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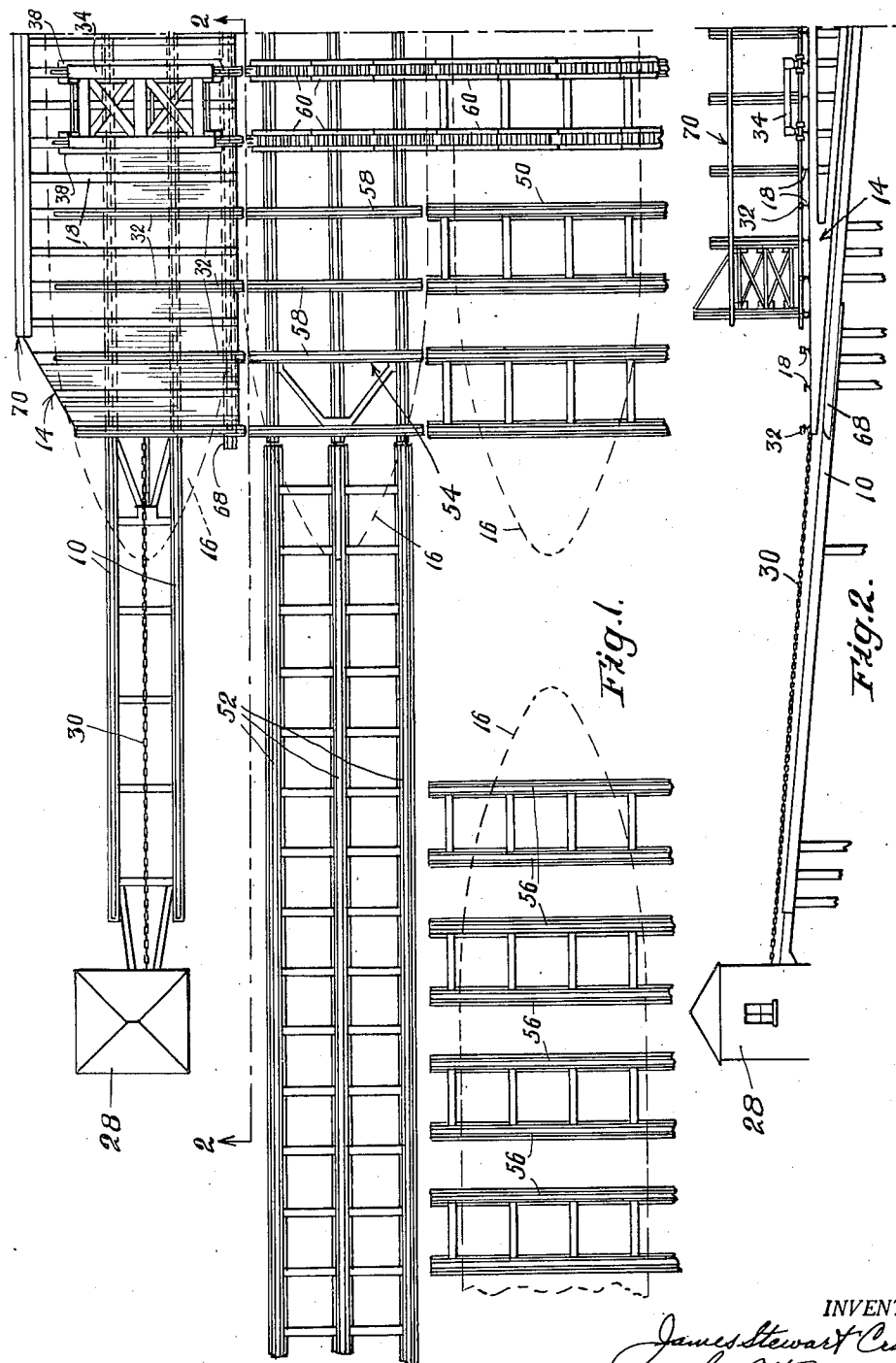
J. S. CRANDALL

