United States Patent

[11] 3,613,628

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[45] Patented **Oct. 19, 1971**

[54] **APPARATUS AND METHOD OF JOINING TUG AND BARGE IN OCEAN PUSH-TOWING**
5 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **114/235**
[51] **Int. Cl.** **B63b 21/00**
[50] **Field of Search** 114/235, 77

[56] **References Cited**

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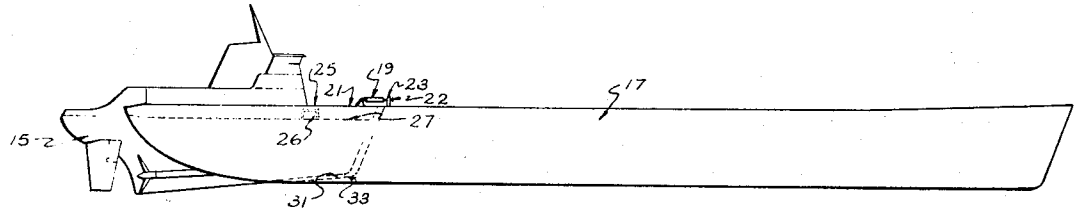
ABSTRACT: A tug and barge push-tow combination joined rigidly in tandem; the forward part of the tug being held between an after bottom ramp of the barge and barge structure overhanging horizontal structure of the tug and between which wedges are forced; and the after part of the tug being held by barge and tug male and female structure that are respectively wedge shaped in three dimensions and cooperatively interfit with reinforced rubber pads therebetween that are compressed within their elastic limits but beyond a possibility of relative movement during forward motion of the combination.



