Oct. 2, 1951 D. M. SCHWARTZ 2,570,161

MARINE RAILWAY HAUL DRIVE

Filed Aug. 9, 1946 5 Sheets-Sheet 1

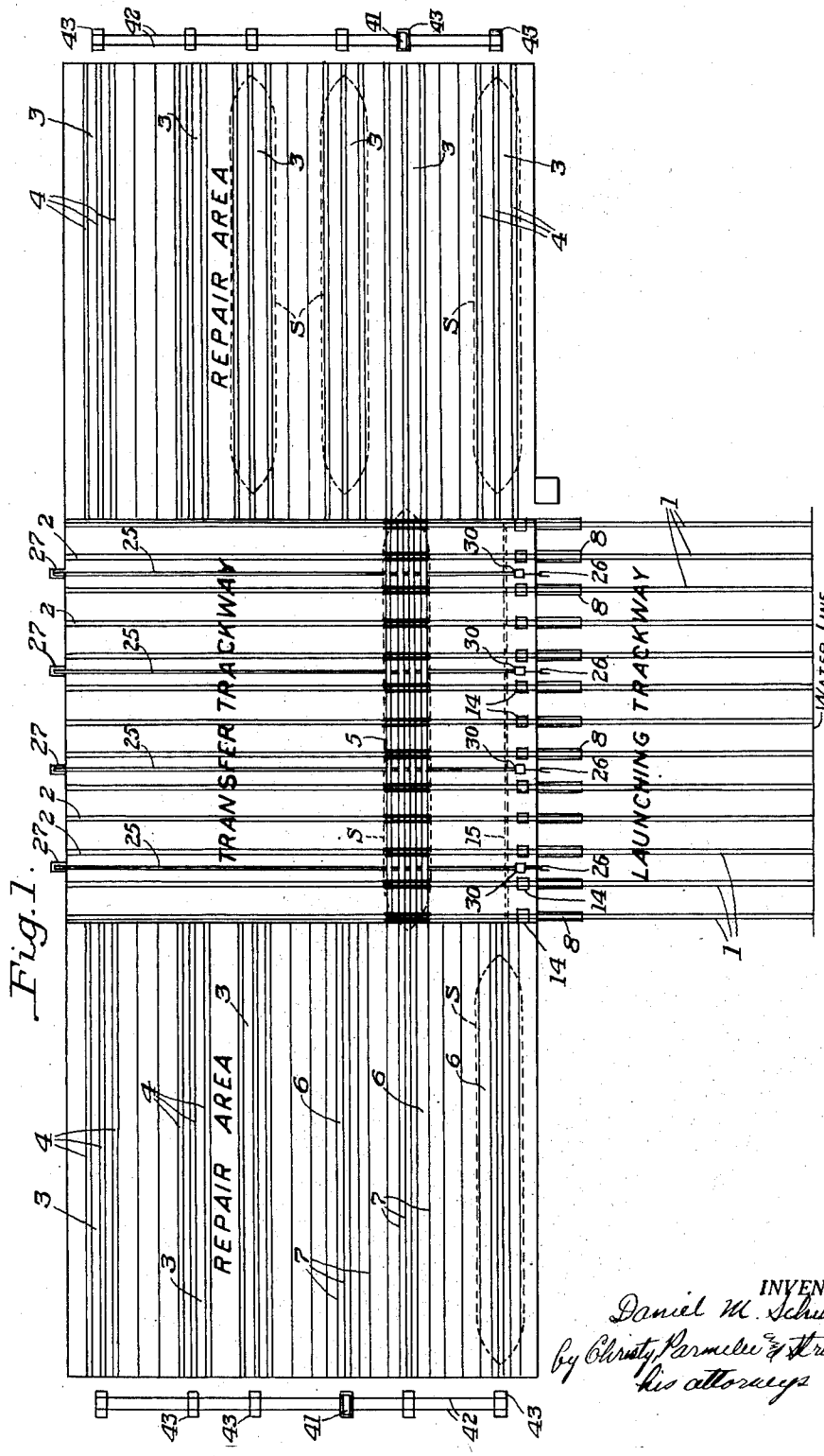


Fig. 1.

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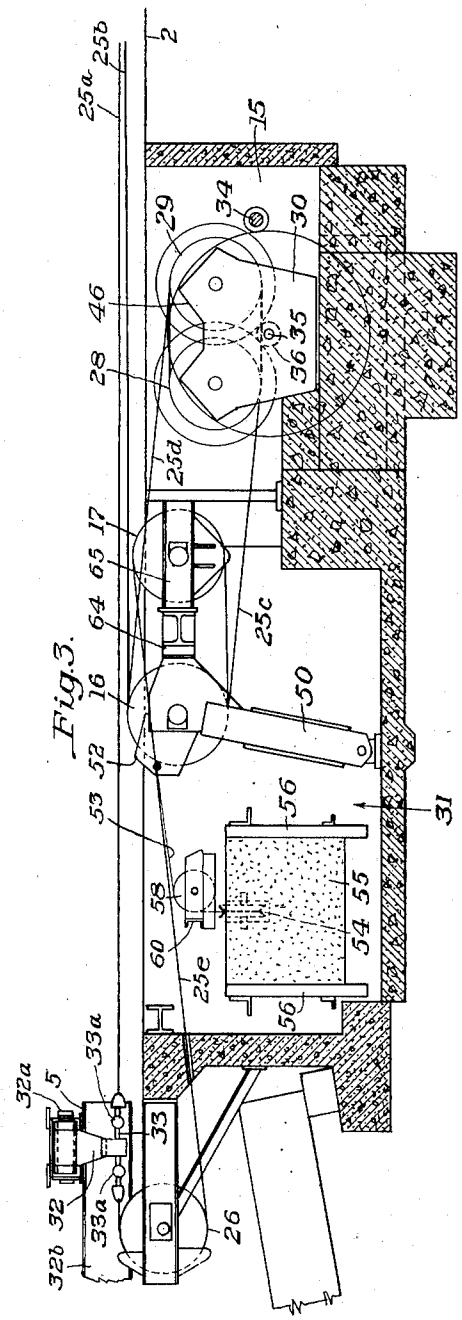


Fig. 3.

