July 31, 1962 F. MONROE 3,046,748

FOLDABLE PIER

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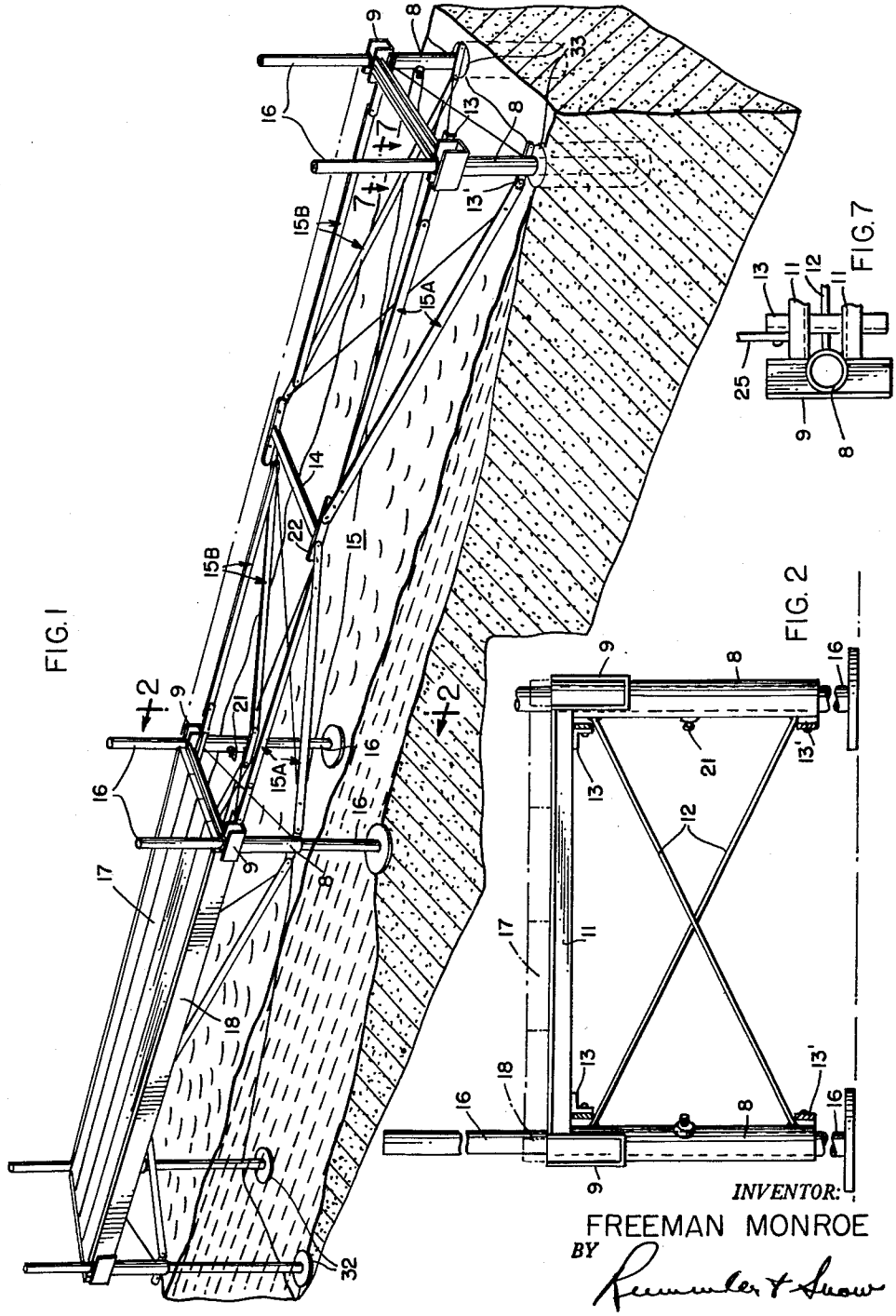


