Nov. 15, 1966 J. W. DICKINSON 3,285,515

PORTABLE MARINE RAILWAY

Filed Nov. 18, 1963

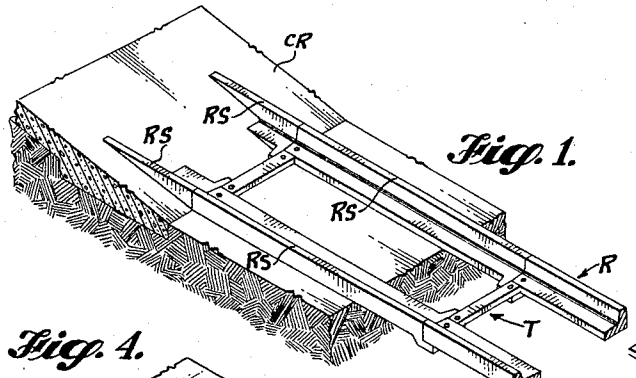


Fig. 1.

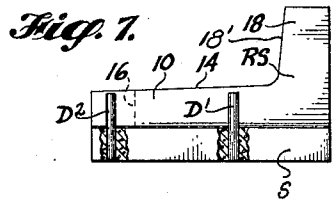
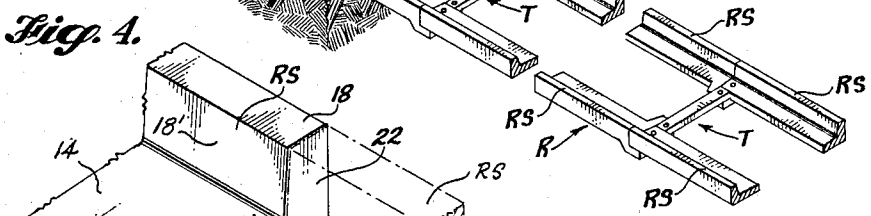


Fig. 7.



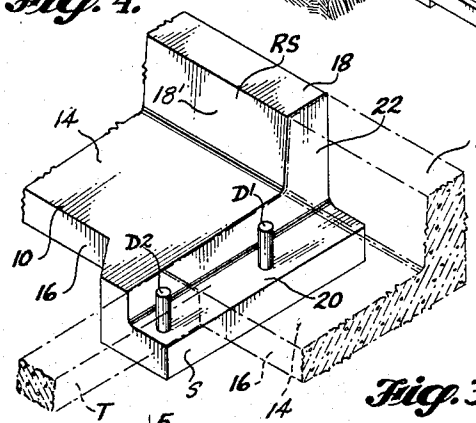


Fig. 4.

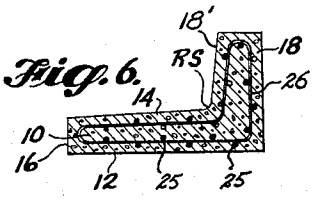


Fig. 6.

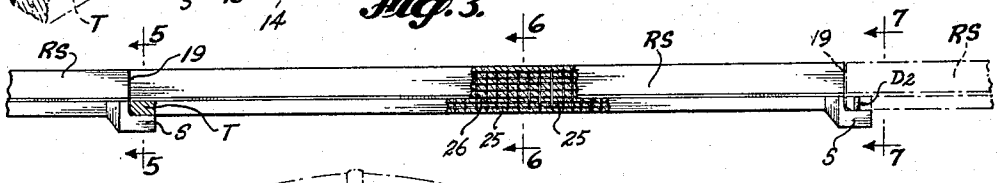


Fig. 3.

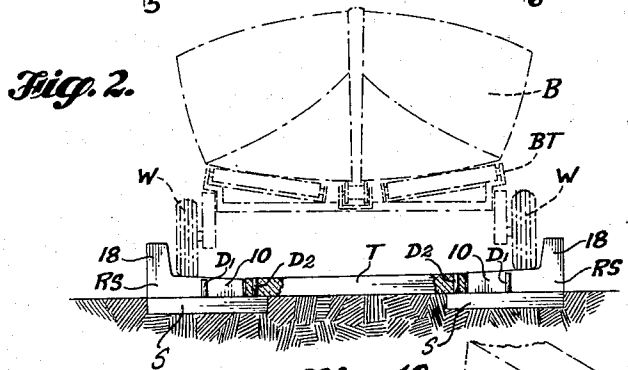


Fig. 2.

