated valves 190 and 192 automatically operate in that order to place the center motor 42 and then the right-hand motor 42 back on the line as speed decreases and load increases. This two-stage automatic speed change in response to the load demands occurs both in forward drive and in reverse drive of the transmission so as to give three speeds each way for any given setting of the zero-max. connected wire 92. To slow the car in an emergency, the operator can at will put full reverse torque on the driven wheel;

and the hydraulic liquid principle in the present transmission readily adapts it to make the transition with only a fraction of the shock, if any, on the machinery when compared with straight gear drives of the prior art devices.

In FIGURES 4 and 12, the hand pump 64 supplies fluid under pressure from a hydraulic reservoir 194 to either one of a pair of manually operated spool valves 196 and 198. When the valve 196 is moved from its solid line neutral position into the dotted line position shown, fluid causes the cylinders 58 to retract the transport wheels 62 at the rear of the car mover device 10. A needle valve 199 is inserted in the line providing for this retractive movement and is adjusted to control the rate at which the wheels move each way between their extreme positions of travel. In the opposite operating position (not shown) from the dotted line operating position of FIGURE 12, the valve 196 delivers fluid in a split path through a pair of check valves 200 in directions into the cylinders 58 so as to lower the transport wheels 62 into operative position. The check valves 200 hydraulically lock the wheels in said position, but by means of a pilot line 202 they are sensitive to retractive pressure in the cylinders 58 to automatically open so as to allow the trapped fluid to freely escape to the reservoir 194. A Waterman type 661-2 is a satisfactory make of pilot-operated check-valve for this purpose.

Movement of the valve 198 from its neutral solid line setting into the dotted operating position shown in FIGURE 12 causes pumped pressure fluid to pass through a pair of check valves 204 into the cylinders 56 in a direction retracting the long and short forks 102 and 104. These forks thus foreshorten and clamp the grooved rollers 118 into wedging or jacking engagement with the car wheel structure so as to force it into its lifted position. The check valves 204 have a hydraulic lock purpose when seated but they are automatically released when subjected to pressure admitted thereto by a pilot line 206. This pilot line 206 becomes pressurized when the valve 198 is moved into its opposite operating position (not shown) from the dotted line operating position of FIGURE 12, in which hydraulic liquid is communicated through needle valves 208 into the cylinders 56 so as to move the forks 102 and 104 forwardly for retracting the grooved rollers 118 from the car wheel. Unseating of the check valves in the way described enables the forks to so move and fully release the car wheel 18, and Waterman type 661-2 check valves operate satisfactorily in that way.

The operations described relative to FIGURE 12 are produced solely with manual motion and only one of the valves 196 or 198 is positioned in an operating position at any one time. When either one is moved into the operating position, the common pump 64 connected thereto is manually operated to move the associated hydraulic cylinders accordingly.

In the modified showing of FIGURE 13 which corresponds in general to FIGURE 6 of the main embodiment, the traction drive output shaft 50b is somewhat longer than the preceding drive shaft and the main frame member 52 is cast somewhat wider in accommodating the same. An end extension on the shaft 50b has a key 146 securing the previous type traction drive sprocket 144 thereon. At the opposite end of the shaft 50b, the rear one of the pair of grooved rollers 118 is journaled thereon by means of a sleeve bearing 210 for free turning rotation about its axis 121 in a manner similar to the front roller 118 previously discussed. Adjacent thereto, a spur pinion 212 which is formed integrally with the shaft 50b rotates at the speed of the sprocket 144 and is in constant mesh with a reversing pinion 214 in a manner enabling the pinion 212 and the grooved roller 118 to rotate in the same direction at all times but at slightly different speeds from one another. The reversing pinion 214 is integral with a shaft 216 journaled in the casting

52 so as to establish a fixed axis 218, and is in continued mesh so as to establish a cog drive 220 with an elongated straight tooth rack member 222. The rack member 222 parallels the track rail 14 and is secured to the inner side thereof at intervals by means of generally L-shaped webs 224 which are secured to the rail by welds if desired or by bolts 226.

