Aug. 10, 1943. H. B. LINDSAY 2,326,236

PONTOON BRIDGE

Filed June 5, 1942

Fig. 2

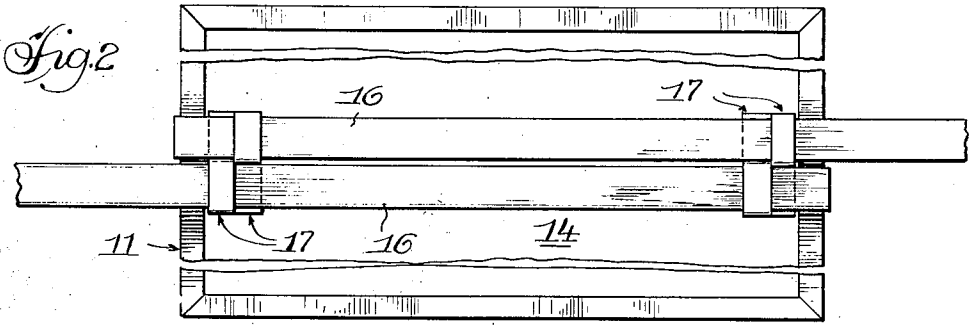


Fig. 3

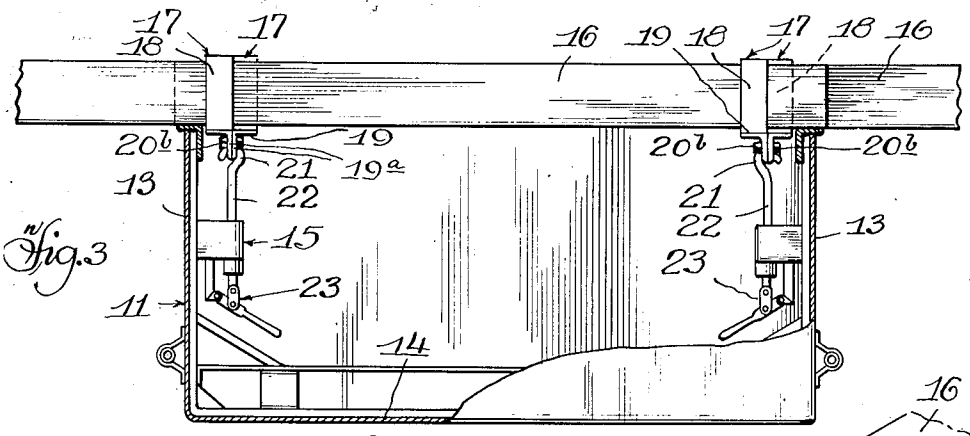


Fig. 6

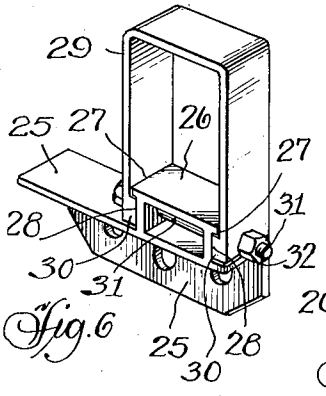


Fig. 4

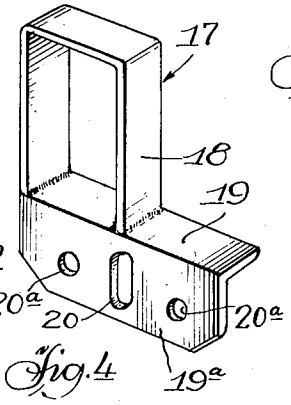


Fig. 5

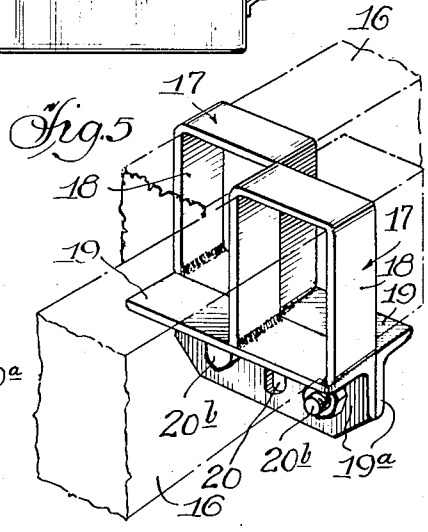
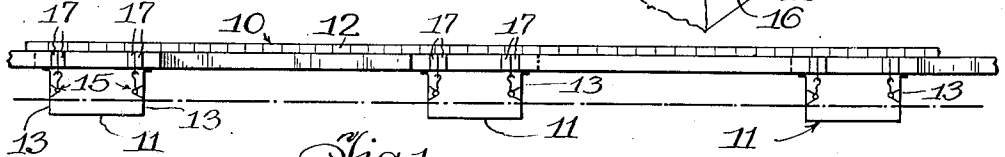


Fig. 1



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Patented Aug. 10, 1943 2,326,236

UNITED STATES PATENT OFFICE

2,326,236

PONTOON BRIDGE

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Application June 5, 1942, Serial No. 445,945

14 Claims. (Cl. 14—27)

This invention relates to improvements in pontoon bridges of the kind used in military operations, and has for its object to provide an improved, lighter and stronger structure of the character described.

One of the principal and customary forms of pontoon bridges now in use consists of a plurality of pontoons spaced apart at predetermined intervals; stout balks (usually heavy, shaped timbers) spanning such intervals, each end of each balk resting on and extending fully across its respective pontoon support; and means for firmly fastening such balk ends to such pontoons, such means usually of the nature of adjustable hooks attached to the pontoon sides and engaging collars attached individually to the balks where they cross the pontoon gunwales; and planking laid crosswise on the balks to form a roadway.

Although the interval between pontoons is usually considerably greater than the width of the pontoon itself, it is highly desirable to render the pontoon bridge, throughout its length, as rigid as possible, not only in the horizontal plane but also in the vertical plane. The purpose of this latter effort is to spread the weight of a heavy vehicle (such as a tank) over as many pontoons as possible. To achieve this, very stout, stiff balks are used, and are individually fastened rigidly, near their ends, to the pontoons. This necessitates very strong hook fastening arrangements to bind each end of the balks firmly down on the pontoon gunwales, and so stiffen the bridge from end to end. The result is in the nature of having continuous balks from shore to shore, and due to their stiffness (and number) a twenty ton tank can cross such a bridge even though the pontoons each have only a ten ton flotation capacity, inasmuch as the stiffness of the balks will cause the (decreasing) partial submergence of adjoining pontoons on either side of the pontoon over which this weight happens to be—often affecting as many as three pontoons on either side.