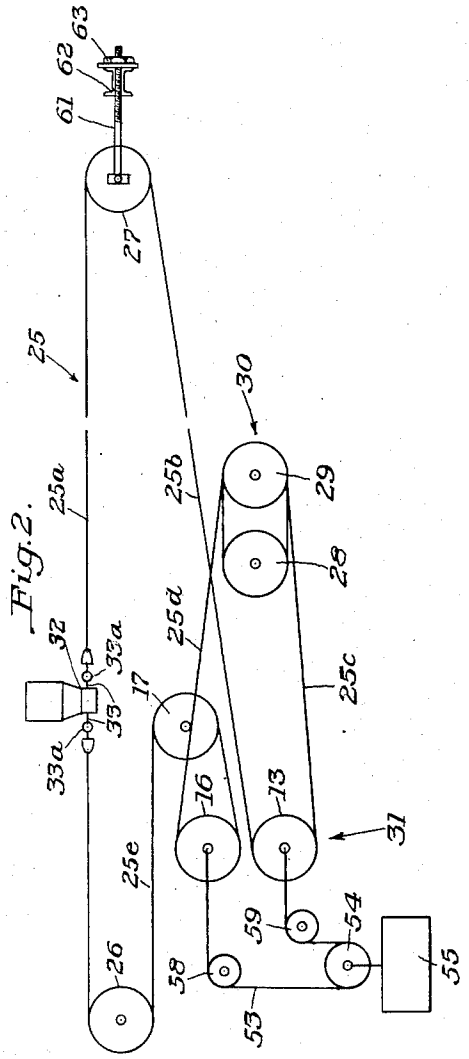


Fig. 2.

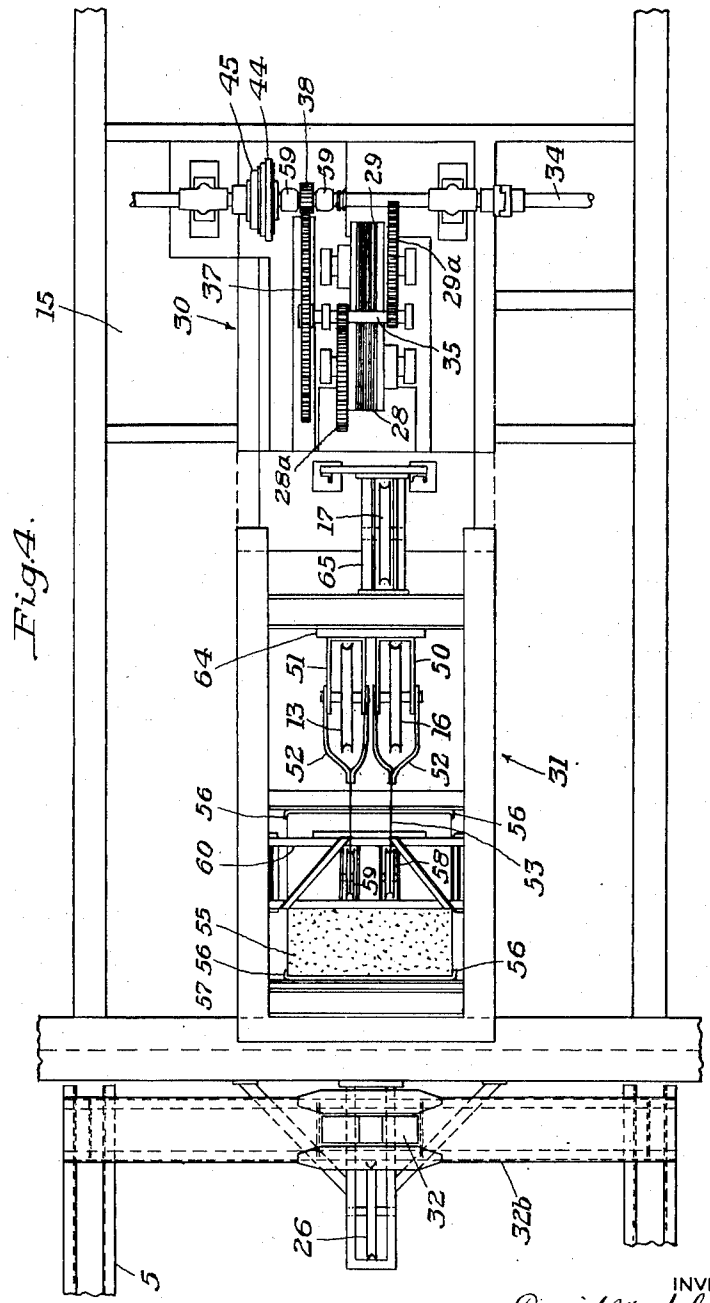
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MARINE RAILWAY HAUL DRIVE

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Fig. 4.