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RAILWAY DRY DOCK

Filed June 22, 1944

4 Sheets-Sheet 1



INVENTOR.
James Stewart Crandall
BY *his Atty*
John H. McKenna

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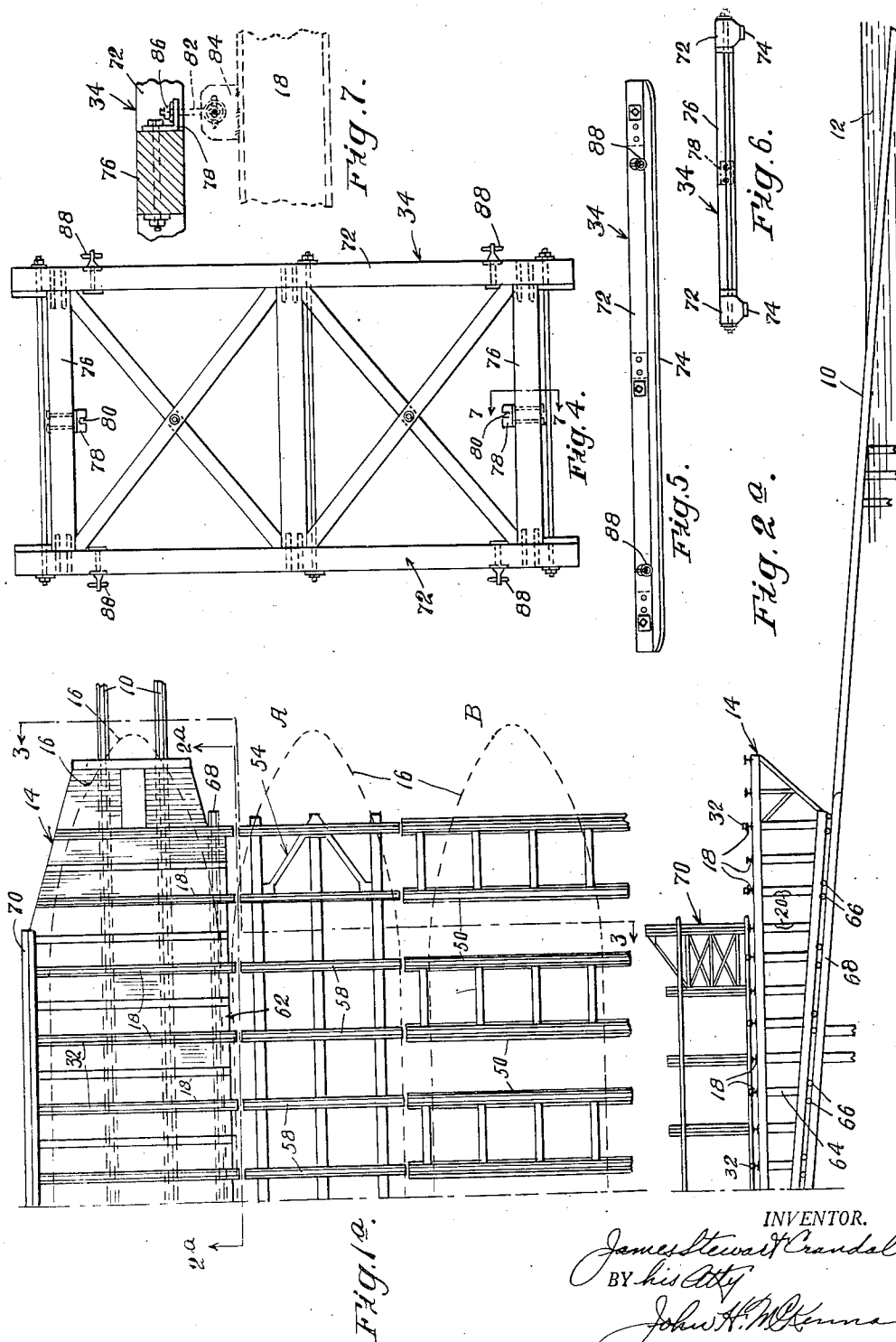
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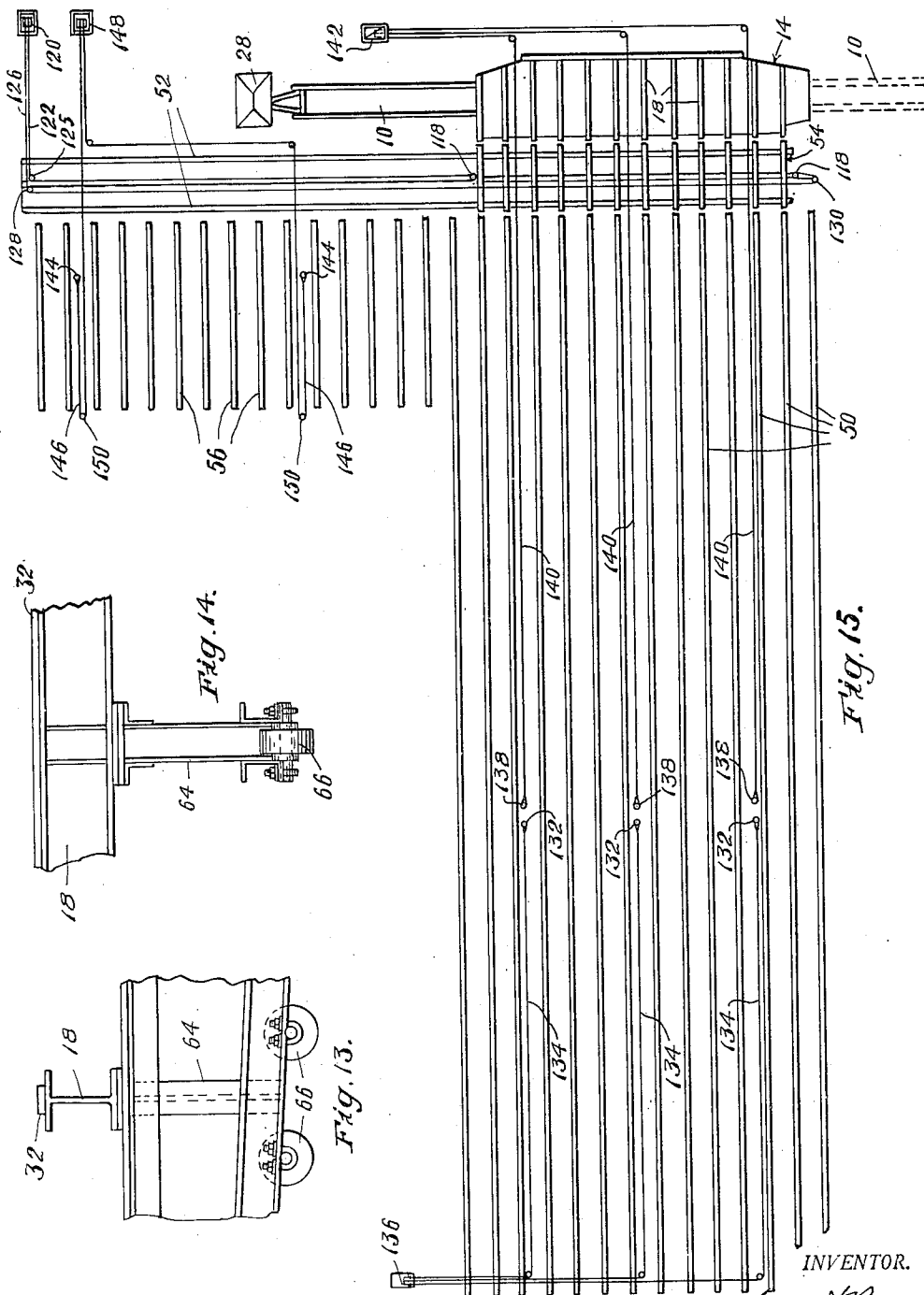
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UNITED STATES PATENT OFFICE