However, in making the balks continuous in stiffness by thus rigidly fastening each balk, individually, to the pontoon at either end, very severe "scissors" stresses are imposed on the balk fasteners, balk collars and pontoon gunwales and sides. These stresses—when a heavy load is carried on the bridge—will greatly exceed the normal flotation stresses on such parts, often being ten times or more as great, necessitating an undesirable strength, and consequently weight, of such pontoon and fastener parts. Even so, the balk fastening systems are sometimes torn out by such excessive scissor stresses.

It may be well to point out that these "scissor" stresses are caused by the overlapping ends of the balks as follows: Upon the imposition of great weight over a pontoon, the balk coming from the pontoon next to the right tends to tilt the pontoon in one direction, while the balk coming from the pontoon next to the left tends to tilt the pontoon in the opposite direction; and as the leverage is very great, these opposite or "scissor" stresses are exerted with great force on the gunwales and balk fasteners.

In carrying out my invention I approach the problem on a different principle and provide an improved construction, lighter and stronger, completely eliminating the tremendously severe scissor stresses described, and rendering it feasible to greatly lighten the pontoon and fastener parts referred to, without any danger whatever of their giving way.

To do this, instead of fastening each balk individually to the pontoon, I provide two "half-collars" at each end of each balk, these "half-collars" being positioned on the balk at points which, when the balk is in place, will be a few inches inside the respective side walls of the pontoon—in other words, right over the balk fastener hook.

These "half-collars" are designed to slide together when the adjoining overlapping ends of the two balks are juxtapositioned and the hook-hole (for taking the balk fastener hook) in the "half-collar" on one such balk will register with the hook-hole in the matching "half-collar" on the other balk. Upon such positioning the respective "half-collars" are preferably bolted together, although for light use of the bridge the fastener hooks passing through the respective hook-holes of both "half-collars" at each side of the pontoon may provide sufficient rigidity in the tying of one balk to the other to prevent any undesirable scissors stresses on the pontoon gunwale and balk fasteners.