FIG. 1

FIG. 7

FIG. 2

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FIG. 3

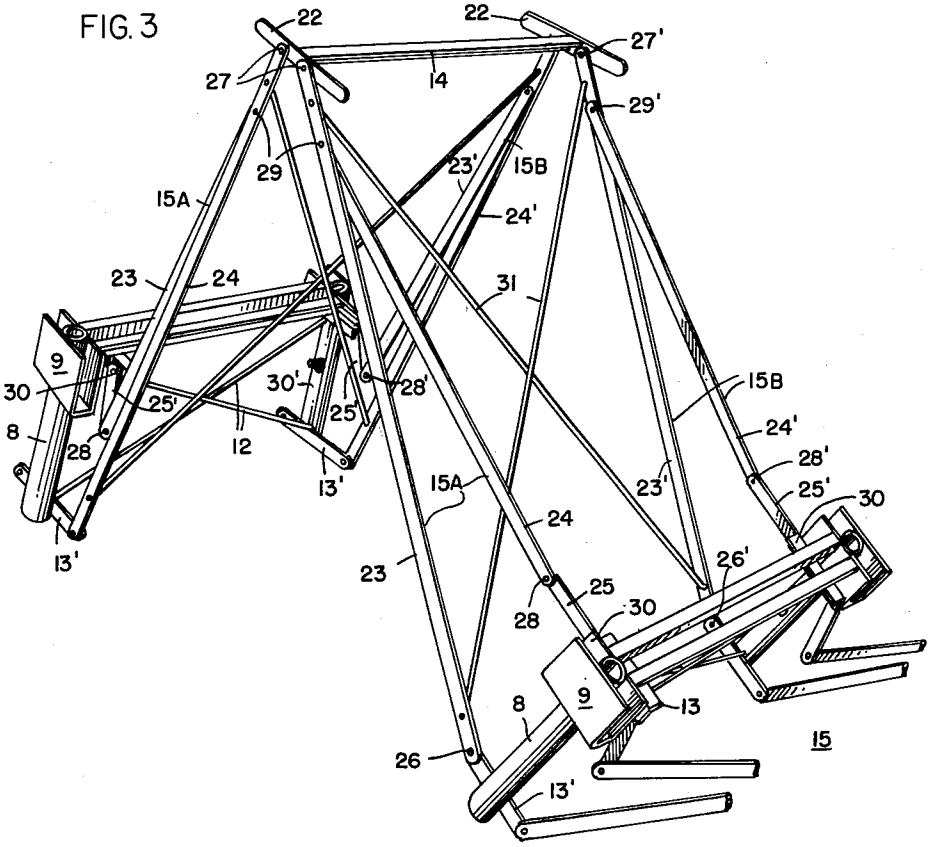
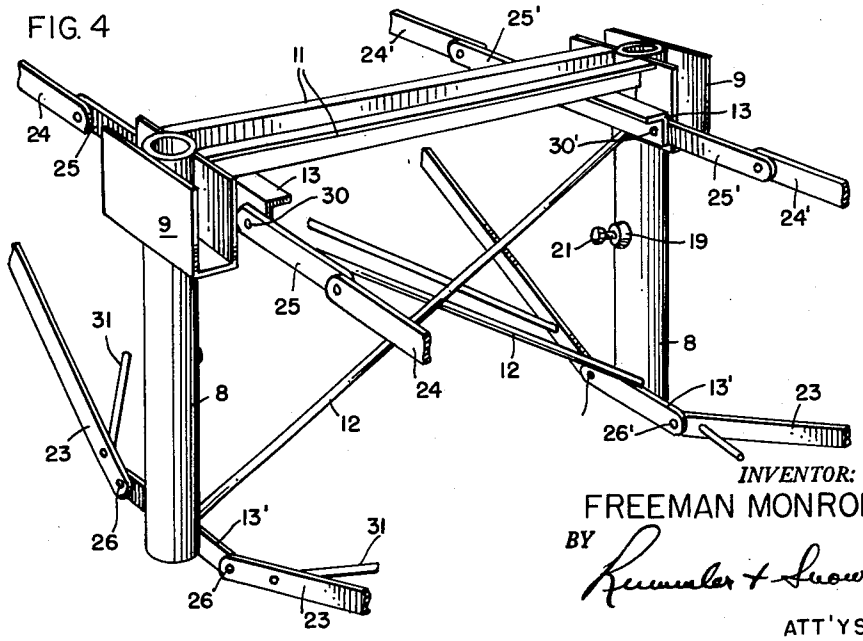