The front and rear grooved rollers 118 in the modification of FIGURE 13 merely support the car wheel structure 18 at the flange 120 thereof whereas the pinion 212 in cooperation with the reversing pinion 214 establishes the sole traction drive path adjacent the rear of the car device 10. The resulting cog drive 220 offers the advantage of improved traction if a car is to be moved up or down a substantial grade or if for other reason a positive rather than a friction drive appears to be the more desirable. Additionally, the cog drive enables the device 10 to be moved under its own power to and from the points where it is positioned against a car wheel.

By means of the modification of FIGURE 14, the tapered rollers 122 of preceding FIGURE 4 of the main embodiment may be altogether omitted and nevertheless lateral stability, i.e., fixed balance, of the device is insured at all times. In FIGURE 14, the drive shaft 50c is journaled in the main casting member 52 in the preceding manner and has the adjacent grooved roller 118 integral therewith so as to establish the fixed axis 121 previously discussed. The corresponding shaft 50c for the front one (not shown) of the pair of grooved rollers 118 has no extension whereas the shaft 50c for the rear roller 118 as illustrated has an end extension by which the drive sprocket 144 is keyed fast thereto. Each of such shafts 50c carries a free-turning roller 228 journaled thereon making smooth contact of engagement with a flat bar forming an auxiliary rail 230 which is parallel to the adjacent main track rail 14. In a similar manner to the embodiment of FIGURE 13, a series of webs 224 spaced twelve inches or eighteen inches center to center supports the auxiliary rail 230, being secured as by welding or being bolted at 226 to the inner side of the track rail 14. In this instance, the previously considered main rail engaging rollers 78 are on one side of the plane 232 of the grooved rollers 118 whereas the free-turning rollers 228 engaging the auxiliary rail 230 are on the opposite side of that plane 232. Thus, the device 10 has the lateral stability desired in its position under the car wheel 18. At least part of the car wheel load is transmitted into the rail through the four rollers 78 and through the two rollers 228, whereas in the preceding embodiments that part is carried solely through the four rollers 118.

In the operation of the device 10 of the preceding figures, the operator selectively prepares it for movement to the point to be applied to a car depending on whether or not a track rail 14 is available leading in the direction of the car wheel to be lifted. If so, he centers the device 10 on that rail 14 and thereafter lowers the shoes 134 into the track centering position shown in solid lines in FIGURE 4. Due to the support offered by the four rail engaging rollers 78, he rolls it by merely pushing the device to point of application. Otherwise, he operates the valve 196 and pump 64 of FIGURE 12 in an appropriate manner to lower the transport wheels 62 and then he pivots the device 10 thereabout by means of the handle 72 of FIGURE 2 so as to raise it to an inclined position and move same on its transport wheels 62 to the desired point of application.

At a point adjacent the right rear wheel 18 to be lifted on a railroad car, the operator arranges the parts in a surrounding relation in accordance with the plan view of FIGURE 5 and then closes the fork so as to latch and box in that wheel by moving the second frame member into the dotted line latched position 54a shown. During or after the first few strokes of the hand pump 64 applied by the operator in bringing the rollers 118 into initial firm contact with the car wheel flange 120, he also screws-in

the rollers 122 until the tapered end portions 150 thereof (FIGURE 7) firmly contact the outer edge of the car wheel 18. The taper on these rollers is to allow for wear, and in comparison to the position of FIGURE 7, the rollers are extended somewhat farther outwardly in the direction of the plane of the wheel 18, in cases of substantial wear.

A satisfactory make of the hand pump 64 is the Star-Jack model CP-04-150, which if used with 2½" diameter hydraulic cylinders 56 enables the operator to lift the wheel of a fully loaded car with moderate force, up to 25 pounds being exerted on the last few hand strokes on the pump. A desired characteristic that this pump offers is that it automatically changes over from high-speed, low-pressure operation to low-speed, high-pressure conditions dependent upon pressure demand.

The gas engine 28 of FIGURE 3 is then started in conventional way and brought up to full operating speed, it being previously attended to that the guide shoes 134 and the transport wheels 62 are fully retracted. Thereafter, the operator carries the remote control 94 to a point which he reaches on the brake platform 24 (FIGURE 1) and at which he releases the car brakes. At no time can the car 12 overrun the dictated speed of the car mover device 10. By operation of the control elements 98 of FIGURE 2, the operator is thus in full command of starting, running and spotting the car at any preselected point on the track, at which he firmly resets the hand brake wheel 22 immediately. At any time during an emergency situation, the availability of the ignition grounding stop wire 88 of FIGURE 10 and the hand brake wheel 22 of FIGURE 1 enables the operator to quickly bring a moving car 12 to a friction halt from his remote position, or in faster order he can accomplish the same thing by changing the transmission to an opposite setting and applying full reverse torque of the engine.