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MARINE RAILWAY HAUL DRIVE

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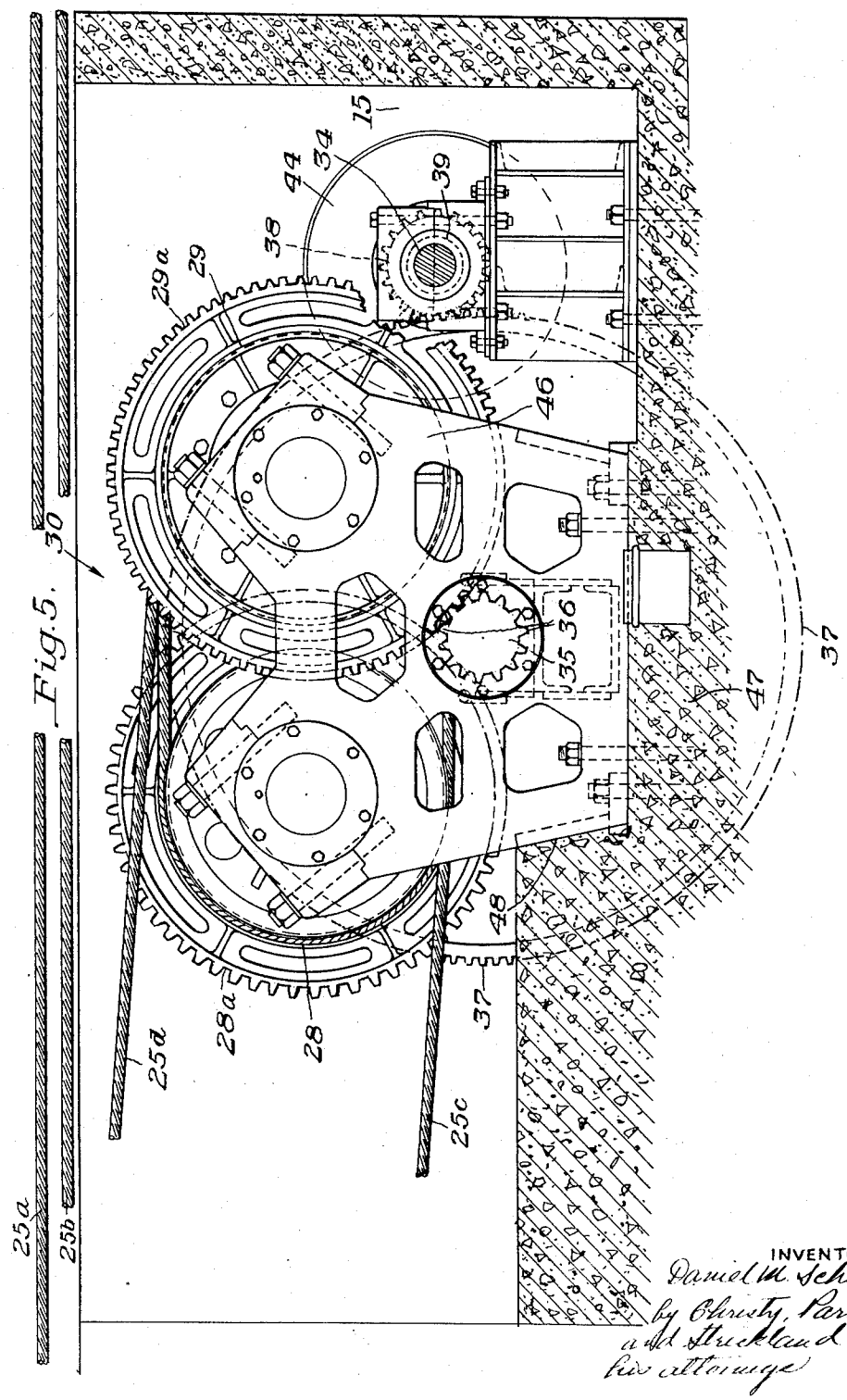


Fig. 5.

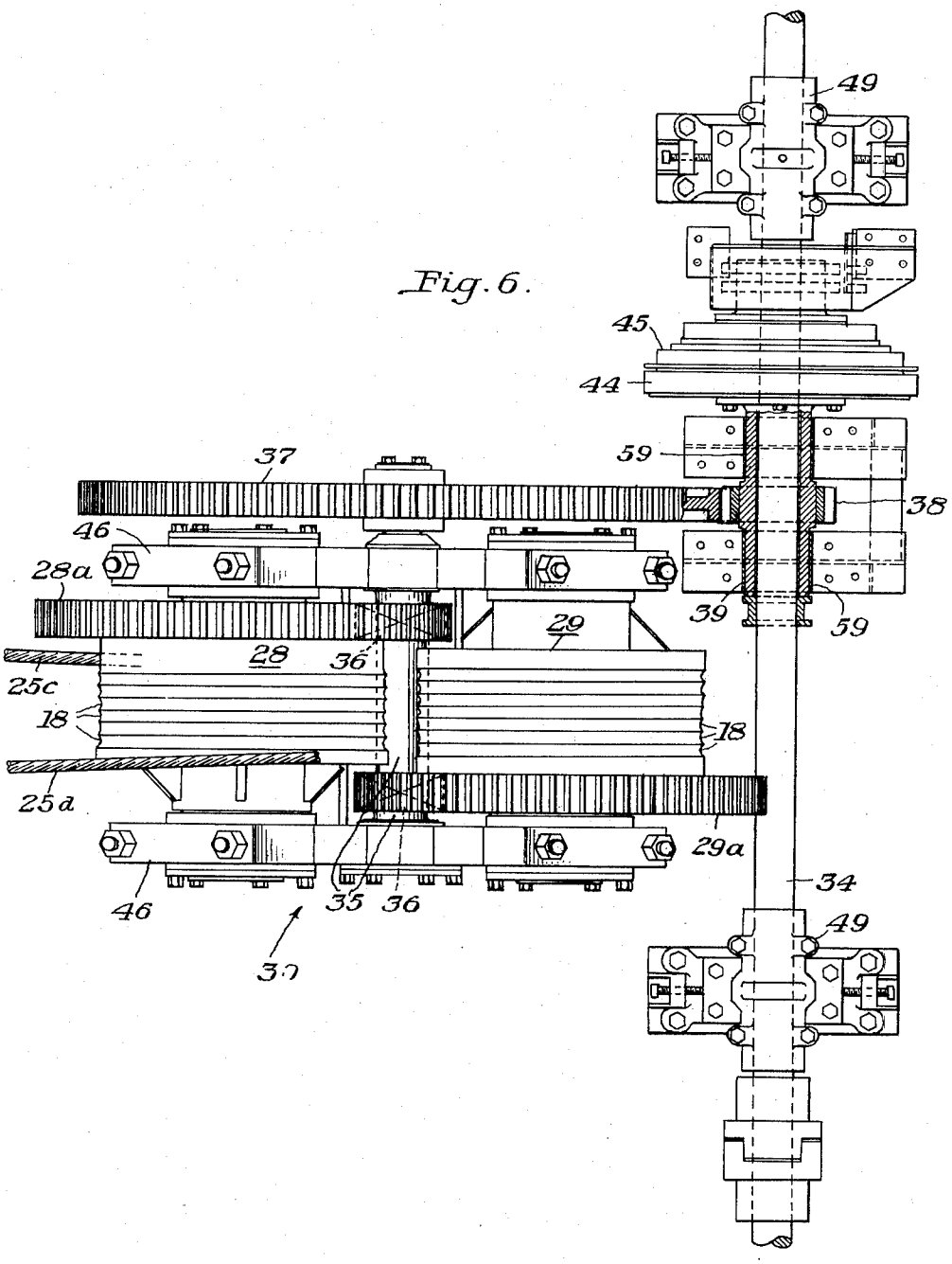
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MARINE RAILWAY HAUL DRIVE

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Fig. 6.