2,392,081

RAILWAY DRY DOCK

James Stuart Crandall, Lexington, Mass., assignor to Crandall Dry Dock Engineers Inc., Cambridge, Mass., a corporation of Massachusetts

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11 Claims. (Cl. 61—67)

This invention relates to improvements in railway dry docks.

More particularly it provides improved dry docking facilities whereby a boat or hull conveniently and efficiently may be transported along the railway dry dock from a body of water to a transfer location on land where the boat or hull may be transferred to a transfer car on which it can be moved to the entrance to a selected storage space, or the boat or hull can be moved from the dry dock cradle across the transfer car into a particular storage space. Conversely, the boat or hull may be moved on and from or across the transfer car from a storage space to the dry dock cradle, on which latter it can be transported along the railway dry dock from the transfer location to the body of water.

It is an object of my invention to provide a longitudinal transfer car which can be moved along longitudinal tracks arranged parallel to the railway dry dock between the latter and lateral transfer tracks, so that the longitudinal transfer car can serve for moving a boat or hull from the dry dock cradle, or from particular lateral transfer tracks to lateral transfer tracks further along the longitudinal transfer tracks onto which the boat or hull may be moved. Or the longitudinal transfer car may constitute a bridge across which a boat or hull may be moved from lateral transfer tracks to the railway dry dock or from the railway dry dock to lateral transfer tracks.

Another object is to provide a railway dry dock having the usual plurality of rails along which the dry dock cradle can move but which, at a boat-transfer location, has a relatively short auxiliary rail upon which an overhanging portion of the cradle rides and is supported at the boat-transfer location.

Still another object is to employ transfer cars operable on longitudinal transfer tracks and lateral transfer tracks and track sections with a series of separate roller units for the individual tracks which are movable along the tracks relative to the transfer cars riding thereon.

It is, moreover, my purpose and object generally to improve the structure and operation of railway dry docks and dry docking facilities.

In the accompanying drawings:

Figures 1 and 1a together represent in plan a dry dock embodying features of my invention, lateral transfer cars and roller units being omitted from all but one pair of lateral tracks, for clearness of showing;

Figures 2 and 2a are cross-sectional views respectively on lines 2—2 and 2a—2a of Figure 1;

Figure 3 is a cross-sectional view on line 3—3 of Figure 1a, with a hull represented in full lines on the dry dock cradle and other hulls represented in dotted lines respectively on the longitudinal transfer car and on the lateral transfer tracks;

Figure 4 is a plan view of a lateral transfer car;

Figure 5 is a side elevation of the car of Figure 4;

Figure 6 is an end elevation of the car of Figures 4 and 5;

Figure 7 is a detail cross-sectional view on line 7—7 of Figure 4, including a dotted representation of a means for releasably securing the car to a deck rail of the railway car;

Figures 8—12 are detail views of the various roller units;

Figures 13 and 14 are detail fragmentary views of the vertical wheeled support for the overhang of the dry dock cradle, the wheels riding on the short auxiliary rail; and

Figure 15 is a diagrammatic plan view of my improved dry dock showing the power means and cable connections for moving the various cars along the various tracks.

Referring to the drawings, the railway dry dock 10 extends with a predetermined inclination from a location suitably below the surface of a body of water 12 to a location well up on land so that the dry dock cradle 14 may carry a boat or hull 16 thereon either from the water to a transfer location on land or from said transfer location to the body of water 12.

The cradle 14 preferably is of all steel construction although this is not necessary so long as it is made capable of accommodating boats or hulls of a particular predetermined class as regards dimensions and weight. As represented, it is of welded steel construction having a multiplicity of uniformly spaced apart transverse deck beams 18 disposed generally in a common horizontal plane in all positions of the cradle, and a series of supporting columns 20 of gradually increasing lengths from one end to the other of the car, the lower ends of the columns having secured thereto the two inclined runners 22, 24 which extend parallel with the railway tracks 10. Between each runner 22, 24 and a track of the railway dry dock 10 are flanged roller units 26 which are connected together lengthwise of the dry dock and the cradle 14 runs on these roller units 26 which in turn run on the tracks of the railway dry dock 10. By this means, I avoid need for lubrication while ensuring a superior type of anti-friction free-rolling mount for the cradle 14 on the railway dry dock 10.

The cradle 14 may be moved up the inclined dry dock 10 by any suitable means such as any well known power mechanism in the control house 28, acting through the chain or cable 30 which may be connected to the cradle 14. The cradle 14 will ride down the inclined dry dock 10 when chain or cable 30 is let out by the operator at the control house.

Lateral transfer track sections 32, of predetermined number, are mounted on the deck of cradle 14. As represented the cradle 14 has twenty-three transverse deck beams 18 and a lateral track 32 extends along alternate beams 18, starting with the number one beam at the extreme left hand end of the cradle as viewed in Fig. 1. A transfer car 34 will be mounted on each pair of lateral tracks 32, or on such of the tracks as may be desired for any particular undertaking. These transfer cars preferably will be of welded all steel construction, although here again the material and structure of the transfer car may be varied so long as the cars are made capable of accommodating a particular class of boats or hulls, as regards size and weight. With a structure as herein represented, it is preferable to have six transfer cars 34, one on each pair of lateral tracks 32, each transfer car having spaced apart parallel runners 36 for running on roller units 26, comparable to the roller units 26. The bilge blocks 40, upon which the boat or hull directly rests, are mounted on the transfer cars 34 and when the boat or hull is in place on the transfer cars, it ties all of the cars together so that all of the cars 34 with the hull or boat thereon can move laterally as a unit.