After spotting each car in its newly moved position, the operator stops the engine 28 or reduces it to idling speed, whereupon he unjacks the wheel 18 and releases the spring catch 114 (FIGURE 4) so as to unbox the device 10 therefrom.

The operation is then repeated on the next car to be moved.

As herein disclosed, the car mover 10 is shown applied to the rear of a car 12 at its right rear wheel 18. It is evident that the device is equally applicable to the front of the car beneath the left front wheel (not shown) and that if he chooses the operator in either case can walk along the two-rail track 14 in full control following the car mover 10 as it drives a car. The connection and arrangement of the for.-rev. control wire 90 and the control element 98 with which it is associated is preferably such that when the latter is in its forward position the car moves away from the operator if he is walking behind, and conversely in its reverse position the car moved toward the operator. The drawings also show a three-wire control cable harness 86, but self-evidently a fourth Bowden conduit and slide wire can be added or substituted for an existing control wire and connected to the engine throttle (not shown) for remotely controlling engine speed. So also the specification uses a term of convenience applied to the car wheel structure 18 as having a lifted position, whereas actually the jacking or wedging action of the grooved rollers 118 thereagainst is carried on only to the degree necessary to intensify their pressure of interengaged contact for proper friction drive grip. In such case, the load contact pressure immediately between the car wheel 18 and the rail 14 is diminished by the amount with which the grooved rollers 118 share the burden of that loaded car wheel but without necessarily lifting it from the rail. In view of the reduced residual pressure of contact between wheel and rail the tractive effort in the embodiments of FIGURES 6 and 14 is largely transmitted into the track rail through the car wheel axle 20 and the opposite one of the companion wheels. It is

to be understood that in the embodiment of FIGURE 13, the tractive effort is introduced exclusively through the cog drive 220 into the track rail structure 14, the pitch radius of the spur pinion 212 being 1.2 inches in one physical embodiment.

While I have described certain presently preferred embodiments of my invention, it is to be understood that they may be otherwise embodied within the scope of the appended claims.

I claim:

1. Self-propelled vehicle means for travel on a two-rail track comprising the combination of wheeled rail car structure having a plurality of flanged wheels at least two of which are connected together in opposed positions by a solid axle, one of said interconnected wheels constituting a traction drive wheel on a rail of said track, a wheeled carriage structure between the other interconnected wheel and the other rail and rotatably supporting the former at least in part by interengagement with the flange thereof, and captive power delivery means on one of said structures for applying power directly to said flange to rotate said other wheel in a manner exerting the resulting tractive effort largely through said axle and said drive wheel into the first said rail of said track.

2. Self-propelled vehicle means for travel on a two-rail track comprising the combination of wheeled rail car structure having a plurality of flanged wheels at least two of which are connected together in opposed positions by a solid axle, one of said interconnected wheels constituting a traction drive wheel on a rail of said track, a wheeled carriage structure between the other interconnected wheel and the other rail and rotatably supporting the former at least in part by interengagement with the flange thereof, a brake platform at an end of said car and a hand brake wheel thereadjacent for operating a set of car wheel brakes, captive power delivery means on one of said structures for applying power directly to said flange to rotate said other wheel in a manner exerting the resulting tractive effort largely through said axle and said drive wheel into the first said rail of said track, and a remote control operator's device having a connection to said power delivery means and having an operative length to extend the operating head thereof to said brake platform for controlling the application of vehicle power from a vantage point adjacent said hand brake wheel.

3. Vehicle means according to claim 2 and further comprising means to secure said operating head in an out of the way position to the back of the hand of the operator affording him dual control characterized by freedom to operate the hand brake wheel unimpeded.

4. A self-propelled car mover device for use with one wheel structure of a car mounted for movement along rail means, said device including a carriage individual to said wheel structure and cooperatively, with said rail means, supporting that wheel structure for rolling relative to the rail means, said carriage comprising rotatable means thereon disposed on opposite sides of the underportion of said wheel structure so as to straddle the latter in balanced, load-sharing rotatable contact therewith, power delivery means fast to a member forming an integral part of said carriage for applying traction power to operatively drive said car along said rail means, and remote control harness means flexibly connected to said power delivery means to manually control the delivery of its driving power to drive said car.