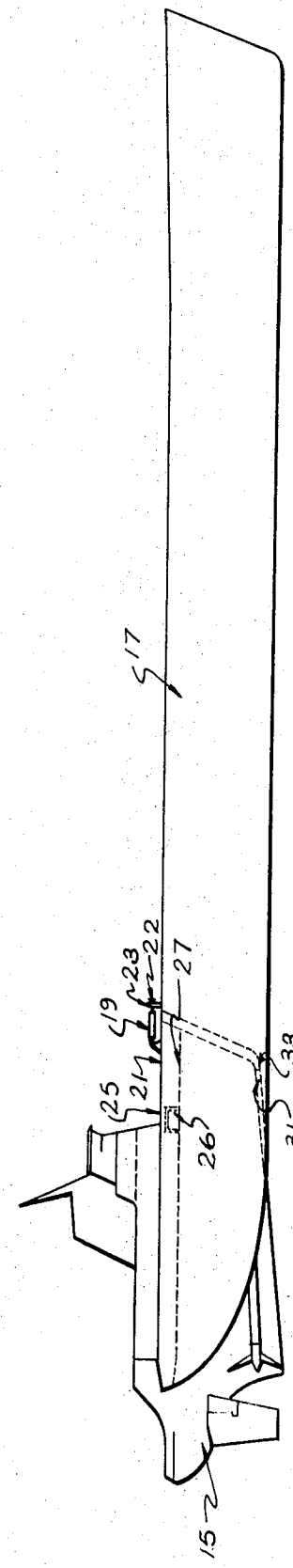


Fig. 1

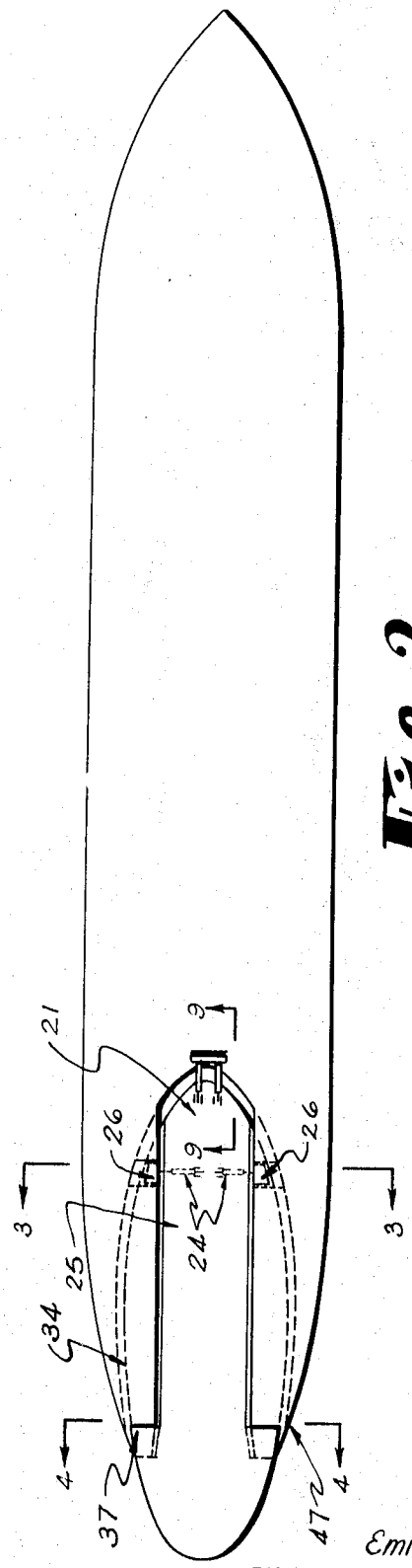


Fig. 2

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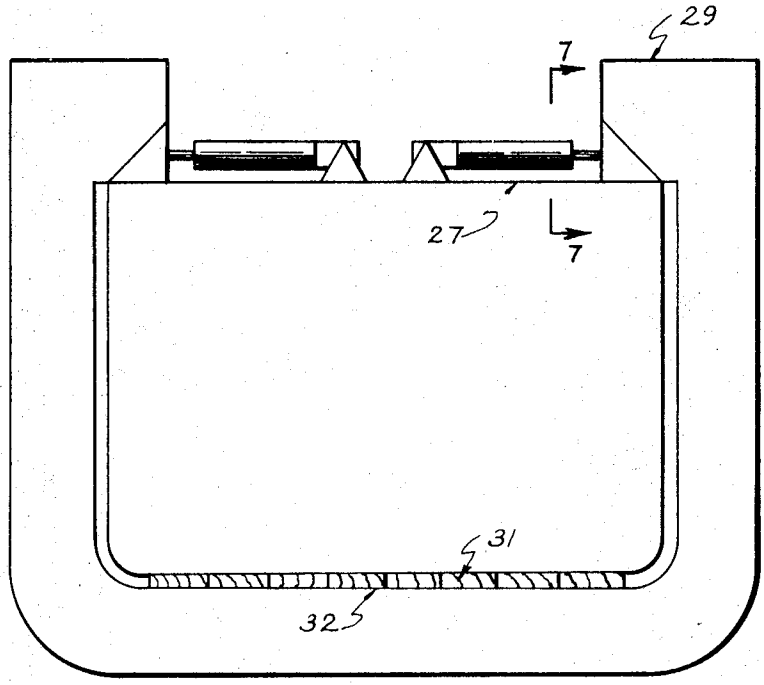