In Figs. 1 through 2a, the cradle 14 is shown at the transfer location, well up on the railway dry dock 10, and opposite the series of lateral transfer tracks 50 which may have length for accommodating one or a number of boats or hulls moved thereon for storage purposes or for undergoing repairs. If desired, the boats or hulls may be constructed on these lateral transfer tracks 50 and, upon completion, or at a suitable stage of partial completion, be moved to the dry dock cradle 14 for launching.

According to the invention, however, longitudinal transfer tracks 52 intervene between the railway dry dock 10 and the lateral transfer tracks 50, and a longitudinal transfer car 54 is movable along tracks 52 between a position opposite the lateral transfer tracks 50 and a position opposite another series of lateral transfer tracks 56, constituting a second berth in which boats or hulls may be stored or repaired or constructed. Obviously there may be still other berths with lateral transfer tracks 56 like those represented in Fig. 1.

It is a feature of my present invention that the longitudinal transfer car 54 serves both as a bridge across the longitudinal transfer tracks 52, across which a boat or hull may be moved from the lateral transfer tracks 50 to the dry dock cradle 14 or from the cradle 14 to the lateral transfer tracks 50, and as a car for moving a boat or hull thereon from the transfer location opposite tracks 50 to a location opposite the tracks 56, or from the latter location to the transfer location. For this purpose, the longitudinal transfer car 54 has mounted thereon the lateral track sections 58 located for registering simultaneously with the lateral transfer tracks 50 and the lateral tracks 32 on the deck beams 18 of cradle 14 when the latter is at the transfer location of Figs. 1-2a. Hence, assuming that a boat or hull is to be moved from the dry dock cradle 14 to the lateral trans-

fer tracks 50, roller units 60 comparable with the roller units 26 and 38 on the railway dry dock are first arranged on the lateral track sections 53 and the tracks 50, after which the boat or hull, mounted on the transfer cars 34, can be rolled from the cradle 14 across the longitudinal transfer car 54 to the lateral transfer tracks 50, the boat or hull tying the transfer cars 34 together so that all of them, with the boat thereon, move as a unit. If, on the other hand, a boat or hull is to be moved from tracks 50 to the dry dock cradle 14, similar transfer cars 34 will be supporting the boat or hull on tracks 50, as represented in dotted lines at B in Fig. 4, so that they and the boat can be moved as a unit across the longitudinal transfer car 54 to the lateral track sections 32 on the cradle 14. However, if desired, instead of moving the boat or hull across the longitudinal transfer car 54, it may be stopped on the car 54 in the dotted position marked A in Fig. 4 and be transported thereon to another berth for movement onto lateral transfer tracks 56 therein.

The longitudinal transfer tracks 52 are represented as three in number although two or a larger number than three may be provided without departing from the spirit and scope of my present disclosure. In any case, the track 52 adjacent the ends of the lateral transfer tracks 50, 56 may extend relatively close to the ends of the latter tracks so that only a small overhang of the lateral track sections 58 of longitudinal transfer car 54 is required for getting substantially continuous runs of tracks 50, 58 when these are in alignment. However, it is not practicable to have the longitudinal transfer tracks 52 close enough to the railway dry dock 10 to avoid a substantial overhang of the transverse track sections 32 on the dry dock cradle 14. Fig. 3 shows the track sections 32 extending a substantial distance laterally from the dry dock 10 into operative registration with the track sections 58 of the longitudinal transfer car 54.

According to my invention, this substantial overhang at 62 (Fig. 3) of the tracks 32 is effectively supported at the transfer location by a structure indicated generally at 64 which constitutes a part of the dry dock cradle 14 and has wheels 66 for riding on an auxiliary rail 68 extending only at the transfer location. In other words, the cradle 14 rides on the usual plurality of rails throughout the major extent of the dry dock but has the auxiliary relatively short rail 68 at the transfer location on which the wheels 66 ride as the cradle 14 approaches the transfer location and by which, through the supporting structure 64, the overhangs 62 of track sections 32 are rigidly supported against depression when a boat or hull is being moved between the cradle 14 and the longitudinal transfer car 54. At the opposite side of the cradle, there is provided the elevated platform structure 70 which may extend along the major longitudinal extent of the cradle.