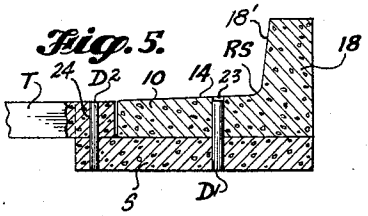


Fig. 5.

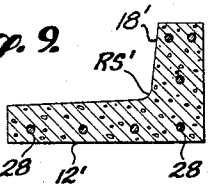


Fig. 9.

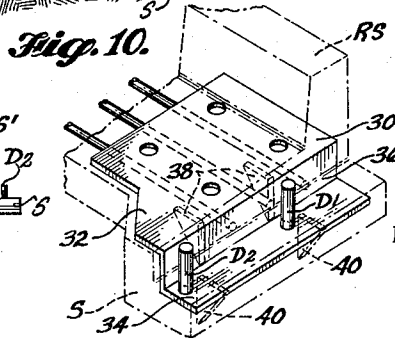


Fig. 10.

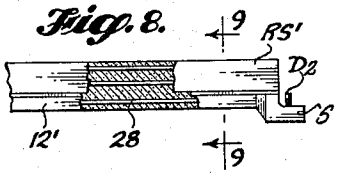


Fig. 8.

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PORTABLE MARINE RAILWAY

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13 Claims. (Cl. 238—121)

The present invention relates to marine railways, and more particularly to a portable marine railway of sectional construction and involving precast, reinforced concrete components, adapted to be readily secured together to form a two track continuous railway.

There is a need for a marine railway that may be removed from the water during the non-seasonal period of the year when the boat owner does not desire to use his boat, or during a period when he is away from his waterside property. Such a marine railway must also be non-corrosive, durable, capable of being readily assembled and disassembled, should involve a minimum of components, and have rail joints which are simple but reliable. A principal object of the present invention is to provide a portable marine railway that meets these criteria.

Characteristically, the portable marine railway of the present invention comprises a pair of substantially parallel, sectional rails, each sectional rail comprising a plurality of precast concrete rail sections, and a plurality of precast concrete crossties, extending between and interconnecting the said sectional rails. The rail sections include relatively broad track portions, which in use may rest directly on and be supported by the ground, both above and below the water line, much in the same manner as a spread footing supports a building structure. According to the invention, one end of each rail section includes a shelf portion extending both longitudinally and laterally from such end and underlying the opposite end portion of the adjoining rail section. A dowel or the like extends upwardly from the shelf portion into a dowel receiving opening in the end portion of the adjoining rail section and serves to couple the rail sections together. Each shelf portion also has an inboard extension on which the end portion of a crosstie is supported and retained by a second dowel extending upwardly from said shelf extension into a dowel receiving opening provided in the end portion of the crosstie.

These and other objects, features, advantages and characteristics of the marine railway and components thereof characterizing the present invention will be apparent from the following description of typical and therefore non-limitive embodiments of marine railways, taken together with the accompanying illustrations wherein like letters and numerals refer to like parts, and wherein:

FIG. 1 is a perspective view of a marine railway typifying the invention, taken from an upper aspect and showing the onshore end of the railway partially embedded in a concrete ramp or the like, inclining shoreward from the waters edge, said marine railway being fragmented in the middle for simplicity of illustration;

FIG. 2 is an elevational view of the marine railway, taken at an intermediate location, and looking shoreward, with the foreground rails removed so as to present end elevational view of the shelf portions and the end surfaces and the dowels of the next pair of rail sections, such view also presenting a side elevational view of a transverse crosstie, extending between and interconnecting the sectional rails, with the end portions of such crossties partially cut away so as to present a clear showing of the engagement of the crosstie dowels by the openings in the end portions of said crossties, and such view further presenting by broken or phantom lines a showing of a small boat supported on a conventional boat trailer, with the pneumatic tires of such trailer riding on the track portions of the rails;

FIG. 3 is a fragmentary side elevational view of one of the sectional rails, looking toward the inboard side thereof, with a mid-portion of the center rail being cut away for the purpose of showing the reinforcing steel embedded therein;