Fig. 3

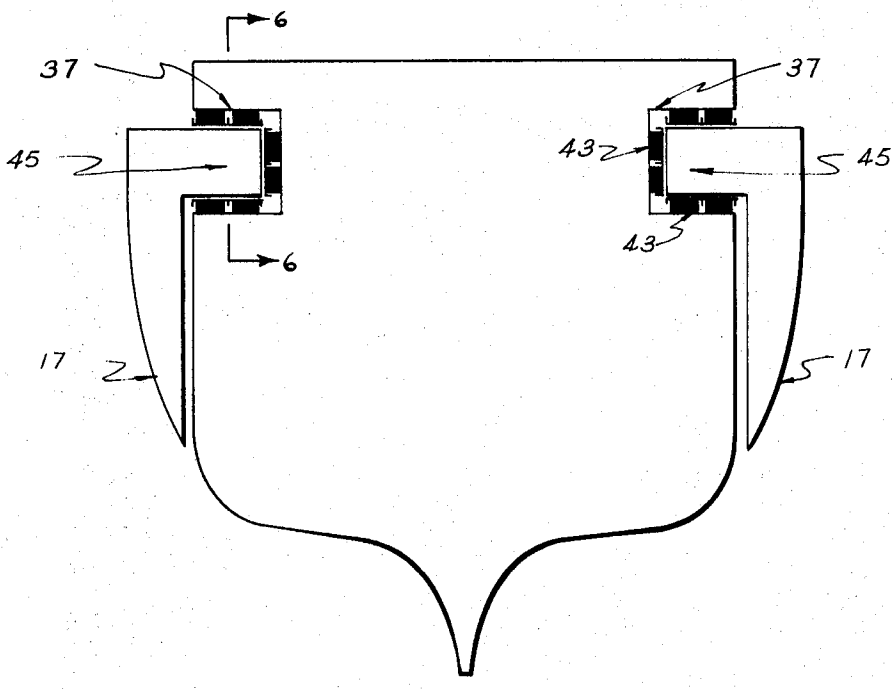

Fig. 4

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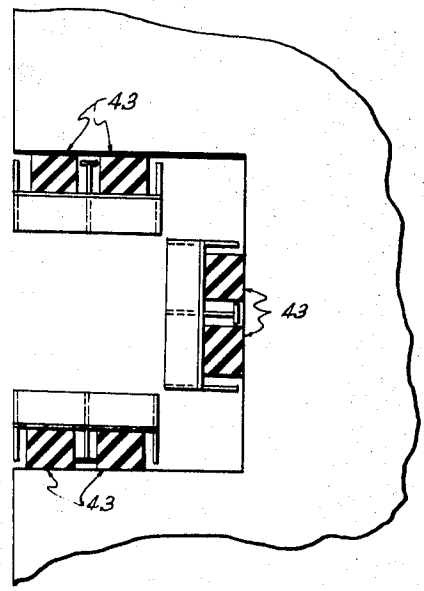