FIG. 4



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FIG. 5

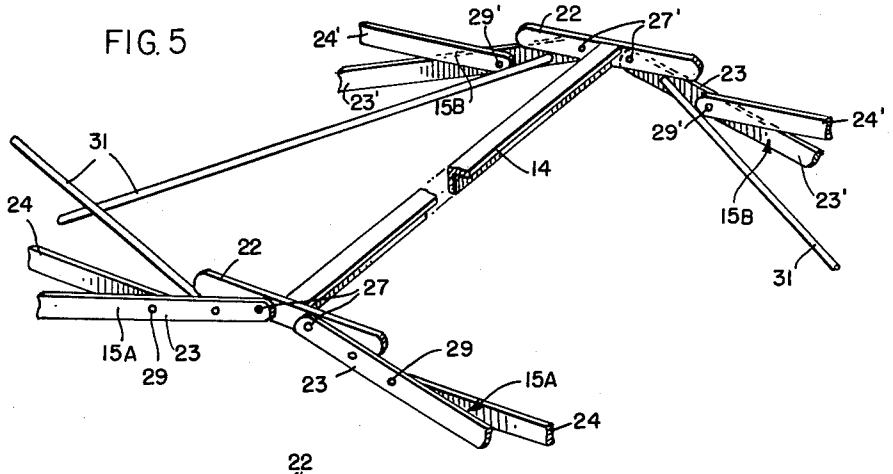
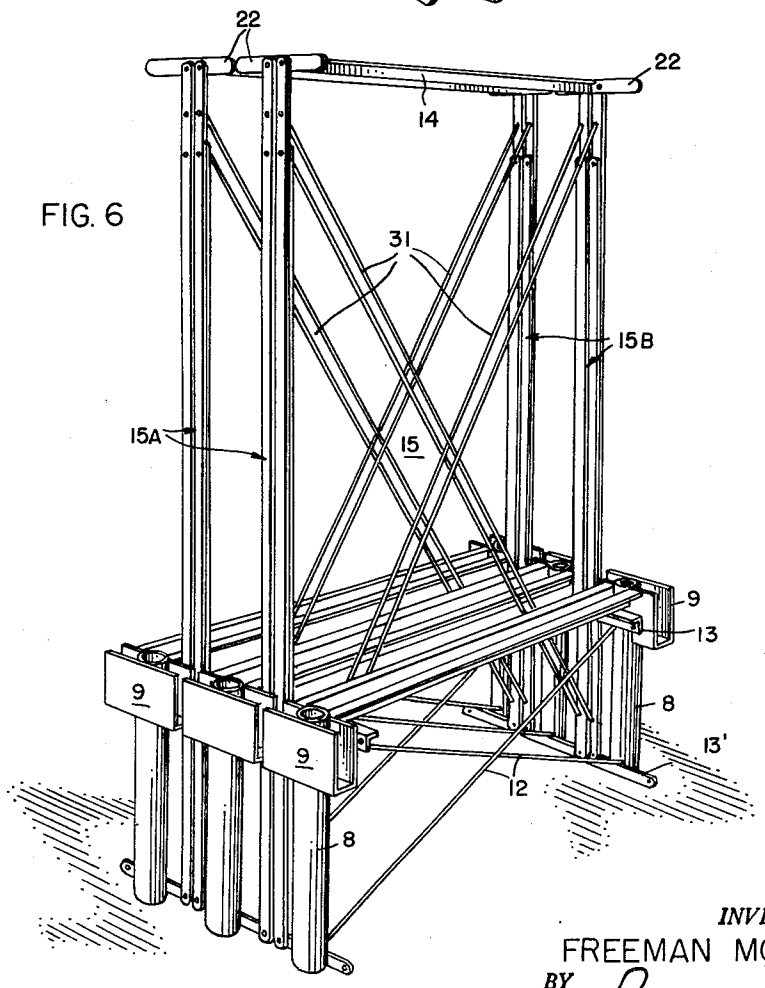