FIG. 4 is an enlarged scale fragmentary perspective view of one of the joints situated between adjoining rail sections and between the crossties;

FIG. 5 is a transverse sectional view, taken through a rail at a joint, substantially along line 5—5 of FIG. 3;

FIG. 6 is a transverse sectional view, taken through a mid-portion of a rail section, substantially along line 6—6 of FIG. 3;

FIG. 7 is an end elevational view looking toward the shelf end of a rail section, such being taken from the aspect indicated generally by line 7—7 of FIG. 3;

FIG. 8 is a fragmentary side elevational view of a modified form of rail section struction, involving the use of pre-stressed reinforcing steel, such view being taken from the same aspect as FIG. 3;

FIG. 9 is a transverse sectional view taken through the rail section of FIG. 8, substantially along line 9—9 of FIG. 8; and

FIG. 10 is a fragmentary perspective view of shelf end; and of a typical shelf end reinforcing member, such view showing the concrete parts in broken lines.

Referring now to FIG. 1, the marine railway of the present invention is illustrated as comprising a pair of substantially parallel, sectional rails R, interconnected by transversely extending crossties T. Each sectional rail R consists of a plurality of successively interconnected rail sections RS. According to the invention, both the rail sections RS and the crossties T are precast, steel reinforced, concrete beams.

As illustrated in FIG. 1, the pair of rail sections RS located nearest the shore may be partially embedded in a concrete (Portland cement or asphalt type) ramp CR, but preferably the remaining rail sections RS and the crossties T making up the marine railway are detachably interconnected and easily disassembleable. The railway may then be taken up and stored in the non-seasonal period of the year, if so desired, so as to prolong its useful life. The concrete ramp CR is illustrated leading from the water's edge and extending up and onto the shore where it communicates with a boat storage structure, or an access road or the like.

The rail sections RS include relatively wide but shallow, generally rectangular shaped track portions 10, providing such rail sections RS with relatively broad bases. In most installations the rail sections RS are "ground supported," i.e. the relatively wide, flat bottom surfaces 12 of the rail section track portions 10 lay directly on and are supported by the ground, both above and below the surface of the water. Each track portion 10 further includes an upper, wheel supporting surface 14, and a generally straight and flat inboard edge surface 16. Preferably, the wheel supporting surfaces 14 slope inwardly a slight amount, making them substantially self-cleaning. Water movement over and across the wheel supporting surfaces 14 tends to wash the mud deposits, small rocks, etc. off the rail supporting surfaces 14 in the inward or declining direction. The wheel supporting surfaces 14 should be made smooth, as by troweling, to eliminate debris retaining pockets and thereby facilitate the removal of debris. Each rail section RS also includes an outboard side wall 18 connected to and extending upwardly from the outboard side portion of its track portion 10.

A small boat B may be launched by backing the trailer BT down ramp CR, onto the sectional rails R and into the water. If a motor vehicle is used during the back-up operation, such vehicle is stopped at or near the water's edge. If the distance from the ramp CR is substantial, the

trailer BT is uncoupled from the vehicle and then moved by hand onto the railway until the boat B is in the water and removed from the boat trailer BT by flotation. Thereafter the boat trailer BT is rolled up the marine railway and removed from the water. As illustrated in FIG. 2, the outboard side walls **18** prevent lateral movement of the wheels W and derailment of the trailer BT. As clearly shown by FIGS. 2 and 5–7, for example, the inboard side surfaces **18'** of the side walls **18** preferably lean or slope outwardly away from vertical so as to not make rubbing or binding, frictional contact with the side walls of wheels W. As perhaps best shown by FIG. 7, a fillet (i.e. concave junction) is formed at the intersection of the inboard side surface **18** with the wheel supporting surface **14**, strengthening the rail section RS at such location.

A preferred joint construction for detachably interconnecting adjoining rail sections RS and for detachably connecting the crossties T to the sectional rails R will now be described, with particular reference being made to FIG. 4 of the drawings. Preferably, one end portion of each rail section RS, which may be termed the apertured end portion, has an end surface **19** (see FIG. 3) extending substantially at a right angle to the surfaces of the rail section RS which it intersects. This end **19** of each rail section RS may be said to be "square cut" or "squared." At least one dowel receiving opening in the nature of a generally vertically extending passageway is provided in such apertured end portion.