Fig. 5

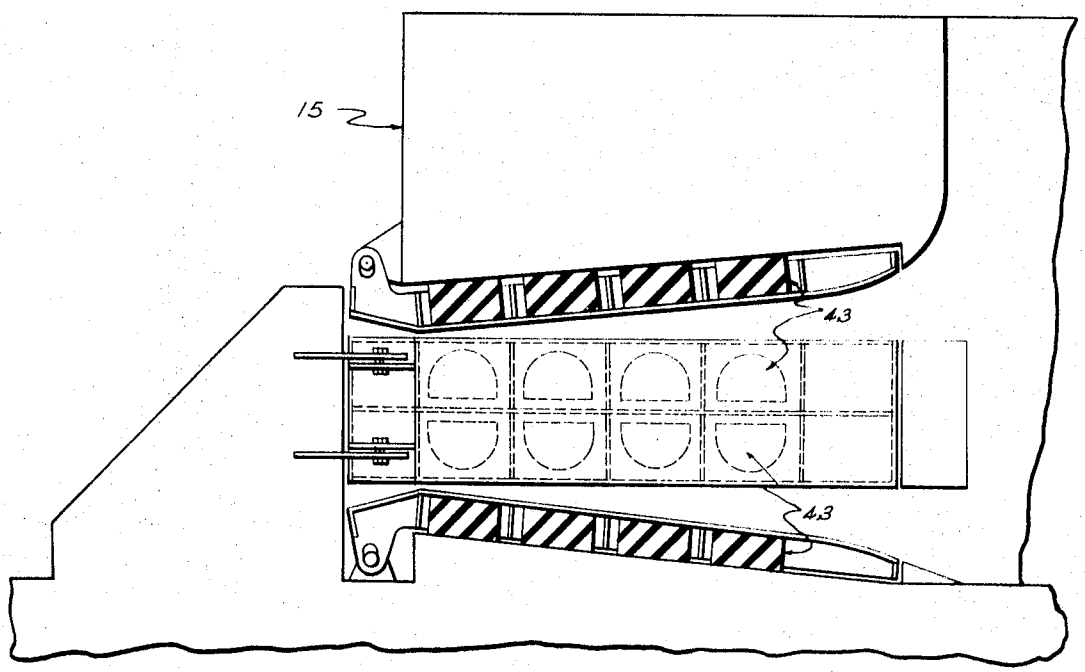

Fig. 6

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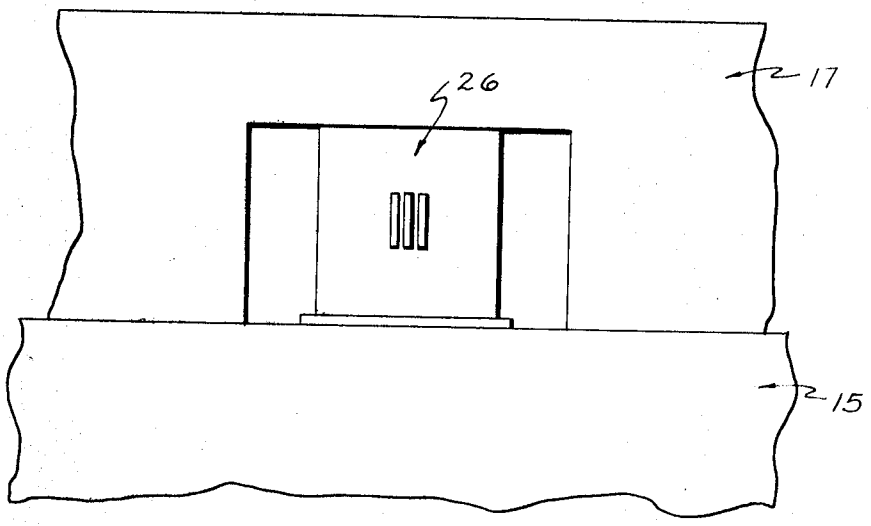