FIG. 6



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FOLDABLE PIER

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5 Claims. (Cl. 61—48)

This invention relates to foldable piers for use around gradual sloping shore lines of bodies of water.

The main objects of this invention are to provide an improved form of pier for use on the gradually-sloping shores of bodies of water; to provide an improved form of pier comprising integrated sections adapted for quick and easy conversion between folded storage or transport relationship and longitudinally extended use relationship; to provide an improved collapsible-extensible sectionalized structure of this kind in which a plurality of identical support sections are so hinged together by linkage and braced that the sections may be folded into a very compact, vertical, parallel relationship for storage or transport or unfolded into extended coplanar relationship for use as a bridge or as a pier; and to provide an improved folding bridge or pier structure of this kind wherein all parts are formed from stock materials thereby making the device very inexpensive to manufacture or to replace parts which may become damaged or broken.

In the adaptation shown in the accompanying drawings:

FIGURE 1 is a perspective view of the in-use position of a folding pier constructed in accordance with this invention;

FIG. 2 is an enlarged, transverse view taken on the plane of the line 2—2 of FIG. 1;

FIG. 3 is a perspective view of pairs of support-standards and the connecting linkage in the process of being folded or extended;

FIG. 4 is an enlarged, perspective view of one pair of support-standards showing the cross-bars and bracing connected to a pair of support-standards and the terminal connections of the linkage between pairs of support-standards;

FIG. 5 is a perspective view of the center portion of the connecting linkage between adjacent pairs of support-standards, as indicated by the circled "5" of FIG. 1;

FIG. 6 is a perspective view of this improved pier structure in collapsed or folded position; and

FIG. 7 is an enlarged, fragmentary, plan view taken on the plane of the line 7—7 of FIG. 1.

The essential concept of this invention is to provide an integral folding bridge, pier, or dock structure comprising rigid support-standards, secured together in pairs by cross-bars and guy-rods, and dual linkage sections hinged to adjacent pairs of support-standards and to an intermediate cross-bar element whereby the linkage sections are shiftable between a folded jack-knife relationship and an unfolded horizontally-extended relationship for respectively disposing two pairs of support-standards in juxtaposed abutting relationship for storage or transport or disposing pairs of support-standards in horizontally-spaced, vertically-parallel relationship for vertically adjustable positioning on ground-supported posts or rods with the cross-bars on the pairs of standard-supports in coplanar relationship with each other and with the intermediate cross-bar element for the support of deck planks.

A folding pier embodying the foregoing concept comprises a plurality of support-standards 8, each embracively mounting a channel-shaped element 9 at its upper end and secured together in pairs by cross-bars 11 and guy-rods 12 with brackets 13 and 13′ fixed adjacent the opposite ends of each support-standard. A series of two or more such pairs of support-standards 8 are interconnected to an intermediate cross-bar element 14 by double-section side-linkage 15 for disposing the pairs of

support-standards 8 in predetermined, horizontally-spaced, vertically-parallel relationship for adjustable positioning on posts 16 for the support of deck planks 17 and side rails 18, or disposing the several pairs of support-standards 8 in folded or collapsed, juxtaposed relationship for storage or transport.

The support-standards 8, as here shown, are short sections of conventional pipe. Each such support-standard 8 is formed with a boss 19 through which extends a threaded hole for the reception of a set screw 21, whereby each support-standard 8 may be fixedly positioned on the respective post 16, as will be explained presently.