It is clear that these "half-collars" can be made as stout as desired without adding appreciably to the weight of the assembly (which must, of course, be as easily portable as possible).

It is further clear that, when the overlapping ends of adjoining balks are joined by their respective "half-collars" being firmly bolted together, I have produced a continuous stiffness balk for the length of the bridge, without placing any of the severe stresses described upon the pontoons and their balk fastening systems. In-

deed, these latter become merely flotation elements and positioning elements of the bridge, respectively. Yet I have a lighter, stronger means for continuous stiffness of the bridge in order to spread any concentrated weight over a number of pontoons as already described.

It is to be noted that it is unnecessary to provide rights and lefts of my "half-collar," even whether successive balks are overlapped on their respectively alternate sides or continuously on like sides in echelon, but only necessary that both "half-collars" that are to be juxtapositioned to form my compound collar, shall be alike and interchangeable for right or left hand.

The invention may best be understood by reference to the accompanying drawing, in which

Figure 1 is a view in side elevation of a pontoon bridge constructed in accordance with my invention.

Figure 2 is an enlarged fragmentary plan view of a single pontoon showing the arrangement of a pair of balks extending in opposite directions therefrom.

Fig. 3 is a view in side elevation of the pontoon shown in Figure 2, with a portion of the pontoon shown in section to illustrate the means for securing the balks relative thereto.

Figure 4 is a detail perspective view of one form of holding "half-collar" which, in conjunction with a like "half-collar" on the adjoining lapped balk, serves to hold the ends of the balks together and in turn to hold the pontoon in place under the balks, by means of the balk fastener hook.

Figure 5 is a detail perspective showing such arrangement for holding a pair of adjacent balks together by means of two holding "half-collars" of the kind illustrated in Figure 4, with said holding "half-collars" clamped together in mutually reversed positions.

Figure 6 is a perspective view showing a modified form of holding "half-collar" similar to that shown in Figure 4, but wherein the strap of said collar is detachably mounted on its base so as to facilitate its attachment to or removal from a balk.

Referring now to details of the embodiment of my invention shown in the drawing, a portion of a pontoon bridge structure indicated generally at 10 consists of a plurality of pontoons 11, 11 which support a continuous floor structure 12. The pontoons 11 may be of any suitable form, herein each consisting of a hollow float of generally rectangular cross section, having side walls 13, 13 and bottom wall 14, and open at the top, as shown in Figure 3. Along the inner faces of both side walls 13, 13 are mounted a plurality of anchoring devices 15, 15 which will presently be described in detail.

The floor structure 12 includes a plurality of balks 16 consisting of elongated planks of similar size and shape, usually made of wood. Each adjacent pair of pontoons 11 is spanned by a plurality of balks 16 disposed in edgewise position, with the opposite ends of each balk extending across and supported on both upper edges of the opposite walls 13, 13 of their respective pontoons. In the preferred arrangement shown in Figure 2, the end of one balk extending in one direction from the pontoon is arranged closely adjacent the end of another balk extending in the opposite direction. This forms a sidewise lapping joint between each adjoining pair of balks, supported on both side walls of each of said pontoons, as shown in Figures 2 and 3.

Referring now to the means for securing the balks to the pontoons illustrated in detail in Figures 2 to 5, inclusive, I provide a plurality of metal "half-collar" members 17, 17 of which one is shown in Figure 4. Each of said members includes a loop 18 of such size and shape as to fit over and receive a balk 16 therein. Each loop is rigidly mounted as by welding on a base member 19. In the form shown, the base member 19 is substantially twice the width of the loop 18, and the latter is secured in upright position at one end of said base member. Said base member also has a depending flange 19^a, the outer face of which is flush with the adjacent face of the loop 18. The flange 19^a has a centrally disposed aperture 20 therein adapted to receive a hook 21 of the anchoring device 15. Said flange also has a pair of apertures 20^a, 20^a near the opposite ends thereof adapted to receive locking bolts 20^b, 20^b, as will now be described in connection with Figure 5.