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2,570,161

UNITED STATES PATENT OFFICE

2,570,161

MARINE RAILWAY HAUL DRIVE

Daniel M. Schwartz, Salt Lake City, Utah, assignor to Dravo Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Application August 9, 1946, Serial No. 689,396

14 Claims. (Cl. 61—67)

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My invention relates to marine railways of the type disclosed in Letters Patent No. 1,860,177, granted May 24, 1932, to Francis R. Dravo et al., and in an application for Letters Patent, Serial No. 644,690, filed by Gilbert H. Atwood and me, and owned in common with my present invention.

My present invention, comprising a continuation-in-part of said application, consists in certain new and useful improvements in means for moving the ship-supporting shunt carriages of such railways.

A marine railway comprises a trackway including a plurality of pairs of parallel rails extending from below water at the shore of a waterway upward upon an inclined bank at the edge of the waterway. The rails are supported upon sleepers borne upon a suitable foundation bed of concrete, and upon the pairs of rails launching cradles or carriages are adapted to travel.

Extending from the inshore end of each carriage is a hauling chain that leads to and is trained over a winch sprocket wheel at the head of the trackway, and from the otherwise free ends of such chains extending from the sprocket wheels back-haul cables run to the lower end of the trackway where they pass around fixed pulleys and thence to the offshore ends of the assembled carriages to which they are severally attached. Each carriage is thus arranged within the extent of or reach of a continuous or closed loop of hauling line which is formed of chain and cable, with the chain portion of the line trained upon a winch at the upper end of the trackway, and the cable portion trained upon an idler pulley at the lower end of the trackway. Mechanism is provided for operating the winches selectively and/or in unison, as described in said Letters Patent No. 1,860,177, and in an application for Letters Patent, Serial No. 568,875, filed by Gilbert H. Atwood and me December 19, 1944, now Letters Patent No. 2,415,805, dated February 18, 1947.

In practice a boat to be removed from the water for repair or overhauling is drifted broadside to the lower end of the trackway and secured by shore-lines. Then the carriages (or a desired number of the carriages) are lowered in unison on the tracks into position of abutment against the side of the ship's hull, it being remarked that the carriages are, before they are lowered, brought to alignment. In this lowering operation the back-haul cables are effective. When the carriages have been brought to abutment upon the hull of the boat, the shorelines

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are slackened off, and the carriages are by the back-haul lines advanced downward along the tracks. The advancing carriages in their further descent push the vessel off-shore until, in deeper water, they pass beneath the hull. As soon as the carriages so clear the vessel, their movement is arrested, and the vessel is by the shorelines hauled shoreward into position above the submerged carriages. Lines from the vessel then are secured to the hauling chains of the two-end carriages, to hold the vessel in position above the carriages, which are then moved shoreward on the upwardly inclined trackway. The boat in this way is brought to rest upon the rising carriages.

As the upward travel of carriages continues the full weight of the boat is received by the carriages. The individual carriages are adjusted relatively to the others, to insure that the weight is evenly distributed among the several carriages, and then all of the carriages are advanced in unison, and the boat is borne upward upon the inclined tracks to desired position out of the water. If prolonged repair or other work is in order, the boat is blocked up upon blocking arranged between the tracks of the inclined trackway.

In elaboration a horizontal trackway is provided at the upper end of the inclined trackway, the horizontal trackway extending inland from the inclined trackway, whereby a boat may be transferred from the inclined to the horizontal trackway, and moved a suitable distance inshore to be blocked up for repair, or a ship may be constructed at a point inshore and then transferred to the inclined trackway for launching. The inclined trackway is sometimes referred to as the launching trackway or ways, while the horizontal trackway is generally known as the transfer trackway or shunt area.

The boat is transported over the transfer trackway on one or more transfer carriages, which are arranged to receive the boat from the launching carriages (when they are moved to the upper end of the inclined launching trackway) for travel upon the horizontal transfer trackway. Alternately, the transfer carriage may be mounted on the launching carriages before they are lowered to receive the boat from the water, in which case the boat is received immediately upon the transfer carriage. The so-supported boat is transported on the launching carriages to the top of the launching trackway, where the transfer carriage and the supported boat are pulled from the launching carriages to the tracks on

the transfer trackway. The details of marine railway structure and mode of operation here alluded to are fully disclosed in application Serial No. 644,690, above referred to.

In cases where it is desirable to build or repair several boats simultaneously, the marine railway installation is further elaborated by the provision of one or more repair berths that extend in horizontal plane laterally from the transfer trackway, these berths being provided with tracks upon which a ship may be borne on suitable carriages to and from the transfer trackway, whereon it may be transported to and from supported position on the inclined launching trackway. By virtue of this arrangement a ship may be removed from the water and placed in a repair berth, or may be removed from a berth and launched after repair or construction has been completed, without interrupting the course of work being done on other ships stationed in other berths.

With the foregoing general description of a marine railway in mind, it is to be noted that my present invention consists in certain new and useful improvements in a shunt haul hoist, the technical name of the means for propelling the transfer carriage or carriages, with or without a supported boat, over the extent of the horizontal transfer trackway, and to and from position upon the launching carriages when they are appropriately positioned at the top or head of the inclined launching trackway.

The invention will be understood upon reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic view in plan of a marine railway in which the invention is embodied;

Fig. 2 is a diagrammatic view showing the reeving of the hauling cable of a shunt haul hoist unit of the invention;

Fig. 3 is a fragmentary view, showing a cross section through the machinery house of the marine railway, and illustrating diagrammatically the winch of one of the hoist units and the slack take-up device for the cable thereof;

Fig. 4 is a view in plan of the structure shown in Fig. 3;

Fig. 5 is a fragmentary view to still larger scale of a section of the machinery house, and showing in side elevation the winch of one of the hoist units; and

Fig. 6 is a view in plan of the winch shown in Fig. 5, illustrating additionally in plan a portion of the line drive shaft of the winch, and showing in section the quill pinion on the shaft which meshes with the drive-gear of the winch.