5. A gas-powered car mover device for wheeled cars adapted to be moved on track means and having at least one platform on the car associated with means for settable and releasably operating the car brakes, said device including a carriage individual to a wheel structure of a car and cooperatively, with said track means, supporting that wheel structure for rolling movement, said carriage comprising rotatable means thereon disposed on opposite sides of the underportion of said wheel structure so as to straddle the latter in balanced, load-sharing rotatable contact

therewith, captive gas-power delivery means on said carriage comprising reversible transmission mechanism coupled for applying power to rotate that wheel structure to operatively drive said car, and a plural wire control means flexibly connected to said gas-power delivery means by means including at least one connection to said reversible transmission mechanism and effective to control the power and its direction of application from a remote brake-operating platform on said car.

6. A car mover device for one of two opposite flanged wheels of a movable rail car, said device including a carriage and a captive engine and traction transmission unit thereon, said unit comprising fixed input and traction output shafts connected by means in said transmission providing a torque-boost ratio power path therebetween, boxing-in means carried by said carriage comprising a first set of relatively movable rollers interposed at the front and rear of a car wheel in engagement with the flanged portion thereof, said carriage further carrying a set of free-turning rollers mounted so as to be simultaneously interposed at the front and rear of said car wheel for independent contact with another portion of said car wheel, at least one roller of the first set being directly driven by said traction transmission output shaft and together with the free-turning set of rollers defining a partial ring of points of contact with the lower portion of said car wheel, and hydraulic means for clampingly and retractively moving the rollers of said first set relative to said flanged car wheel.

7. A torque input device for use with flanged wheel structure provided on a movable rail car, said device including a carriage having a plurality of members joined to form a frame, a source of prime power mounted to a member forming part of said carriage frame and providing an input shaft with the axis fixed with respect to the carriage, a traction drive output shaft mounted to a frame member in said carriage and having a fixed axis, means connected between and providing a reversible speed reducing power path between said shafts, a set of grooved rotatable roller means carried by said carriage interposed respectively at the front and rear of said car wheel structure in interengagement with said flange and at least one of which roller means being coaxially arranged upon said output shaft, said roller means operatively arranged in supporting relationship with respect to said flange, and a separate set of rollers carried by said carriage out of contact with said first roller means set for independently rolling longitudinally along a rail.

8. A torque input device according to claim 7 wherein further rotatable means is coaxially arranged on said output shaft and in operative engagement with means fast to said rail so as to provide a separate connection thereto in addition to said separate set of rollers for rolling therealong.

9. A torque input device according to claim 8 wherein said means fast to said rail presents a flat surface cooperating with said further rotatable means to establish rolling engagement along their smooth interface of contact, and wherein said one roller means on said traction output shaft is fast thereto and in drive transmitting relation to said car wheel structure, and wherein said output shaft journals said rotatable means for independent rotation.

10. A torque device according to claim 8 wherein said means on said rail presents a longitudinally extending cog surface which through a meshing connection cooperates with said further rotatable means to establish a cog drive between said traction output shaft and said rail, and wherein said output shaft is fast to said further rotatable means for rotation therewith and journals said one grooved roller means for independent rotation.

11. A torque input device for one of two opposite wheels of a movable rail car for turning same through an output motor-driven means adapted to drivingly engage said wheel, said device including a carriage, a captive engine and transmission unit thereon, said transmission comprising a pump coupled to said engine, a plurality of

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torque-booster output motors common to and operatively communicating with a line from said pump, which motors operate on the line with one alone or with the combined output of at least one other pump with the number on the line automatically increasing with increasing line pressure, and boxing-in means on said carriage interposed at the front and rear of said one car wheel and carrying a set of free-turning supporting rollers for rolling longitudinally along a rail in response to the operation of said transmission.