The channel-shaped elements 9 are short sections of stock material cut out medially on one side to embracively fit around the upper end of the support-standard 8 where the parts may be bonded or otherwise secured together. This forms an open-top, open-end saddle for the support of the deck side rails 18, as will be explained presently.

The cross-bars 11, here are shown as lengths of conventional angle-iron. Pairs of these cross-bars 11 are bonded at their ends to the respective elements 9 in spaced parallel relationship with the angles facing oppositely downward. The guy-rods 12 are appropriate lengths of stock material crossed and suitably secured at their ends adjacent the opposite ends of the respective support-standards 8.

The brackets 13—13′, like all of the foregoing parts, are short sections of stock material. As here shown, the brackets 13 are angle-iron and bonded medially of their ends to the respective elements 9 and, preferably also, to the under sides of the adjacent ends of the cross-bars 11. The brackets 13′ are sections of flat stock and are bonded medially of their ends to the respective support-standards 8 adjacent their lower ends, vertically-parallel with the brackets 13.

Each intermediate cross-bar 14, like the cross-bars 11, is a length of angle-iron. Here it is shown disposed with its angle downwardly. At its opposite ends are transversely bonded brackets 22 formed of flat stock similar to the brackets 13′.

The linkage 15 is comprised of a cross-bar 14 with the brackets 22 and two identical sets, A and B respectively, of a single links 23—23′ and double links 24—24′ and 25—25′ connecting an intermediate cross-bar bracket 22 with opposite pairs of support-standard brackets 13—13′.

The links 23—23′ are hinged by pins 26—26′ to a bracket 13—13′ on the support-standards 8 and by pins 27—27′ to the respective brackets 22 on the intermediate cross-bar 14. The links 24—24′ and 25—25′ are hinged together by pins 28—28′. The longer links 24—24′ are hinged by pins 29—29′ to the respective links 23—23′ adjacently inward from their hinge pins 27—27′ to the respective brackets 22. The shorter links 25—25′ are hinged by pins 30—30′ to the brackets 13 on the respective support-standards 8.

The linkage 15 is braced by guy-rods 31 crossed and secured at their opposite ends to the opposite ends of the links 23—23′ adjacently inward of the hinge of these links 23—23′ to the respective brackets 13′ and 22.

The support posts 16 may be lengths of either rods or pipe with an outside diameter to readily telescope within the support-standards 8. The length should be such as to provide for a portion of the posts to extend above the deck planks 17, even at the far-out water-end of the pier. One end of each post 16 is bonded to a pad 32 by means of which the post may be made to rest firmly on the ground either on or off shore except, possibly, for the innermost land-end posts 16 when it is desired to have the pier firmly anchored on the shore. In that event, the innermost set of posts 16 might well be set in holes in concrete blocks 33 or a concrete base.

The posts 16 should have the respective support-stand-

ards 8 so positioned thereon as to dispose the cross-bars 11 of the several pairs of support-standard 8 and the intermediate cross-bars 14 in coplanar relationship to best support the deck planks 17 and the side rails 18. Such coplanar relationship of the several cross-bars can be attained by the locking of the several support-standards 8 to the respective posts by the set screws 21. Such coplanar relationship of the bars may be either on a horizontal plane, regardless of the contour of the shore, or it may slant downwardly toward the water, as circumstances may indicate is most desirable.

When it is desired, for any reason, to collapse this folding pier, it is only necessary to remove the deck planks 17 and side rails 18 and "break" the linkage 15 between each pair of support-standards 8 and push inwardly on the outermost pair of support-standards 8. Thereupon, the sections A and B of the linkage 15, at opposite sides of the intermediate cross-bars 14, will shift into vertical-parallel positions as the pairs of support-standards 8 likewise move into substantially abutting parallel relationship, as is clearly shown in FIG. 6.