At the opposite end of the each rail section RS, a shelf S is provided which extends outwardly from such rail section RS and underlies the apertured end portion of the adjoining rail section RS. As is clearly illustrated in FIG. 4, the apertured end portion of said adjoining rail section RS rests directly on the substantially flat upper surface **20** of the shelf S, and the end wall **19** of said apertured end portion essentially abuts against an identically shaped end wall **22** on the other rail section RS extending upwardly from the upper surface **20** of the shelf S, substantially at a right angle thereto. Because of the function which it performs, the upper surface **20** of the shelfs may be termed a "rail section supporting surface." As pictured in FIG. 4, for example, a fillet is formed at the intersection of end surface **22** and shelf surface **20**, strengthening such location by eliminating the so-called "notch effect."

The dowel **D1** is slightly smaller in diameter than the dowel receiving opening **23**, making it easy to assemble and disassemble the rail sections RS. Of course, the relative positioning of dowels **D1** and the dowel receiving openings **23** could just as well be reversed, i.e. the dowel **D1** could extend downwardly from the end of the rail section RS into a dowel receiving opening formed in the shelf S.

According to the invention, the shelf portion S and the immediately adjacent end portion of the rail section RS, including wall **22**, extend laterally inboard of the rail R. As shown in FIG. 4, the inboard extension of shelf surface **20**, the inboard extension of end surface **22** and the terminal portion of inboard edge surface **16** together form a substantially "square cornered" nook. The "squared" end portion of a crosstie nests snugly in said nook, with its end surface extending contiguous (i.e. substantially abutting) the said terminal portion of the inboard edge surface **16**, and with one side of said crosstie end portion extending contiguous the inboard extension of end surface **22**. A second dowel **D2**, embedded at one end into the inboard extension of shelf portion S, extends upwardly from shelf portion S and into a dowel receiving opening in the crosstie end portion and serves to detachably connect and crosstie to the sectional rail R. The diameter of the second dowel **D2** is slightly smaller than the diameter of the dowel receiving opening **24**, for the purpose of facilitating assembly and disassembly of the marine railway.

As will be evident, relative pivotal movement of the

adjoining rail sections RS about the first dowel **D1** is prevented by the near abutting relationship of the two end surfaces of such adjoining rail sections RS. Similarly, pivotal movement of the crossties about the crosstie dowel **D2** is prevented by the near abutting engagement of its end and side surfaces with the upright surfaces of the nook, i.e. the inboard extension of end surface **22** and the terminal portion of edge surface **16**.

It should be noted that the crossties T are supportable entirely by the rails R. Thus in the marine railway of the present invention the rails R of themselves constitute the base or foundation for the railway, while the crossties T serve to tie together the rails R and make an integral assembly. This is unlike conventional railway design wherein the rails are supported by crossties which constitute the base of the railway.

Preferably, both the rail sections RS and the crossties T are reinforced internally by means of reinforcing steel.

The rail sections RS are designed to carry a moving concentrated load, and in this respect are treated much like floor slabs which are substantially uniformly supported from below throughout substantially their full extent. According to one aspect of the invention, the reinforcement includes a plurality of suitably placed longitudinal rods, some of which are designated **25** in FIGS. 3 and 6, which rods **25** are unstressed when the rail sections RS are not loaded, and an appropriate number of suitably located lateral ties, some of which are designated **26** in FIGS. 3 and 6. Of course, the lower set of longitudinal rods extending through the track portions of the rail sections RS are designed to carry the tension stresses to which the rail section is subjected during use of the railway, and due to the weight of the boat and trailer assembly which is concentrated at the wheels W. The outboard side wall **18** is also reinforced, because the rail sections RS are precast and may be subjected to rough handling, during transportation of the same, for example, such as from their point of manufacture, or to or from a point of storage. Thus, the longitudinal rods extending through the outboard side walls **18** are designed to carry the usual bending stresses that outboard side walls **18** might be expected to experience during the transportation and handling of the same. Crossties T may be simply reinforced like a square column, i.e. with single longitudinally extending rods spaced diagonally from each corner and laterally spaced, and with lateral ties consisting of pieces of reinforcing wire bent in the form of a rectangle, surrounding said longitudinal rods.