12. A torque input device for one of two opposite wheels of a movable rail car to be moved having at least one platform associated with means for settably and releasably operating the car wheel brakes, said device including a carriage, a captive engine and transmission unit thereon, said transmission being of the automatic change-speed type comprising a pump coupled to said engine and a plurality of torque-booster output motor means common to and in automatically selected operative communication with said pump, one of said motor means having a permanently open communication with said pump and effective to operate at predetermined speed under a first circumstance and at a proportionately diminished speed under second circumstances under which first circumstance said one motor means is consuming full pump output and under which second circumstances said one motor means is automatically selectedly dividing said full pump output with at least one other output motor means, boxing-in means on said carriage interposed at the front and rear of said one car wheel and carrying a set of free-turning supporting rollers for rolling longitudinally along a rail, means operated by said motors and connected to drive said car wheel, and remote control means for operating said captive engine from a remote brake-operating platform on said car.

13. A torque input device for one of two opposite wheels of a movable rail car to be moved having at least one platform associated with brake-operating and releasing mechanism, said device including a carriage, a captive prime mover and transmission unit thereon, said prime mover comprising a unidirectional constant speed spark ignition engine operatively coupled to said transmission, boxing-in means on said carriage interposed at the front and rear of said one car wheel and carrying a set of rollers for rolling longitudinally along a car rail, means operated by said motors and connected to drive said car wheel, a plural control wire harness for manually controlling the applied power and its direction of application from said captive spark ignition engine and transmission unit from a remote brake-operating platform on said car, and ignition grounding means forming a connection between said harness and said engine for stopping said engine at will from said remote platform.

14. A torque input device for one of two opposite wheels of a movable rail car provided with manual wheel brakes, said device including a carriage, a captive engine and transmission unit thereon, said transmission comprising an infinitely variable ratio reversible automatic hydraulic transmission, boxing-in means interposed at the front and rear of a car wheel carrying a set of free-turning rollers for rolling longitudinally along a rail, a separate set of rollers carried by said means at least one of which is transmission driven and together with the free-turning set of rollers providing at least six points of contact between the top of a car rail and the periphery of the adjacent car wheel and a plural control wire harness for coordinated use in conjunction with said manual wheel brakes for controlling the input power and its direction of application from said captive engine and reversible transmission unit to move and stop the car and for resetting the wheel brakes.

15. In a mover for cars having rail engaging wheels, the combination of a carriage provided with members including a main member and together joined to form a frame, transmission means mounted to one of said frame

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members and including an engine-connected input shaft and a traction drive output shaft each having a fixed axis thereto, car wheel-engaging rollers individual to a second frame member and to said main frame member, and fork members common to said main and second members to complete said frame and shiftably mounted to said main member for expansively and retractively moving the second frame member with respect thereto for relatively withdrawingly and clampingly moving said wheel-engaging rollers.

16. The combination according to claim 15 and further including hydraulic cylinders individual to said fork members for shifting same on said main member and operatively connected between said main member and said fork members, and a source of hydraulic pressure fluid common to said cylinders to coordinate movement of same in concert upon said second frame member.

17. The combination according to claim 15 wherein said second member is supported on slide means forming an adjustable joint between one of said fork members and said second member and disposed so as to enable the latter to slide independently of said one fork member at right angles to their expansive and retractive path of movement together as aforesaid.

18. The combination according to claim 15 and further including spring catch means whereby said second member is detachably joined to one of said fork members for releasing of said frame at that joint, slide means permanently supporting said fork members so as to form separate adjustable joints between each of said members and said main member for accommodating said shiftable movement, and slide means permanently supporting said second member on a fork member and disposed so as to enable the former member to move independently to the latter member at right angles to their aforesaid shiftable movement together for opening of said frame.

19. A torque input device for one of two opposite wheels of a movable rail car provided with wheel brakes, said device including a carriage, a captive engine and transmission unit thereon, boxing-in means on said carriage interposed at the front and rear of said one car wheel, said carriage carrying a set of rollers for rolling longitudinally along a car rail structure, retractable track engaging guides on said carriage to center it on said rail, and separate sets of rotatable means carried by said carriage at least one of which is transmission driven and together with the first-named set of rollers providing a plurality of points of contact with the top of said rail structure and with the periphery of said wheel.

20. A car mover device for one of two opposite wheels of a rail car to be moved having at least one platform associated with brake-operating and releasing mechanism, said device including a carriage, a captive engine and transmission unit thereon, boxing-in means on said carriage interposed at the front and rear of said one car wheel and provided with forks shiftably mounted thereon for disposition one at each side of the car wheel, there being means operated by said transmission and frictionally connected to drive said car wheel, said carriage carrying a set of free-turning supporting rollers for rolling with a car along a car rail, and further carrying retractable transport wheels for rolling along independently of the car rail and without the car, hydraulic cylinder means individual to said forks and to said transport wheels for retractively and extensibly moving the same, and a source of hydraulic fluid common to said cylinder means.