So collapsed, the pier may remain tied to the land-based pair of support-standards 8 when it is not convenient or desirable to leave the pier extending out into the water. Or, so collapsed, the pier may be removed from its shore support and stored away or transported to another point of use.

When such a collapsed pier is again to be used, it requires only a pulling out in the horizontal direction of the one outermost pair of support-standards 8 and the linkage 15 will automatically dispose the several support-standards 8 in horizontally-spaced, vertically-parallel relationship for again positioning on the posts 16. The planks 17 and rails 18 then may be replaced on the cross-bars 11 and the saddle elements 9, respectively.

The main advantages of this invention reside in the unitary, fully assembled, construction of the improved device whereby it can be folded for storage and extended for use without the need for special tools or operating skill; in the fact that it may be made in substantially any number of sections, all connected to provide a unitary structure, to suit almost any desired use as a bridge pier or dock; in its relatively light weight whereby it can be readily handled and operated for use or storage; and in its simple low cost construction which can be easily made and kept in repair.

Although but one specific embodiment of this invention has been herein shown and described it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

I claim:

1. A pier of the class described comprising, a plurality of pairs of support-standards each pair fixedly secured together by deck-supporting cross-bars to dispose the support-standards in spaced parallel relationship, axially-spaced link-connecting brackets secured to each support-standard transversely of the cross-bars, an intermediate cross-bar having link-connecting brackets fixed transversely adjacent its opposite ends, first pairs of side-links permanently hinged at their opposed ends to the link-connecting brackets on the intermediate cross-bar and at their opposite ends permanently hinged to the opposed ends of the lower of the link-connecting brackets on the respective pairs of support-standards, and second pairs of two-part side-links one part of each of which two-part links is permanently hinged to the adjacent link of the first pairs of side-links, the other part of the two-part side-links being permanently hinged to the upper link-connecting bracket on the respective pairs of support-standards, the respective pairs of side-links being adapted to fold into vertical jack-knife relationship so as to locate adjacent pairs of support-standards in substantial abutting parallel relationship for storage or transport with the intermediate cross-bar spaced above the abutting support-standards and for unfolding into horizontally-extended disposition so as to locate adjacent pairs of support-standards in horizontally-spaced vertically-parallel disposition with the support-standard cross-bars and the intermediate cross-bar in horizontal coplanar relationship for the support of deck planks.

2. A pier of the class described comprising, a plurality of pairs of support-standards each pair fixedly secured together by deck-supporting cross-bars to dispose the support-standards in spaced parallel relationship, axially-spaced link-connecting brackets secured to each support standard transversely of the cross-bars, an intermediate cross-bar having link-connecting brackets fixed transversely adjacent its opposite ends, first pairs of side-links permanently hinged at their opposed ends to the link-connecting brackets on the intermediate cross-bar and at their opposite ends permanently hinged to the opposed ends of the lower of the link-connecting brackets on the respective pairs of support-standards, second pairs of two-part side-links one part of each of which two-part links is permanently hinged to the adjacent link of the first pairs of side-links, the other part of the two-part side-links being permanently hinged to the upper link-connecting bracket on the respective pairs of support-standards, the respective pairs of side-links being adapted to fold into vertical jack-knife relationship so as to locate adjacent pairs of support-standards in substantial abutting parallel relationship for storage or transport with the intermediate cross-bar spaced above the abutting support-standards and for unfolding into horizontally-extended disposition so as to locate adjacent pairs of support-standards in horizontally-spaced vertically-parallel disposition with the support-standard cross-bars and the intermediate cross-bar in horizontal coplanar relationship for the support of deck planks, and pairs of bracing-rods fixedly interposed between the opposed links of each of the first pairs of links with the opposite ends of the rods secured adjacent the opposite ends of the same link.