In the rail section form depicted in FIGS. 8 and 9, the lower set of longitudinal rods **28** are prestressed or pretensioned, giving such rail section RS greater strength capabilities. As a first step in the fabrication of a prestressed concrete rail section RS, a form is constructed to include an inside configuration that matches the outside configuration of the rail section RS, as pictured in the drawing. High strength reinforcing steel (i.e. with an ultimate tensile strength above 200,000 p.s.i., for example), is placed in the form and passed through holes in anchor plates located at the ends of such form. Such rods of reinforcing steel, the number of which are predetermined by conventional design techniques, are then put in tension by suitable means, such as mechanical or hydraulic jacks, for example. The concrete is then cast and allowed to harden. Next, the steel is secured to the anchor plates, and the jacks are removed. The steel tends to contract to its original length but is prevented from doing so by the concrete interposed between the anchor plates. Hence the reinforcing steel remains under tension and the concrete between the anchor plates is put in compression. At the same time, the prestressing of the reinforcing steel puts some tension in the concrete near the top of the track portion **10**. Care is exercised so that the compression stress in the bottom portion of a rail section RS does not exceed the permissible concrete compression stress, and the tension stress put in the upper part of

the track portion **10** does not exceed the permissible concrete tension stress. When the rail sections RS are subsequently loaded by the wheels of the boat and trailer assembly, bending moments are created in such rail sections RS which by themselves cause a tension stress in the bottom portion of the rail section RS and a compression stress in the upper part of the track portion **14**. The compression and tension stresses caused by the wheel loadings tend to counteract and cancel out the tension and compression stresses caused by the prestressing of the reinforcing steel. Preferably the dimensions of a rail section RS and the position and amount of prestressed steel are so arranged that the maximum tension stress experienced by the lower portion of the beam due to wheel loading is equal to or slightly greater than the compression stresses put into the concrete at such a location by the prestressing procedure, while the compression stresses put into the upper part of track portion **10** are substantially larger than the tension stresses put therein by the prestressing. Thus, when loaded by the wheel and trailer assembly, the concrete performs throughout essentially as a monolithic material, carrying its share of stress over the entire cross section, which is principally in compression.

FIG. 10 illustrates a typical manner of reinforcing the shelf end of a rail section RS. As illustrated, a metal member **30** of suitable thickness and width to carry the shear stresses involved is embedded into the concrete at the shelf end of the rail section RS. Such member **30** may include a generally horizontally disposed main portion **42** embedded in the concrete, a generally horizontally disposed flange portion **34** embedded in the shelf S, and a generally vertically extending intermediate portion **36**, interconnecting said main and flange portions **32**, **34**, respectively. Knee braces **38** may be provided as pictured, such knee braces **38** being welded to the respective under and rear surfaces of portions **32**, **36**. The dowels D may extend through openings drilled or punched in shelf portion **34**. Also, knee braces **40** may extend between the lower portions of the dowels D and the under surface of flange portion **34**, in the manner illustrated, such knee braces **40** being welded to both the dowels D and the shelf portion **34**. In the illustrative form of the invention which does not involve prestressing (FIGS. 1–7) the longitudinal rods, the major portion **32** of the end reinforcing member **30** may lie on or be spaced slightly above the end portions of the longitudinal rods **24**. In the illustrative form of the invention wherein the longitudinal rods extending through the track portion **10** are prestressed (FIGS. 8–10) the vertically extending portions **36** of the end reinforcing member **30** may function as the anchor plate at the shelf end of the rail section RS and the end of the longitudinal rods of steel secured thereto. At the opposite end of each rail section RS a flat, vertically extending, rectangular piece of steel plate may be embedded into the concrete to serve as the second anchor plate, with the near ends of the longitudinal rods of reinforcing steel being secured thereto. Portion **36** of member **30** is illustrated in FIG. 10 as having its outer face substantially flush with the end surface **22** extending upwardly from the shelf portion S. As an alternative arrangement, the portion **36** might also be concealed in the concrete. It also might be desirable in some cases to do away with the end reinforcing member and reinforce the shelf portion S and the adjoining portion of the rail section with steel rods. Furthermore, in the prestressed form of rail section, it might be desirable to do away with the steel end plates altogether and rely on the bond between the concrete and reinforcing steel to put the lower portion of the concrete in compression.