21. A device according to claim 20 and further including manual means for applying the hydraulic fluid from said source selectively to said hydraulic cylinder means, and remote control manual means for controlling the input power and its direction of application from said captive engine and transmission unit to move a car.

22. A torque input device for one of two opposite wheels of a movable rail car, said device including a carriage, a captive engine and transmission unit thereon,

said unit comprising reversible transmission mechanism connected to the engine of the unit, boxing-in means on said carriage interposed at the front and rear of said one car wheel in operatively surrounding manner with respect to the lower portion of said wheel so that it is in effect boxed-in thereby, said carriage carrying a set of rollers for rolling longitudinally along a rail, said engine being drivingly coupled to said one car wheel through means including said reversible transmission mechanism, and a plural control wire means connected to said captive engine and transmission unit by means including at least one connection to said reversible transmission mechanism and effective for controlling the input power and its direction of application from said captive engine and transmission unit to move the car.

23. In an arrangement of supporting rollers for engagement with a standard flanged car wheel at spaced points on the periphery of the latter, enabling the load of the wheel to be distributed over plural points of contact, said roller arrangement including a plurality of grooved rollers interengaged with the flange of said wheel, the improvement comprising the combination of beveled rollers to engage the flat portion of said wheel in line contact in a generally longitudinally extending direction with respect to said beveled rollers, and means connected to said beveled rollers to adjust said beveled rollers longitudinally to compensate for surface wear of either of the interfaces establishing said line contact.

24. A torque input device for one of two opposite wheels of a track-borne car provided with wheel brakes and movable along a track, said device including a carriage, a captive engine and transmission unit thereon, retractable transport wheels carried by said carriage for rolling longitudinally along a horizontal surface, hydraulic cylinders individual to said transport wheels for retractively and extensibly moving the same relative to the carriage and operatively connected between said carriage and said wheels, said engine being coupled to one of said car wheels through means including said transmission, and boxing-in means on said carriage for interposition at the front and rear of said one car wheel in operatively surrounding manner with respect to the lower portion of said wheel so that it is effectively boxed-in thereby, said carriage carrying a separate set of rollers for rolling longitudinally along said track independently of said transport wheels.

25. In car structure equipped with a brake platform at an end of said car structure and a hand brake wheel there-adjacent for operating a set of car wheel brakes, said structure adapted for travel as a self-propelled vehicle means on a two-rail track, the improvement comprising a plurality of flanged wheels which are carried by said car for rolling along said track and at least two of which wheels are connected together in opposed position by a solid axle, one of said interconnected wheels constituting

a traction drive wheel on a rail of said track, a wheeled carriage structure between the other interconnected wheel and the other rail and rotatably supporting the former at least in part by interengagement with the flange thereof, captive power delivery means on one of said structures for applying power directly to said flange to rotate said other wheel in a manner exerting the resulting tractive effort largely through said axle and said drive wheel into the first said rail of said track, and a remote control operator's device including a hand-operated power control head, and a motion transmitting connection between said power control head and said power means and of an operative length therebetween to extend the hand-operated control head to said brake platform for controlling the application of vehicle power from a vantage point adjacent said hand brake wheel.

26. In an arrangement of supporting rollers for engagement with a standard flanged car wheel at spaced points on the periphery of the latter, enabling the load of the wheel to be distributed over plural points of contact, said roller arrangement including a plurality of grooved rollers interengaged with the flange of said wheel, the improvement comprising the combination of beveled rollers to engage the flat bevel portion of said wheel in line contact in a generally longitudinally extending direction with respect to said beveled rollers, axial adjustment means arranged in operative relation with said beveled rollers for adjustably mounting same and being co-axial to said rollers and having a swiveled connection thereto to adjust said rollers longitudinally to compensate for surface wear of either of the bevel interfaces establishing said line contact, and means supporting the beveled rollers and their axial adjustment means in the operative relationship aforesaid and comprising a common carriage adapted to carry said plurality of grooved rollers.

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