Figure 5 shows the arrangement of two "half-collar" members 17 when secured together, forming a compound collar, to hold an adjoining pair of balks 16, 16 and, with a corresponding like compound collar at the other end of the overlapped portion of said balks, form a rigid lapping joint therebetween, as indicated in Figures 2 and 3. The two "half-collar" members (forming a compound collar) are interchangeable, and are placed in mutually reverse position so that their respective flanges 19^a, 19^a are in registering position with each other, but with their respective loops 18, 18 offset laterally with respect to each other, as clearly shown in Figure 5. The two "half-collar" members are secured together in this position by bolts 20^b, 20^b. The arrangement is such that the hook 21 may then be inserted in the two registering apertures 20, as clearly shown in Figure 3.

The anchoring devices 15, 15 shown herein each consists of a hook 21 extending vertically, with its shank 22 suitably connected at its lower end by a tensioning lever device indicated generally at 23. The form of tensioning lever device shown herein is similar to those heretofore employed in, for example, automobile jacks (although vertically reversed) for the purpose of adjusting the height of a bar and thereafter holding it in locked position, so further details of said tensioning lever and looking mechanism need not be described herein as it forms no essential part of my invention.

In the modified form of "half-collar" shown in Figure 6, the base flange 25 is somewhat similar to the base member 19 of the form of ring shown in Figure 4, but is provided with an upstanding pedestal 26 having overhanging shoulders 27, 27 at opposite ends thereof forming grooves 28, 28 extending horizontally along opposite ends of said pedestal. A collar section 29 is formed in an inverted U-shape, with lugs 30, 30 extending inwardly along the lower extremities thereof so as to fit within the grooves 28, 28 beneath the overhanging shoulders 27, 27 of the pedestal 26. A removable locking bolt 31 with end nut 32 passes transversely through the lower extremities of said collar section 29 and the pedestal 26 so as to secure the ring section to said pedestal as shown in Figure 6. When the nut 32 is unscrewed and the bolt 31 is removed, however, the lower extremities of the collar section 29 may be spread laterally or slid longitudinally so as to remove said collar section from its pedestal.

PONTOON BRIDGE
27

This modified form of "half-collar" shown in Figure 6 is preferable in some cases since it renders it unnecessary to apply the balk to the "half-collar" by sliding the balk endwise therethrough. It is particularly advantageous in certain instances where the balk may already have projections thereon, as in some cases where holding collars of a type previously employed are permanently mounted on the balks so as to make it impossible to slide the balks endwise into the solid form of "half-collars" shown in Figures 4 and 5.

From the above description it will now be understood that the end of each balk which rests on the opposite side walls of its respective pontoon is strongly secured by a compound collar to the adjoining lapping balk, and the compound collars in turn are fastened to the pontoon by a hook device immediately adjacent each wall. In this way any tilting action of the balk relative to the pontoon is wholly restrained by the strong compound collars and not by the pontoon gunwales and hook fasteners, as in previous structures.

Although I have shown and described certain embodiments of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of my invention as defined in the appended claims.

I claim as my invention:

1. A pontoon bridge structure including a plurality of pontoons and a plurality of balks adapted to have their opposite ends supported by said pontoons, and means for detachably anchoring the adjoining ends of two balks extending in opposite directions from the pontoon on which they are supported, consisting of a pair of holding devices disposed adjacent opposite sides of said pontoon, and mutually securing both of said balks to each other and to said pontoon.

2. In a pontoon bridge structure including a plurality of pontoons, and balks for connecting said pontoons together, means for securing the adjacent ends of said balks together in pairs at widely spaced points to form lapping joints, and means on said pontoons for detachably connecting each pair of said securing means to said pontoons with said lapping joints supported on said pontoons so that said balks form a continuously stiff structure supported on each of said pontoons so as to distribute a portion of the load on said balks to adjacent pontoons.

3. In a pontoon bridge structure including a plurality of pontoons, and balks for connecting said pontoons together, means for securing adjacent ends of a pair of adjoining balks together at widely spaced points to form a laterally lapping joint, and means for detachably connecting said securing means to a pontoon with said lapping joint supported on the latter, so as to prevent relative tilting movement between said balks and said pontoons and distribute a portion of the load on said balks to adjacent pontoons.