In some installations it might be desirable to reverse the positioning of track portions **10** and side walls **18**, placing side walls **18** inboardly of its track portion **10** and adjacent the inside rather than outside side walls of the wheels W. In such installations the shelf extensions for supporting the crossties T may be formed to extend in the direction oppositely from that pictured or, in the alternative, may be formed to extend as pictured, with an opening formed at the location of dowel D2 (FIG. 4) and an elongated spike or pin inserted therethrough and driven into the ground for locating the rails R, in lieu of the crossties. However, use of crossties is preferred, to maintain the between-rail spacing more uniform over extensive periods of use.

These and other variations, modifications, adaptations, and features characteristic of the present invention will be apparent to those skilled in the art to which the invention is addressed, within the scope of the following claims.

What is claimed is:

1. In a marine railway, a pair of substantially parallel, sectional rails and a plurality of precast concrete crossties, each sectional rail comprising a plurality of successively interconnected precast concrete rail sections, with at least some of the rail sections including shelf means at one end thereof, said shelf means extending below and supporting the adjacent end portion of the next rail section, each such shelf means also extending below and supporting an end portion of a crosstie, each such shelf means having first and second dowels embedded therein, with the first dowel extending upwardly into an opening in the rail section end portion supported by the shelf means, and with the second dowel extending upwardly into an opening in the crosstie end portion supported by such shelf means.

2. The combination of claim **1**, wherein each precast concrete rail section has a substantially L-shaped lateral cross-sectional configuration and includes a generally horizontally disposed track portion, the upper surface of which is the wheel supporting surface of such section, and a generally vertically disposed outboard side wall connected to and extending upwardly from said track portion.

3. A marine railway comprising a pair of substantially parallel, sectional rails, each sectional rail including a plurality of precast concrete rail sections, each rail section having an upper, wheel supporting surface extending substantially the full extent of its length, a shelf portion at one end of the rail section having an upper, rail section supporting surface offset below said wheel supporting surface, an end surface extending upwardly from said shelf portion upper surface to the wheel supporting surface, a dowel embedded in and extending upwardly from the shelf, each rail section also including an end portion distal its shelf that has a bottom surface spaced below the wheel supporting surface, an end surface extending between said bottom and wheel supporting surfaces, and a dowel receiving opening therein spaced inboard of the said end surface, with the shelf portion of at least some of the rail sections underlying the end portion of the adjacent rail section, and with the dowel that is embedded in each such shelf portion extending into the dowel receiving opening, said marine railway further comprising a plurality of precast concrete crossties, each crosstie having at least one end portion with a dowel receiving opening therein, with a shelf portion of a rail section underlying each said crosstie end portion having the opening therein, said shelf portion including a dowel embedded therein and extending upwardly into the dowel receiving opening of the crosstie.

4. In a sectional marine railway, axially aligned first and second rail sections of precast concrete, said first rail section comprising an apertured end portion having a substantially flat bottom surface, a substantially flat upper wheel supporting surface, a substantially flat end surface extending between said bottom and wheel supporting surfaces, substantially at right angles to both, and inboard edge surface extending substantially at right angles to both the bottom and end surfaces, and a dowel receiving opening extending therethrough between said bottom and wheel supporting surfaces, said second rail section having a shelf portion at one end thereof extending below and supporting the apertured end portion of the first rail section, said

second rail section also having an upper wheel supporting surface extending substantially the full extent of its length, said shelf portion including an upper, rail section supporting surface, and a dowel embedded in said shelf portion and extending into the dowel receiving opening in the apertured end portion of said first rail section, said second rail section also including a substantially flat end surface extending between the wheel supporting and rail section supporting surfaces of said second section, substantially at right angles to both, said end surface of the second section extending contiguous the end surface of the first section, said inboard edge surface of said first section extending substantially at a right angle to both the end surface and the rail section supporting surface of said second rail section, a second dowel extending upwardly from the shelf portion of the second rail section, and a crosstie extending transversely of the marine railway, and supported at one end by the shelf portion of said first rail section, said crosstie including an end portion disposed on said shelf portion, said end portion having a dowel receiving opening therein, with said second dowel extending into and being accommodated by said dowel receiving opening in the crosstie, said crosstie also having a substantially flat end surface disposed contiguous a portion of the inboard edge surface of said first rail section and a substantially flat side surface disposed contiguous a portion of an end surface of said second rail section.