Fig. 7

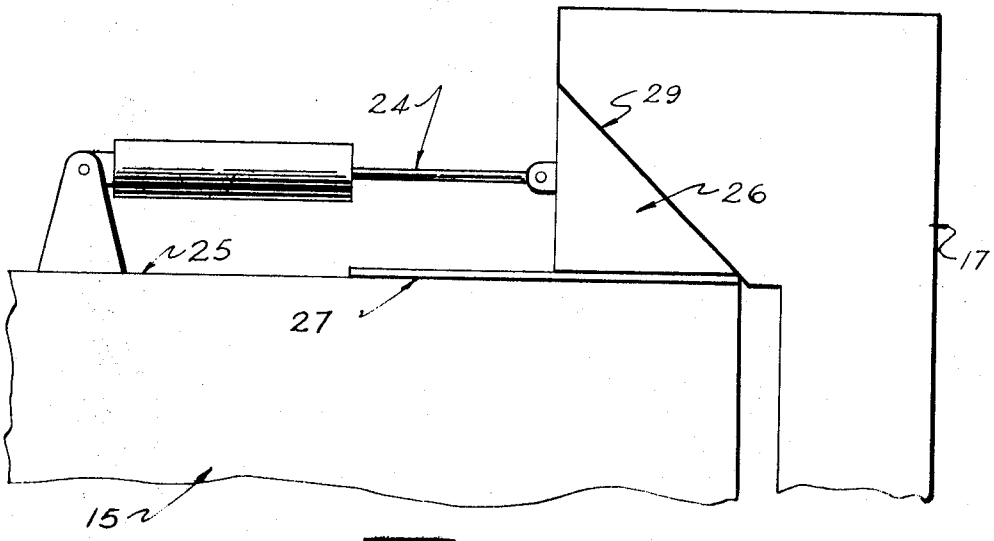

Fig. 8

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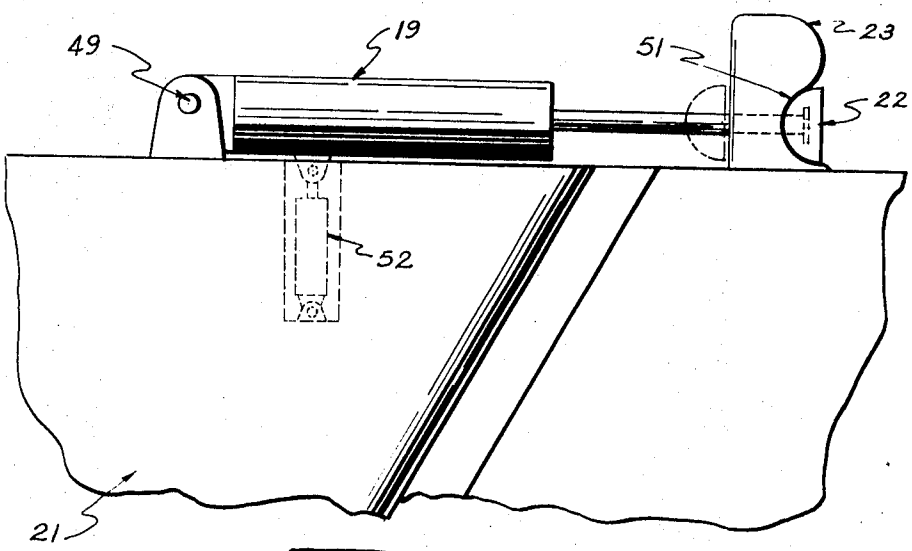

Fig. 9

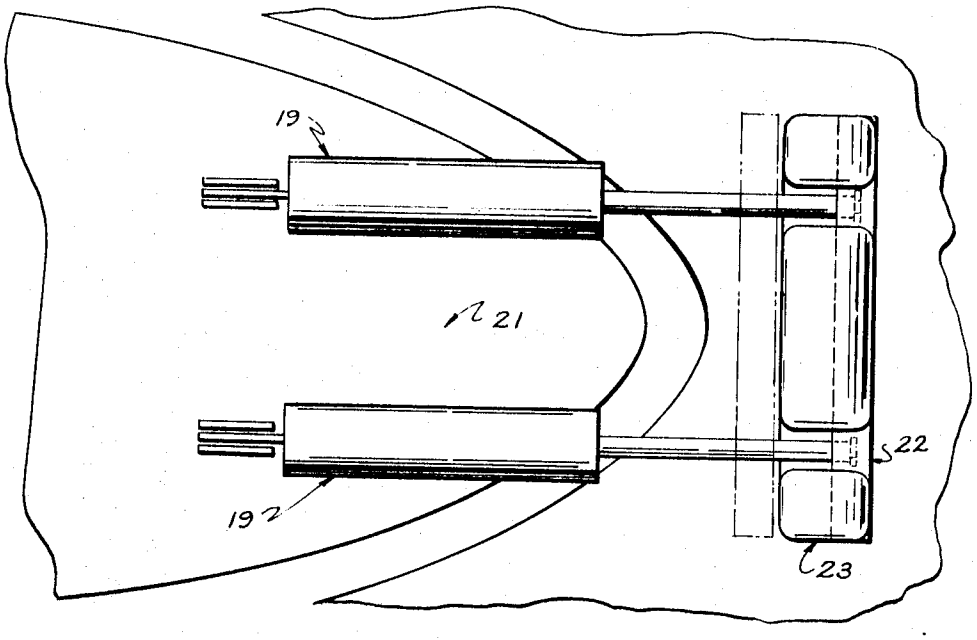

Fig. 10

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APPARATUS AND METHOD OF JOINING TUG AND BARGE IN OCEAN PUSH-TOWING

The invention relates generally to ocean push-towing and more particularly to the apparatus and method of joining a tug and a barge into a seagoing unit.