Referring to Fig. 1, a marine railway installation of the invention is illustrated in plan. The launching trackway or ways comprises a plurality (in this case thirteen) pairs of tracks 1 that rest on steel beams embedded in reinforced concrete pads on the bank of a waterway, as described in Letters Patent No. 1,860,177 and No. 2,415,805. The tracks of each pair may be spaced apart at a relatively narrow interval say five feet, and the several pairs of tracks may be spaced apart at a relatively wider interval, say twenty-three feet. The tracks may be laid at a slope of 1:8; they may be about four hundred feet long, and may extend one hundred and sixty feet beyond the water line, to a depth of about twenty feet below the surface of the water. From their lower ends below water the rails extend in a common inclined plane to the transfer trackway which comprises pairs of tracks 2, in this case like in number and in spacing unto the pairs of tracks 1 of the launching trackway. The tracks 2 extend in a horizontal plane, and such plane is located at an interval above the upper ends of the tracks 1 so that the tops of the launching carriages 8, which are severally arranged to travel on the pairs of tracks 1, may, when the carriages are at the top of the launching trackway, be positioned in common plane with the transfer trackway, each carriage 8 being provided on its top with a pair of rail sections (not shown) that are thus brought into alignment with the corresponding pair of tracks 2 of the transfer trackway. Extending laterally from the right-hand side of the transfer trackway are six berths 3 in which ships *s* may be constructed or blocked up for repair, while on the left-hand side of the transfer trackway are three berths 3 and three berths 6. Each berth 3 is provided with three equi-spaced pairs of tracks 4, while in the berths 6 are three pairs of tracks 7 of different spacing, as shown. As illustrated and described in application Serial No. 644,690, the tracks 4 and 7 extend in horizontal plane at an interval above the plane of the tracks 2 of the transfer trackway, such interval being equal to the depth of a transfer carriage or docking platen 5 which is adapted to travel on the transfer tracks.

In order to dock a boat the transfer carriage 5 is run from the tracks 2 of the transfer trackway into position upon the tops of the launching carriages 8 aligned at the upper end of the launching trackway, in which position they are diagrammatically indicated in Fig. 1. Then, the launching carriages 8 and the transfer carriage 5 supported thereby are lowered into the water and the boat to be docked is received and blocked-up upon the carriage 5; the carriages 8 and 5, with the supported boat, are drawn upwardly by means of winches 14 located in a machinery house 15 provided at the head end of the launching trackway but below the plane of the transfer trackway, it being remarked that the several winches 14, one winch being provided for each launching carriage, are driven by a line shaft 34 (Figs. 3 to 6) that extends longitudinally of the machinery house and is powered and controlled by such means as are described in said Letters Patent No. 1,860,177 and No. 2,415,805. Upon reaching the head or upper end of the launching trackway the shunt haul hoist, in which this invention is centered, as will be presently described, is operated to draw the transfer carriage 5 and the supported boat from the carriages 8 and along the transfer tracks 2 into position opposite to the repair berth 3 or 6 into which the boat is to be stationed. As described in application Serial No. 644,690, the carriage 5 is provided with rails that are aligned with the rails (4 or 7) of the berth into which the boat is to be located, and these rails of the carriage 5 receive hydraulic lift buggies that are positioned beneath the ship, and, by operation of the hydraulic lifts, raise and support the ship, whereupon a cable, extending from one or the other of the winch machines 41 located at the outer ends of the berths 3, 6, is connected to the supported boat, and the winch machine operated to draw the boat on the lift buggies into the selected berth. The cable is not shown, but will be understood to be a block and tackle structure, as described in application Serial No. 644,690.

Regarding the winch machines 41, it may be noted that a pair of tracks 42 is laid along the aligned outer ends of each group of berths, and

each winch machine is mounted on wheels for travel along the tracks from one berth to another. Aligned with the center-line of each berth a dead-man 43 is provided, each dead-man comprising a heavy monolith to which the winch machine may be detachably anchored. As thus anchored, the otherwise mobile winch machine is firmly secured to withstand the reaction of the stress applied to the cable when drawing a vessel or barge from the docking platen into a berth. By virtue of this organization a single winch machine is adapted adequately to serve each group or line of berths.

In order to deliver or launch a boat from a berth to the water, the operations described are reversed, with the qualification that, whereas the traveling winch machine of the berths on the same side of the transfer trackway as the boat is used in drawing the boat from the transfer carriage 5, in the launching operation the winch machine on the opposite side of the transfer trackway is employed. Otherwise, the launching operations may be substantially the reverse of the operations described in docking a vessel.

The shunt haul hoist of my present invention comprises a plurality of hoist lines 25, four in number in this case, as appear in Fig. 1. Each hoist line comprises a closed loop of steel cable extending over the horizontal face of the transfer trackway area and being trained between pulleys 26 and 27 mounted, respectively, at the opposite ends of the transfer trackway. The upper reach 25*a* of the hoist line (see Figs. 2 and 3) extends in uninterrupted reach between the two pulleys 26 and 27, while the lower reach 25*b* of the cable 25 extends from the pulley 27 to a pulley 13 of a cable-tensioning device 31. From pulley 13 the cable extends through a reach 25*c* to a drive 30 including two driven drums 28 and 29 having parallel grooves 18. The cable is wrapped around the two drums, just as though the two drums were a single drum of oval shape as viewed from the side, the cable being wrapped in the parallel grooves of the two drums a sufficient number of turns, say six turns, to maintain the cable in secure frictional engagement with the peripheries of the drums, this particular arrangement of the drums and cable serving to provide a winch assembly in which the long reach of cable does not track across the faces of the drums, or slip on the drums when they are rotated, such as is the case with a single drum. From the winch drums the cable extends through a reach 25*d* to a pulley 16 of the tensioning device 31, and from pulley 16 the cable is trained over an idler pulley 17, whence it extends through a reach 25*e* to the pulley 26, thereby completing the closed continuity of the cable loop. Such is the organization of each of the four cables 25 which provide the shunt haul hoist, and, as presently will appear, means are provided attaching the transfer carriage to the reach 25*a* of each cable, and the line shaft 34 in the machinery house 15 is adapted to drive the cables in unison in either direction, whereby the transfer carriage either with or without a supported ship, may be shifted on the transfer trackway in either direction as desired.