5. In a marine railway composed of a pair of substantially parallel, sectional rails and a plurality of transversely extending crossties, interconnecting said rails, a first rail section having a square cut end portion including a flat end surface, a flat bottom surface extending substantially at a right angle to said end surface, and a flat inboard edge surface extending substantially at right angles to both said bottom and end surfaces, a second rail section having a square cut end including a flat end surface extending contiguous the end surface of said first rail section, and a shelf portion extending from said second rail section, below the end surface thereof, outwardly to underlie the end portion of said first rail section, said shelf portion including an upper surface extending substantially at right angles to said end surface of said second section, said shelf portion upper surface extending in supporting contact with the bottom surface of said first rail section, with said shelf portion upper surface and the end surface of said second section extending inboardly of the marine railway and forming with the edge surface of said first rail section a generally square cornered nook, and a crosstie having a square cut end portion nested in said nook, said end portion having a flat end surface disposed contiguous a portion of the inboard edge surface of said first rail section, a flat bottom surface extending contiguous said shelf portion upper surface and a flat edge surface extending substantially at right angles to both the end and bottom surfaces of said crosstie end portion contiguous a portion of the end surface of said second rail section, means connecting the end portion of said crosstie to the assembly of said first and second rail section.

6. The combination of claim 5, wherein each rail section further comprises a generally horizontally disposed track portion, having an upper wheel supporting surface and a generally vertically disposed outboard side wall connected to and extending upwardly from said track portion.

7. The combination of claim 6, wherein each wheel supporting surface slopes inwardly, making the same substantially self-cleaning.

8. In a beach supported sectional rail for a two rail marine railway, a pair of identical, end-to-end joined, precast concrete rail sections, each comprising a supported end and a supporting end, and each having a substantially flat upper surface of a width sufficient for supporting the wheels on only one side of a wheeled vehicle utilizing the railway, a large area beach contacting bottom surface extending substantially the full length and the full width of the section, a generally vertical end surface at each end of the section, and a support shelf at the supporting end of the section, which shelf depends below the section at such end and extends longitudinally beyond the generally vertical end surface at such end, said shelf having an upper support surface that is substantially at the same level as the bottom surface at the supported end of the section, and beach contacting bottom, side and end surfaces, all situated below said bottom surface at the supported end of the section and immediately adjacent the shelf, with the generally vertical surface at the supported end of the section extending between, and making outside corners with, the upper and lower surfaces of the section at such end, with the generally vertical surface at the supporting end extending between the upper surface of the section and the upper surface of the shelf, and making an outside corner with said section upper surface and an inside corner with said shelf upper surface, with the supported end of one of said sections resting on and being supported by the shelf at the supporting end of the other section, with the generally vertical end surface at such supported end substantially abutting the generally vertical surface at such supporting end, with the upper surfaces of the two sections meeting at substantially the same level, and with the shelf constituting a bottom protuberance projecting into the beach below the assembled rail.

9. The combination of claim 8, wherein the supported end of each rail section includes at least one dowel receiving opening extending from its bottom surface upwardly towards its upper surface, and a dowel extends upwardly from the shelf of each section into the dowel receiving opening of the rail section supported by such shelf.

10. The combination of claim 8, wherein the wheel supporting surface of said rail sections slopes inwardly making the same substantially self-cleaning.

11. The combination of claim 8, wherein each rail section includes an upstanding retaining wall at one side of its upper wheel supporting surface.

12. The combination of claim 10, wherein the side surface of the upstanding retaining wall which faces the wheel supporting surface inclines away from the wheel supporting surface at an angle substantially greater than ninety degrees, so as to be non-vertical and not make binding, frictional contact with the side surface of a pneumatic tire rolling along the wheel supporting surface.

13. The combination of claim 8, wherein the bottom surface is substantially flat except for said shelf portion, and the bottom surfaces of the two rail sections are substantially coplanar when the sections are joined together.

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