In the plan view of Figs. 1, 1a, and in Figs. 2, 2a, only one of the transfer cars 34 is shown on the dry dock cradle 14, it being understood that a similar car 34 will be on each pair of the tracks 32. Also, it should be understood that the roller units 60, represented in Fig. 1 on two only of the tracks 50 and track sections 58, would be on all of the tracks 50 and track sections 58 prior to a lateral movement of transfer cars 34 with a boat thereon to or from the railway dry dock.

Figs. 4-7 illustrate one of the transfer cars 34

and a means for temporarily securing it in place on the cradle 14.

The car 34 may be of wood construction suitably braced and reinforced for needed strength and durability. Its side members 72 constitute parallel runners which, preferably, are provided on their under sides with the metallic strips 74 which constitute shoes for engaging the roller units 60. Each transverse end element 76 of the car has a grooved cleat 78 thereon whose groove 80 is adapted to receive a swinging bolt 82 which is shown pivotally mounted on an ear 84 which is welded to the top of the deck beam 18 which extends centrally of each car 34 when the car is on a pair of the lateral transfer track sections 32 of the dry dock cradle 14. There are two ears 84 for each car 34, and two swinging bolts 82 for engaging the grooved cleats 78, one at each end of the car 34. A nut 86 on each bolt 82 can be screwed into engagement with the cleat to effect the temporary securement of each car 34. Ring bolts 88 toward the ends of each runner constitute means for attachment of cables for drawing the cars along the lateral tracks and track sections.

The roller bearing units are shown in detail in Figs. 8-12. Figs. 8 and 9 show a preferred construction for use on the longitudinal transfer tracks 52, in which a multiplicity of rollers 90 are freely rotatable each about an axial retaining pin 92 which has its opposite ends retained in the side bars 94 which are maintained in a predetermined spaced parallel relation by spacing members 96 and tie bolts 98. Means 100 is provided for detachably securing the units together in end to end relation.

The roller unit shown in Figs. 10-12 is of a preferred construction for use on the railway dry dock 10. This unit has the multiple rollers 26 rotatable around the axial retaining pins 102. The side bars 104, in this case, however, are reinforced by angle iron bars 106. Spacers 108 and tie bolts 110 maintain the side bars in predetermined spaced parallel relation as in the previously described unit. Overlapping plates 112, 114 have aligned holes for reception of removable pins 116, whereby these railway units may be detachably secured together in end to end relation.

The roller units 60 for the lateral transfer tracks may be generally similar to those already described although they need not be attached together, end to end, and preferably will be relatively short units as represented in Fig. 3. However, the units for the lateral track sections of the cradle 14 may be substantially longer than the units for the lateral tracks 50 and the lateral tracks sections 58 of the longitudinal transfer car.

The diagrammatic plan view of my improved railway dry dock, shown in Fig. 15, indicates power means for moving a boat or hull along the various tracks, the cable or chain for moving the dry dock cradle 14 being omitted in this view because indicated in Figs. 1 and 2.

The longitudinal transfer car 54 has a sheave 118 at each end. A power means 120 is adapted to wind up and draw in a cable 122 which is trained over a sheave 124 and around sheave 118 on the near end of car 54 whence the cable extends back parallel with itself to a point of anchorage at the inboard end of longitudinal transfer tracks 52. Another cable 126 is trained around sheave 128 at the inboard end of tracks 52 and extends thence around sheave 130 at the outboard

end of the tracks and around the sheave 118 at this end of car 54 with the end of the cable anchored at the outboard end region of the tracks 52. This cable 126 is let out when cable 122 is being drawn in, and conversely the cable 122 is let out when cable 126 is being drawn in, by operation of the power means 120 in the opposite direction. Hence car 54 may be drawn in either direction along tracks 52 by operation of the power means 120 in the proper direction.

If a boat is to be moved from the dry dock cradle 14 to the lateral transfer tracks 50, the ends 132 of cables 134 will be attached to the lateral transfer cars 34 on which the boat will be mounted on the cradle. Then, operation of the power means 136 can draw the lateral transfer cars 34 with the boat thereon across the longitudinal transfer car 54 onto the tracks 50. In case a boat or hull on tracks 50 is to be moved to the railway dry dock 10, the ends 138 of cables 140 will be attached to the near ends of lateral transfer cars 34 on which the boat will be mounted, after which, operation of the power means 142 can draw the cars and boat as a unit across the longitudinal transfer car and onto the cradle 14.