4. In a pontoon bridge structure, a plurality of pontoons, a plurality of balks for connecting said pontoons together, and holding devices for detachably securing said balks together and to said pontoons, including a plurality of pairs of similar collar members, each having a ring mounted on a base member extending laterally from one side of said ring, said pair of collar members being arranged to be detachably connected together in mutually reversed relation with their base members in registering position, but with their rings in laterally offset position, to secure the ends of a pair of balks together in lapping relation.

5. A new article of manufacture, a collar member for securing the ends of a pair of balks together in laterally lapping relation, consisting of a ring of such size and shape as to receive a balk therein, and having its bottom side secured on one end of a base member so that the latter extends laterally beyond said ring, whereby said ring can be detachably secured to a like collar member, with the side faces of their base members in registering mutually reversed positions, and with said rings in laterally offset relation to each other, to hold a pair of balks in adjacent lapping relation to each other.

6. A new article of manufacture, a collar member for securing the ends of a pair of balks together in laterally lapping relation, consisting of an inverted U-shaped holding member of such size and shape as to receive a balk therein, and having its bottom ends detachably secured on one end of a base member so that the latter extends below and laterally beyond said holding member, and the sides of said holding member being yieldable when detached from said base member so as to permit said holding member to be passed over a balk and thereafter secured to the latter by attachment to said base member.

7. A new article of manufacture, a pair of like interchangeable half-collar members for securing the ends of a pair of balks together in laterally lapping relation, each of said half-collar members having openings of such shape and size as to receive a balk therein, and means for detachably connecting said half-collar members together in laterally offset relation to each other so as to hold said balks rigidly together.

8. A new article of manufacture, a pair of like interchangeable half-collar members for securing the ends of a pair of balks together in laterally lapping relation, each of said half-collar members having openings of such shape and size as to receive a balk therein, and means for detachably connecting said half-collar members together in laterally offset relation to each other so as to hold said balks rigidly together, and means affording mutual anchoring connections for both of said half-collar members.

9. A new article of manufacture, a pair of like interchangeable half-collar members for securing the ends of a pair of balks together in laterally lapping relation, each of said half-collar members having openings of such shape and size as to receive a balk therein, and having a base member offset laterally toward one side thereof, said base member having means permitting detachable connection with the base member of the other half-collar member so that said collar members may be connected in mutually reversed position, with their collar openings in laterally offset relation to each other.

10. A new article of manufacture, a collar member for securing the ends of a pair of balks together in laterally lapping relation, consisting of an inverted U-shaped holding member of such size and shape as to receive a balk therein, and having its bottom ends detachably secured on one end of a base member so that the latter extends laterally beyond said holding member, and the sides of said holding member being yieldable when detached from said base

member so as to permit said holding member to be passed over a balk and thereafter secured to the latter by attachment to said base member, said collar member being arranged for interchangeable detachable connection to a similar collar member in mutually reversed positions so that their respective holding members are in laterally offset relation to each other.

11. A pontoon bridge structure including a plurality of pontoons and a plurality of balks supported thereon with their ends forming overlapping joints, and anchoring means for said balks consisting of a plurality of pairs of collar members, each pair being detachably connectible together and to their respective pontoons for rendering said lapping joints rigid with respect to each other, and with their respective pontoons.

12. In a pontoon bridge structure including a plurality of pontoons and a plurality of balks adapted to be supported on said pontoons with their ends in laterally lapping relation, the combination of means for detachably anchoring said balks to said pontoons comprising securing devices rigidly connecting the lapped joints of said balks together.

13. A pontoon bridge structure including a plurality of pontoons and a plurality of balks adapted to have their opposite ends rigidly and removably attached in lapped relation to the ends of the succeeding balks in each direction and supported by said pontoons, and means for detachably anchoring such mutually lapped ends of two balks extending in opposite directions to the pontoon on which they are supported, consisting of a pair of holding devices disposed adjacent opposite sides of said pontoon, and mutually securing both of said balks together and to said pontoon.

14. A pontoon bridge structure including a plurality of pontoons and a plurality of balks supported thereon, with their ends overlapping, and means on said balks for detachably rendering the lapped joints of said balks rigid with each other at a plurality of points therealong, said means being detachably connected with their respective pontoons.

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