3. A pier of the class described comprising, a plurality of pairs of tubular support-standards, channel-shaped elements embracively bonded to each standard to form open-top and open-end seats for deck side rails, a pair of deck-supporting cross-bars bonded at their ends to the respective elements transversely thereof to dispose the support-standards in parallel relationship, crossed guy-rods secured at their ends to the support-standards, and double-section side-link permanently hinged at their opposite ends to an intermediate deck-supporting cross-bar and to adjacent pairs of support-standards for folding the side-link sections into vertical jack-knife relationship to locate pairs of support-standards in substantial abutting parallel disposition for storage or transport with the intermediate cross-bar spaced above the abutting support-standards and for unfolding the side-link sections into horizontally-extended disposition to locate adjacent pairs of support-standards in horizontally-spaced vertically-parallel disposition with the cross-bars of the support-standards and the cross-bar of the side-link sections in horizontal coplanar relationship for the support of deck planks and supporting side rails seated in the channel-shaped elements.

4. A pier of the class described comprising, a plurality of pairs of tubular support-standards, channel-shaped elements embracively bonded to each standard to form open-top and open-end seats for deck side rails, a pair of deck-supporting cross-bars bonded at their ends to the respective elements transversely thereof to dispose the support-standards in parallel relationship, crossed guy-rods secured at their ends to the support-standards, axially-spaced link-connecting brackets secured to each support-standard transverely of the cross-bars, an intermediate cross-bar having link-connecting brackets fixed transversely adjacent its opposite ends, first pairs of side links permanently hinged at their opposed ends to the link-connecting brackets on the intermediate cross-bar and at their oppo-

site ends to the opposed ends of the lower of the link-connecting brackets on the respective pairs of support-standards and second pairs of two-part side-links one part of each of which two-part links is permanently hinged to the adjacent link of the first pairs of side-links, the other part of the two-part side-links being permanently hinged to the upper link-connecting bracket on the respective pairs of support-standards, the respective pairs of side-links being adapted to fold into vertical jack-knife relationship so as to locate adjacent pairs of support-standards in substantial abutting parallel relationship for storage or transport with the intermediate cross-bar spaced above the abutting support-standards and for unfolding into horibontally-extended disposition so as to locate adjacent pairs of support-standards in horizontally-spaced vertically-parallel disposition with the support-standard cross-bars and the intermediate cross-bar in horizontal coplanar relationship for the support of deck planks and side rails seated in the channel-shaped elements.

5. A pier of the class described comprising, a plurality of pairs of tubular support-standards, channel-shaped elements embracively bonded to each standard to form open-top and open-end seats for deck side rails, a pair of deck-supporting cross-bars bonded at their ends to the respective elements transversely thereof to dispose the support-standards in parallel relationship, crossed guy-rods secured at their ends to the support-standards, axially-spaced link-connecting brackets secured to each support-standard transversely of the cross-bars, an intermediate cross-bar having link-connecting brackets fixed transversely adjacent its opposite ends, first pairs of side-links permanently hinged at their opposed ends to the link-connecting brackets on the intermediate cross-bar and at their opposite ends to the opposed ends of the lower of the

link-connecting brackets on the respective pairs of support-standards, second pairs of two-part side-links one part of each of which two-part links is permanently hinged to the adjacent link of the first pairs of side-links, the other part of the two-part side-links being permanently hinged to the upper link-connecting bracket on the respective pairs of support-standards, the respective pairs of side-links being adapted to fold into vertical jack-knife relationship so as to locate adjacent pairs of support-standards in substantially abutting parallel relationship for storage or transport with the intermediate cross-bar spaced above the abutting support-standards and for unfolding into horizontally-extended disposition so as to locate adjacent pairs of support-standards in horizontally-spaced vertically-parallel disposition with the support-standard cross-bars and the intermediate cross-bar in horizontal coplanar relationship for the support of deck planks, a ground-resting support-post telescopically fitted in each of the respective tubular support-standards, and fastener means on each of the support-standards for engaging the respective support post and adjustably fixing the relative axial position of the support-standard lengthwise of the respective supporting post.

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