Referring particularly to Fig. 6, the drums 28 and 29 of each winch or hoist drive 30 are equipped with gears 28*a* and 29*a*, respectively, while extending centrally beneath the two drums in a countershaft 35 carrying two pinions 36 meshing, one with each of the gears 28*a* and 29*a*. The countershaft is equipped with a large drive gear 37 meshing with a pinion 38 borne by a quill 39 on the motor-driven line shaft 34, and such quill is equipped with one element 44 of a magnetic clutch, while the cooperating clutch element 45 is united to the line shaft. Manifestly, by energizing and de-energizing this clutch, the quill 39 may be connected to and disconnected from the line shaft, whereby the pinion 38 may be powerfully rotated or not, as desired. By the provision of such means, the gear 37 of the drive 30 may be connected to the rotating line shaft at will, and the two drums 28 and 29 of the drive may, through operation of the pinion 36 and gears 28*a* and 29*a*, be rotated in unison to move the hoist line 25. The rotation of the line shaft may be effected either in clockwise or in counterclockwise direction, as described in the above-noted copending applications, and thus the drums 28 and 29 are caused to drive the upper reach 25*a* of the hoist line either in offshore or in inshore direction.

The individual clutches 44, 45 for the gear-trains of the drives 30 permit of the individual and/or the collective operation of the several hoist lines 25, and thus it will be seen that by suitably engaging a desired number of the hoist lines to the ship-supporting transfer carriage (or carriages), the hoist lines may be operated in unison to move the carriage, with or without a supported boat, in the desired direction upon the transfer trackway. The permissible individual operation of each drive unit 30 allows the operator to align the connections to the carriage, and to effect an adjustment of tension among the several hoist lines, so that equalization of the hauling stress may be established.

The engagement of the hoist lines to the transfer carriage is advantageously effected by means of clamping arms 32 provided on the inshore edge of the transfer carriage, one clamping arm being provided in proper position for engagement with each hoist line, and each hoist line includes a clamping bar 33 to receive the corresponding clamping arm on the carriage. Each clamping arm (Fig. 3) is pivoted on a pin 32*a* mounted on a hauling beam 32*b* incorporated in the carriage structure 5, and the lower or distal end of the arm is notched or grooved, whereby by swinging the arm on the pin 32*a*, the notch may be closed laterally over the bar 33. A suitable keeper pin or plate may be provided to prevent the unintended disengagement of the arm 32 from the bar 33, and the bar 33 is formed with suitable abutments, in the form of knobs 33*a*, against which the engaging arm 32 may bear when the hoist line is caused to travel in one direction or the other, to shift the transfer carriage. When in the course of carriage movement the arm 32 approaches a position over the sheave 26, the arm may be disconnected from the hoist line and temporarily swung aside to provide clear passage past the sheave.

The drums, drum gears and countershaft of the drive 30 are rotatably mounted in, and lie between, two integral side frames 46 of Y-shape in side elevation, as appears in Fig. 5, and these frames are securely bolted to a massive concrete foundation 47. This foundation includes an abutment portion 48 of concrete on the offshore side of the winch or drive structure, to provide sure anchorage against the reaction of the pull of the hoist line, it being noted that both of the reaches 25*c* and 25*d* of the line extend from the same side of the drums. The extent of both leads of the hoist line from one side of the pair of

drums is an incidental advantage of the reeving of the drums, since it permits the load on the drive and on its foundation to be always in the same direction, no matter in which direction the hoist line is driven.

The provision of the side frames, as illustrated, establishes an effective neutralization of the radial thrusts imposed by the drums upon their bearings; the thrusts are arranged in direct opposition, and are equated in the form of compressive stresses acting upon the sturdy body portions of the side frames lying between the drum bearings. For each wrap of the hoist line around the twin drums, a resultant stress of almost twice the tension in the hoist line is imposed upon the bearings, and it will be understood, therefore, that the six or seven turns of the line around the pair of drums results in a high composite stress. For example, a normal pull of 43,800 pounds on the hoist line becomes an effective stress of over 200,000 pounds.

It further will be noted that the drum gears 28*a* and 29*a* are integral with the respective drums, and that one gear is located within and adjacent to one side frame 46, while the other gear is similarly located adjacent to the other side frame, whereby the pitch circles of the gears may overlap as viewed in side elevation (see Fig. 5), and the drums may be mounted very closely together, saving size and weight in the side frames or housing structure of the drive, and minimizing the required diameter of the drive gear 37. The pinions 36 for both drum gears are mounted on a common countershaft 35 which extends medially below the pair of drums, and the drive gear 37 for this shaft is thus adapted, in keeping with sound machine design, to extend beyond the drums and the side frames or housing, and make immediate engagement with the quill pinion 38 on the through line shaft 34 which drives the several hoist drives 30, as well as the several launching carriage winches 14. This compact arrangement of each hoist drive 30 with its single drive gear 37 meshing immediately with the quill pinion 38, permits the line shaft to have bearings 59 positioned on opposite sides of the quill pinion and in relatively close proximity thereto.

The particular gravity take-up or tensioning device 31 for the hoist line is of very effective construction. The pulleys or sheaves 13 and 16 are mounted in the upper ends of two arms 51 and 59, respectively, as indicated in Figs. 3 and 4. The arms are pivoted at their lower ends to the concrete foundation or floor of the machinery house 15; at their upper ends the arms each carry a portion of U-shape in plan (see Fig. 4), in which the pulley associated therewith is mounted. A bracket or yoke 52 is secured to the upper end of each arm, and to the brackets 52 of the two arms the two ends of a looped cable 53 are respectively secured. The bight in this loop of cable 53 embraces a pulley 54 mounted in a recess provided therefor in a counterweight 55, formed as a heavy monolith of concrete, and arranged for vertical movement in guides 56 incorporated in a framework 57 (Fig. 4). Rising from the pulley 54 the two reaches of the cable are severally supported upon pulleys 58 and 59 borne by a rigid frame 60. The counterweight, as thus suspended in the bight in cable 53, tends under the effect of gravity to swing the arms 50 and 51 on their pivots, and thereby to shift the pulleys 16 and 13 in a direction away from the drive or winch 30, with the result that both of the reaches 25*c* and 25*d* of the hoist line are placed under tension. The range of swing of the arms 50 and 51 is adequate to take-up all slack and elongation of the hoist line.