Assuming now that the longitudinal transfer car 54 is opposite the lateral transfer tracks 56 and a boat is to be moved from car 54 to the tracks 56. The ends 144 of cables 146 will be attached to the transfer cars 34 on car 54 and power means 148, operated to draw the boat onto tracks 56. A reverse movement of a boat from tracks 56 to car 54 may be similarly accomplished except that cables 146 in such case will not extend around the far sheaves 150, and ends 144 of the cables will be attached to the near ends of the transfer cars 34.

I claim as my invention:

1. A railway dry dock comprising longitudinal tracks extending on a predetermined incline between a body of water and a boat-transfer location on land, a cradle movable along said tracks between said body of water and said boat-transfer location, lateral transfer tracks at said boat-transfer location, longitudinal transfer tracks between the railway dry dock and the lateral transfer tracks, a longitudinal transfer car movable along said longitudinal transfer tracks, lateral transfer track sections on the said cradle and on the said longitudinal transfer car adapted to be brought into alignment with said lateral transfer tracks, and lateral transfer cars movable along said lateral transfer track sections and said lateral transfer tracks, whereby a boat on said lateral transfer cars may be moved laterally across said longitudinal transfer car at said boat-transfer location.

2. A railway dry dock comprising longitudinal tracks extending on a predetermined incline between a body of water and a boat-transfer location on land, a cradle movable along said tracks between said body of water and said boat-transfer location, lateral transfer tracks at said boat-transfer location, longitudinal transfer tracks between the railway dry dock and the lateral transfer tracks, a longitudinal transfer car movable along said longitudinal transfer tracks, lateral transfer track sections on said cradle and on the said longitudinal transfer car adapted to be brought into alignment with said lateral transfer tracks, lateral transfer cars on said lateral transfer track sections of the cradle, releasable means for securing said lateral transfer cars against movement relative to the cradle to facilitate reception of a boat on said lateral transfer

cars, means for moving the cradle and said lateral transfer cars with a boat thereon as a unit to said boat-transfer location, and means for moving said lateral transfer cars with the boat thereon as a unit from said cradle and across said longitudinal transfer car to said lateral transfer tracks.

3. A railway dry dock comprising longitudinal tracks extending on a predetermined incline between a body of water and a boat-transfer location on land, a cradle movable along said railway between said body of water and said boat-transfer location, lateral transfer tracks at said boat-transfer location, longitudinal transfer tracks between the railway dry dock and the lateral transfer tracks, a longitudinal transfer car movable along said longitudinal transfer tracks, lateral transfer track sections on the said cradle and on the said longitudinal transfer car adapted to be brought into alignment with said lateral transfer tracks, lateral transfer cars on said lateral transfer track sections of the cradle, releasable means for securing said lateral transfer cars against movement relative to the cradle to facilitate reception of a boat on said lateral transfer cars, means for moving the cradle and said lateral transfer cars with a boat thereon as a unit to said boat-transfer location, means for moving said lateral transfer cars with a boat thereon as a unit from said cradle to said longitudinal transfer car, and means for moving said longitudinal transfer car with the boat thereon longitudinally away from said boat-transfer location.

4. A railway drydock comprising longitudinal tracks extending on a predetermined incline between a body of water and a boat-transfer location on land, a cradle movable along said tracks between said body of water and said boat-transfer location, lateral transfer tracks at said boat-transfer location, longitudinal transfer tracks between the railway dry dock and the lateral transfer tracks, a longitudinal transfer car movable along said longitudinal transfer tracks, lateral transfer track sections on the said cradle and on the said longitudinal transfer car adapted to be brought into alignment with said lateral transfer tracks, lateral transfer cars on said lateral transfer tracks for holding a boat thereon, and means for moving said lateral transfer cars with a boat thereon as a unit laterally across said longitudinal transfer car and onto said lateral transfer track sections of the cradle.

5. A railway dry dock comprising longitudinal tracks extending on a predetermined incline between a body of water and a boat-transfer location on land, a cradle movable along said tracks between said body of water and said boat-transfer location, lateral transfer tracks at said boat-transfer location, longitudinal transfer tracks between the railway dry dock and the lateral transfer tracks, a longitudinal transfer car movable along said longitudinal transfer tracks, lateral transfer track sections on said cradle and on the said longitudinal transfer car adapted to be brought into alignment with said lateral transfer tracks, lateral transfer cars on said lateral transfer tracks for holding a boat thereon, means for moving said lateral transfer cars with a boat thereon as a unit onto said lateral transfer track sections of the longitudinal transfer car, and means for moving the longitudinal transfer car with the boat thereon longitudinally away from said boat-transfer location.