The invention is an improvement of my prior invention of Apparatus and Method of Ocean Push-Towing that is the subject of my pending application for U.S. Pat. Ser. No. 754,558, now U.S. Pat. No. 3,492,964.

In ocean push-towing the tug and the barge must be joined into a single unit easily and quickly and as easily separated. It is an object of the invention to provide complementary structure in the tug and on the barge for joining the two together in a unitary seagoing vessel for travel in any weather on the oceans.

It is a further object of the invention to make the complementary structure rugged and economical and capable of quick and easy assembly and disassembly.

Other objects and a fuller understanding of the invention may be had by referring to the following specifications and claims and drawings in which:

FIG. 1 is a side view of the tube and barge in joined condition,

FIG. 2 is a plan view of the material in FIG. 1,

FIG. 3 is a sectional view along section line 3—3 in FIG. 2,

FIG. 4 is a sectional view along section line 4—4 in FIG. 2,

FIG. 5 is an enlarged view of part of FIG. 4 showing engaging parts,

FIG. 6 is an enlarged sectional view taken along section line 6—6 of FIG. 4,

FIG. 7 is an enlarged sectional view taken along section line 7—7 of FIG. 3,

FIG. 8 is an enlarged view of a part of FIG. 3 shown in section in FIG. 7.

FIG. 9 is an enlarged sectional view taken along section line 9—9 of FIG. 2, and

FIG. 10 is an enlarged view of part of FIG. 2 shown in FIG. 9.

Referring to FIGS. 1 and 2, the tug 15 is shown joined to the barge 17 against longitudinal movement by longitudinally mounted hydraulic rams 19 mounted in the bows 21 of the tug-engaging hooked ends 22 around bollards 23 mounted on the barge (also see FIGS. 9 and 10). Transverse rams 24 mounted on the bow quarters 25 having wedge-shaped heads 26 (see FIGS. 1, 2 and 8) engaging between the tug main deck 27 (see FIG. 3) and the beveled or chamfered projections 29 of the barge, wedges the front of the tug against transverse relative movement, and against the floor 31 of the barge ramp 33 to prevent vertical movement. Along each of the respective stern quarters of the tug, a notch is defined in the tug structure that is wedge shaped forward, outward and upward in three dimensions.

Referring to FIGS. 4–6, the tug structure defining the notches 37 is lined with reinforced rubber pads 43. Opposing projections 45 are wedge shaped complementary to notches 37 and adapted to engage therein. The rubber pads 43 are sized to reduce the dimensions of notches 37 but nevertheless receive the wedged projections 45 which compress said rubber pads within their elastic limits but beyond disengagement therewith, even momentarily. This after arrangement in the stern quarters prevents the stern of the tug 15 from moving transversely and vertically with respect to the barge 17. The tug is thus supported on the floor of the ramp of the barge and is secured fore and aft thereto against all movement in the three possible axes of movement.

To join the tug and the barge together, the tug is first ballasted to conform to the load condition of the barge and is then driven by its own power up the ramp of the indented stern 47 of the barge to within reach of the bollards 23 on the barge by the hooked ends 22 of the hydraulic rams 19 on the bow of the tug. The opposed projections 29 of the barge are wedge shaped in one dimension in overhanging bevels and are engaged by the wedge-shaped heads 26 driven between them

and the deck of the tug. The hydraulic rams 19 are engaged with the bollards 23 by lifting them around the pivot mounting 49, over the bollards and into respective depressions 51 that together prevent inadvertent disengagement. Auxiliary ram 52 mounted vertically in the deck of the tug and pivotally attached to the bow rams 19 are used to lift them. The tug is pulled to its final position in the indented stern 47 of the barge by rams 19 to compress the rubber pads 43 in the notches 37 in the stern quarters by full engagement with the opposed projections 45. The transversely mounted rams 24 are activated to drive their respective wedges between the tug and the barge in the bow quarters. All rams have mechanical locks to prevent their release in case of loss of hydraulic power.