It may be explained that the gravity take-up device 31 is serviceable to take-up the slack and to maintain tension on the non-hauling or unstressed side of the hoist line during operation. For a given friction between the rope and winch drums, the ratio of hauling pull to "slack" side tension in the hoist line is dependent upon three factors: (1) upon the number of wraps of the hoist line or cable around the paired drums; (2) the amount of friction between the cable and the drums; and (3) the efficiency of the cable at the bends which embrace the drums. Accordingly, it will be understood that in order to develop a certain pull in the hauling rope, a small amount of initial tension must be established in the "slack" side of the line. This initial tension may be developed by means of the gravity take-up device. It is preferable additionally to provide a screw take-up means, to work in combination with the gravity take-up device, and in this case such screw take-up comprises a threaded rod 61, to one end of which the bearing block of the inshore sheave 27 is attached. At its opposite end the rod 61 extends through the supporting beams 62, where it is equipped with a nut 63. By adjusting this nut the sheave 27 may be shifted to take-up slack in the hoist line 25, as may be visualized upon considering the diagram of Fig. 2.

In the marine railway described, the drive unit 30 is essentially located close to the offshore end of the path of travel of the ship-supporting carriage upon the transfer trackway, and when such carriage is located at said offshore end of the transfer trackway, ready to be pulled inshore, the hauling reach of the hoist line from the carriage to the sheave 27 and from sheave 27 to winch drive 30 is relatively long, while the slack side of the line is, manifestly, relatively short. Accordingly, when tension is applied to the hoist line, the total elongation of the line is great, and tends immediately to relieve any small initial tension in the non-hauling side of the line. This tends to result in an objectionable degree of slack in the non-hauling side of the line. And, of course, when the carriage is at the inshore end of the transfer trackway and is to be moved shoreward, a similar situation in the hoist line exists.

In the operation of the hauling or hoist apparatus described, the screw take-up 61, 63 is tightened, until, under the effect of the tension placed upon the hoist line, the upper ends of the arms 50 and 51 are swung towards the drive 30, and are brought into abutment upon a rigid beam 64 (Figs. 3 and 4), located adjacent to the frame 65 in which the idler sheave or pulley 17 is mounted. This movement of the arms 50 and 51 effects the rise of the counterweight 55 to the top of its range of travel, and puts upon the hoist line an initial tension equal to one-fourth of the weight of the counterweight. Thus, when the drive 30 is operated to move the transfer carriage in inshore direction, the tension in reach 25*b* of the hoist line acts on sheave 13 to hold the arms 51 against the stop 64, and any slack developing on the non-hauling reach 25*d* of the hoist line is taken up by the movement of the counterweight 55 acting upon the sheave 16 in arm 50. The initial tension is maintained in the non-hauling or "slack" reach 25*d* of the line. Conversely, if the carriage is to be moved shoreward, the tension on the reach 25*d* of the line

acts to hold the arm 50 against the stop 64, while the counterweight acts through the sheave 13 and arm 51 to maintain the initial tension in the reach 25b of the hoist line. The movement of the counterweight in either case is only one-fourth of the line take-up, and the take-up device will be seen to serve both reaches of the hoist line extending from the drive 30 to the sheaves 26 and 27 at the opposite ends of the transfer trackway. The effect of the take-up action is complete, regardless of the direction in which the drums of the hoist drive 30 are operated. And so it is with each of the four shunt haul hoists embodied in the marine railway illustrated in the drawings.

It will be understood that, within the spirit of the invention defined in the appended claims, various modifications, refinements and elaborations of the structure described are contemplated.

I claim:

1. A shunt haul hoist for moving a plurality of ship-supporting carriage means on the transfer trackway of a marine railway, said shunt haul hoist comprising a hoist line for each carriage means, a drive for each hoist line including two drums provided with parallel grooves in which said hoist line is wrapped a plurality of turns, with both drums included within the turns, a gravity take-up device provided with a pulley for each hoist line, a sheave mounted adjacent to one end of the range of travel of each carriage means on said transfer trackway, each hoist line extending from its drive around the pulley of the associated take-up device and sheave to a point of anchorage on said carriage means, and means for selectively rotating the drums of the several drives.

2. The structure of the next-preceding claim, said drum-rotating means for the several drives comprising a rotating line-shaft extending transversely of said transfer trackway, transmission gearing for driving said drums of each drive, and means arranged with said line-shaft for selectively engaging and disengaging said transmission gearing of the several drives.

3. A shunt haul hoist for moving a plurality of ship-supporting carriages on the transfer trackway of a marine railway, said shunt haul hoist comprising a pair of sheaves for each carriage arranged one sheave adjacent to each end of the range of travel of said carriages on the transfer trackway, a hoist line for each carriage having a reach extending along the trackway between the associate pair of sheaves, means for securing said reach of each hoist line to a carriage, a drive for each hoist line including a pair of drums mounted to rotate on parallel axes, said drums being provided with circumferential grooves, the grooves of one drum being parallel to those of the other, each hoist line extending from said reach around the associate sheaves and thence to the pair of drums of the associate drive and being wrapped a plurality of turns in the grooves of said drums, with both drums included within the turns, a gravity take-up device for each hoist line, said take-up device acting on both extents or reaches of the associate hoist line extending between its said sheaves and drive, and means for powerfully rotating the drums of the several drives.

4. A shunt haul hoist for moving a plurality of ship-supporting carriages on the transfer trackway of a marine railway, said shunt haul hoist comprising a pair of sheaves for each carriage arranged one sheave adjacent to each end of the range of travel of said carriages on the transfer trackway, a hoist line for each carriage having a reach extending along the trackway between the associate pair of sheaves, means for securing said reach of each hoist line to a carriage, a drive for each hoist line including a pair of drums mounted to rotate on parallel axes, said drums being provided with circumferential grooves, the grooves of one drum being parallel to those of the other, each hoist line extending from said reach around the associate sheaves and thence to the pair of drums of the associate drive and being wrapped a plurality of turns in the grooves of said drums, with both drums included within the turns, a gravity take-up device for each hoist line, said take-up device acting on both extents or reaches of the associate hoist line extending between its said sheaves and drive, a powerfully driven line-shaft adapted to extend transversely of said transfer trackway, transmission gearing for the pairs of drums of each drive, and means arranged with the line-shaft for selectively engaging and disengaging the transmission gearing of the drives.