6. A railway dry dock comprising longitudinal

tracks extending on a predetermined incline between a body of water and a boat-transfer location, longitudinal transfer tracks extending in a common horizontal plane and spaced laterally from the said railway dry dock at the boat-transfer location, a cradle movable along the said inclined longitudinal tracks, a longitudinal transfer car movable along the longitudinal transfer tracks, lateral transfer track sections on the cradle and on the longitudinal transfer car adapted to be brought into mutual alignment at the boat-transfer location, said lateral transfer track sections on the cradle having substantial overhang bridging the major portion of the space between the railway dry dock and the longitudinal transfer tracks, a relatively short auxiliary rail located under the said bridging portions of the lateral transfer track sections of the cradle when the latter is at said boat-transfer location, and supports on the cradle extending between said bridging portions of the lateral transfer track sections of the cradle and said auxiliary rail, adapted to ride on said auxiliary rail at said boat-transfer location.

7. A railway dry dock comprising a plurality of tracks, longitudinal transfer tracks beside and spaced from the railway dry dock, a cradle movable along the dry dock tracks, a longitudinal transfer car movable along the longitudinal transfer tracks, lateral transfer track sections on said cradle and on said car adapted to be brought into mutual alignment, said lateral transfer track sections of the cradle bridging the major portion of the space between the railway dry dock and the longitudinal transfer tracks, a relatively short auxiliary rail for the cradle extending under the said bridging portions of the lateral transfer track sections of the cradle at a boat-transfer location, and means on the cradle extending between said rail and said bridging portions of the lateral transfer track sections of the cradle and adapted to ride on said auxiliary rail at said boat-transfer location.

8. A railway dry dock comprising a plurality of tracks, longitudinal transfer tracks beside the dry dock tracks, lateral transfer tracks extending from the longitudinal transfer tracks at the side thereof remote from the railway dry dock, means movable along said lateral transfer tracks and adapted to hold a boat, and means for moving said boat holding means with a boat thereon across said longitudinal transfer car from said lateral transfer tracks to said railway dry dock.

9. A railway dry dock comprising a plurality of tracks, lateral transfer tracks at a boat-transfer location along the dry dock, other lateral transfer tracks remote from said boat-transfer location, longitudinal transfer tracks adjacent to the ends of the lateral transfer tracks and between the latter said tracks and the railway dry dock, a cradle movable along the dry dock tracks to and from said boat-transfer location, a longitudinal transfer car movable along said longitudinal transfer tracks to and from said boat-transfer location, and lateral boat-holding transfer cars movable to and from said cradle laterally across said longitudinal transfer car at said boat-transfer location.

10. A railway dry dock comprising a plurality of tracks, lateral transfer tracks at a boat-transfer location along the dry dock, other lateral transfer tracks remote from said boat-transfer location, longitudinal transfer tracks adjacent to the ends of the lateral transfer tracks and between the latter said tracks and the railway dry

dock, a cradle movable along the dry dock tracks to and from said boat-transfer location, a longitudinal transfer car movable along said longitudinal transfer tracks to and from said boat-transfer location, and lateral boat-holding transfer cars movable to and from said lateral transfer tracks laterally across said longitudinal transfer car at said boat-transfer location.

11. A railway dry dock comprising a plurality of tracks, a cradle having lateral transfer track sections thereon, said cradle being movable along the dry dock tracks to and from a boat-transfer location, lateral transfer tracks at said boat-transfer location but having their ends spaced a substantial distance from the ends of said lateral

transfer track sections of the cradle when the latter is at said boat-transfer location, longitudinal transfer tracks adjacent to the ends of said lateral transfer tracks, and a longitudinal transfer car movable along the longitudinal transfer tracks to and from said boat-transfer location, said longitudinal transfer car having lateral transfer track sections thereon for bridging the space between the ends of said lateral transfer tracks and said lateral transfer track sections of the cradle when the latter said cradle and the longitudinal transfer car are at said boat-transfer location.

JAMES STUART CRANDALL.