To separate the tug and the barge, the transversely mounted rams 24 are mechanically unlocked and activated to release the bow quarter single wedges. The bow rams are mechanically unlocked and extended forwardly to release the hooked ends from the bollards. The rams are then rotated upwardly by the auxiliary rams 52 and retracted clear of the bollards and then advanced to engage the flat backs of the hooks with the flat face of the bollards. The bow rams 19 are then activated to push the tug and the barge apart, disengaging the after opposed projections of the barge from the complementary notches 37 of the tug and releasing the compression of the rubber pads, to allow the tug to back away from the barge under its own power.

What is claimed is:

1. An improved apparatus for joining a tug to a barge for ocean push-towing, said barge having an indented stern and a bottom ramp, said apparatus comprising: a longitudinal notch defined on each side of said tug at the stern quarters between the waterline and the top deck; a plurality of rubber pads mounted in three structural sides defining said notches; inward projections extending, longitudinally opposed, on the interior sides of said indented stern, complementary in position and shape to said notches defined in said tug's stern quarters and adapted to fit therein to compress said plurality of rubber pads within their respective elastic limits but beyond disengagement therewith; a second pair of inward projections disposed respectively on each side of said barge's indented stern to overhang forward quarters of said tug, said overhanging projections being beveled respectively downwardly and outwardly; powered transverse wedges mounted on said tug's deck at the forward quarters and adapted to engage between said deck and said beveled projections of the barge thereby wedging the forward quarters of the tug between the bottom ramp and the beveled projections of the barge; and complementary pulling and pushing means mounted on the tug bow and the barge stern for pulling the tug up the bottom ramp of the barge to engage said after projections in said stern quarter notches and compress said rubber pads, and to push said tug down said ramp to disengage said complementary notches and projections.

2. Improved method for joining a tug and a barge having an indented stern and a bottom ramp in ocean push-towing comprising the following steps: ballasting the tug to conform to the loaded condition of the barge; running the tug into the indented stern of the barge and partially up the bottom ramp under said tug's own power to engage after projections of barge in the openings of the stern quarter notches of the tug; pulling the tug completely up the ramp and fully engaging after complementary projections and notches to compress the rubber pads mounted in said notches with said projections within the elastic limits of said pads but beyond disengagement; driving transverse wedges between the tug's forward quarter decks and beveled overhanging forward projections of the barge to wedge the tug forward in the barge between the forward projections and the bottom ramp, thereby securing the tug in the barge against relative movement therebetween in any of the three axes of possible movement.

3. An improved apparatus for joining a tug to a barge as described in claim 1 wherein said complementary pulling and pushing means comprises: a bollard mounted on the barge ad-

jacent the stern indentation, said bollard having a flat after face and a forward face with a depressed lower part; a hydraulic ram pivotally mounted on the bow of the tug and having its operative end shaped flat on its forward face for engaging the flat afterface of the bollard for pushing, and having a complementary shaped afterface adapted to engage in the depressed lower part of the forward face of said bollard for pulling; and an auxiliary ram mounted vertically in a deck of the tug for pivoting said hydraulic ram around its pivotal mounting to engage and disengage with said bollard.

4. An improved apparatus for joining a tug to a barge as described in claim 1 wherein said longitudinal notches are wedge-shaped in three dimensions.

5. An improved apparatus for joining a tug to a barge as described in claim 1 wherein said rubber pads are reinforced with metal backing and side pieces.