5. The structure of the next-preceding claim, both reaches of each hoist line which run from its associate sheaves to its drive extending from the same side of the pair of drums in said drive, and an idler pulley around which one of said last reaches of the hoist line passes to reverse its direction between the drums and the sheave to which it extends.

6. A shunt haul hoist for moving a plurality of ship-supporting carriages on the transfer trackway of a marine railway, said shunt haul hoist comprising a plurality of hoist lines, each having a drive including two drums provided with parallel grooves in which the associate hoist line is wrapped a plurality of turns, with both drums included within the turns, each hoist line having a gravity take-up device provided with a pulley and a sheave mounted adjacent to one end of the range of carriage travel on said transfer trackway, each hoist line extending from its drive around the pulley of its take-up device and around the associate sheave to a point of anchorage to a carriage, and means for powerfully rotating the drums of said drive either selectively or in unison.

7. The structure of the next-preceding claim, said last means comprising a powerfully rotated line-shaft adapted to extend transversely of said transfer trackway, each drive having a set of transmission gearing, pinions on said line-shaft severally meshing with the gearing of said drives, and clutches for selectively uniting said pinions to said line-shaft for either individual or group operation.

8. A shunt haul hoist for moving a plurality of ship-supporting carriages on the transfer trackway of a marine railway, said shunt haul hoist means including a plurality of hoist lines each having a sheave adjacent to each end of the range of travel of said carriages on said trackway, each hoist line having a reach extending along the trackway between its sheaves, means for securing such reach of each hoist line to a carriage, a shunt haul hoist drive for each hoist line including two drums provided with parallel grooves, each hoist line extending around its associate sheaves and being wrapped in said grooves a plurality of turns around the drums of its drive, with both drums included within the turns, a gravity take-up device ef-

fective upon each hoist line in both extents or reaches thereof between its drive and sheaves, and means for powerfully rotating the drums of said drives individually and in unison.

9. A shunt haul hoist for moving a plurality of ship-supporting carriages on the transfer trackway of a marine railway, said shunt haul hoist means including a plurality of hoist lines each having a sheave adjacent to each end of the range of travel of said carriages on said trackway, each hoist line having a reach extending along the trackway between its sheaves, means for securing such reach of each hoist line to a carriage, a shunt haul hoist drive for each hoist line including two drums provided with parallel grooves, each hoist line extending around it associate sheaves and being wrapped in said grooves a plurality of turns around the drums of its drive, with both drums included within the turns, a gravity take-up device effective upon each hoist line in both extents or reaches thereof between its drive and sheaves, a powerfully driven line-shaft adapted to extend transversely of said trackway, a set of transmission gearing for the drums of each of said drives, and means arranged with the line-shaft for engaging said sets of transmission gearing to said line shaft for individual or group operation.

10. The structure of the next-preceding claim, both reaches of each hoist line which run from the sheaves to the hoist line drive extending from the same side of the pair of drums of its drive, and an idler pulley around which one of said last reaches of the hoist line passes to reverse its direction between the drums and the sheave to which it extends.

11. A shunt haul hoist for a plurality of ship-supporting carriages of a marine railway comprising a plurality of hoist lines for connection severally to said carriages, a drive for each hoist line including a pair of drums, a train of transmission gearing for each drive, a line-shaft for driving the pairs of drums of the several drives through the trains of said transmission gearing in unison and in the same direction of rotation, each hoist line being wrapped a plurality of turns around its associate pair of drums, with both drums of the pair included within the turns of the hoist line and with both leads of the hoist line extended from the same side of the pair of drums, and a cable-tensioning device effective upon each of such leads of each hoist line, whereby said carriages may be moved in either of opposite directions on the marine railway without uniform tension in said hoist lines.

12. A shunt haul hoist for a plurality of ship-supporting carriages of a marine railway comprising a plurality of hoist lines for connection severally to such carriages, and a drive for each line, each drive comprising a pair of drums journaled in a housing, a train of transmission gearing for each drive, a line-shaft, means for selectively connecting the transmission gearing of the drives to the line shaft for either individual or group operation of said drives, with the drums of each drive in operation rotated in the same direction, each hoist line being wrapped a plurality of turns around the two drums of its drive, with both drums included within the turns, both

leads of each hoist line extending from the drums on the same side of the drive, whereby in either direction of rotation of the drums of a drive the pull on the hoist line for moving an associate carriage in a corresponding direction, such pull reacting in the turns of the cable about said drums, is opposed by compressive stress upon the body portions of said housing between the drum journals.

13. A shunt haul hoist for a plurality of ship-supporting carriages of a marine railway comprising a plurality of hoist lines for connection severally to said carriages, a drive for each hoist line including a pair of drums, a housing for each drive having two side frames in which the pair of drums of the drive are journaled and between which the drums extend in parallelism, a gear fixed to each drum of each drive, the gear of one drum being located adjacent to and within one side frame of the housing and the other gear being similarly located with respect to the other side frame, and the pitch circles of the two gears overlapping as viewed from the side of the drive, a countershaft extending parallel to, but out of the plane of, the axes of said drums, two pinions on said countershaft meshing one with each of said gears, a drive gear secured to said countershaft adjacent to, and on the outside of, said housing, with the pitch circle of the drive gear extending beyond the housing, and a line shaft equipped with driving pinions severally engaging the drive gears of the drives of said plurality of hoist lines.

14. A shunt haul hoist for a plurality of ship-supporting carriages of a marine railway comprising a plurality of hoist lines for connection severally to said carriages, a drive for each hoist line including a pair of drums, a housing for each drive having two side frames in which the pair of drums of the drive are journaled and between which the drums extend in parallelism, a gear fixed to each drum of each drive, the gear of one drum being located adjacent to and within one side frame of the housing and the other gear being similarly located with respect to the other side frame, and the pitch circles of the two gears overlapping as viewed from the side of the drive, a countershaft extending parallel to, but out of the plane of, the axes of said drums, two pinions on said countershaft meshing one with each of said gears, a drive gear secured to said countershaft adjacent to, and on the outside of, said housing, with the pitch circle of the drive gear extending beyond the housing, a powerfully rotated line shaft, a plurality of pinions rotatable on said line shaft and severally meshing with the drive gears of said drives, and clutches for selectively engaging said pinions to said line shaft.

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