Jan. 12, 1954 B. WILLIAMSON 2,665,656

INTEGRATED BARGE TOW AND BARGES FOR USE AS COMPONENT VESSELS THEREOF

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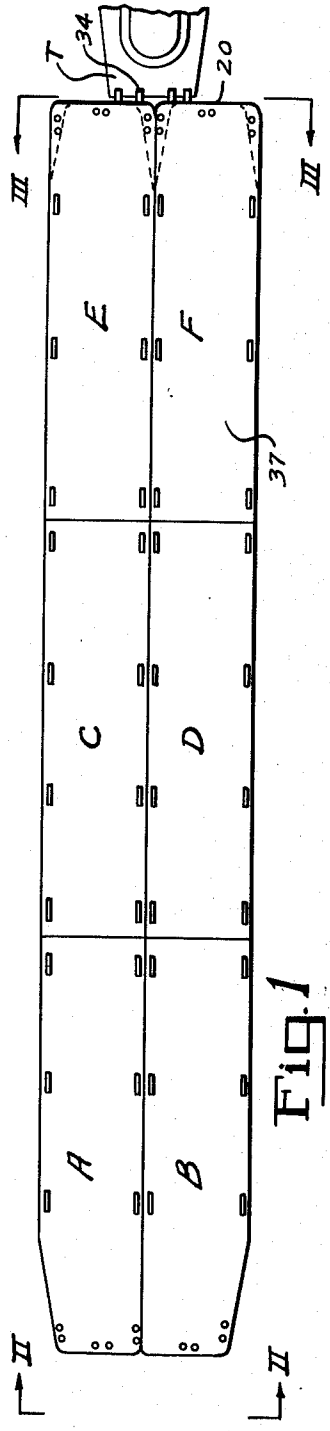


Fig. 1

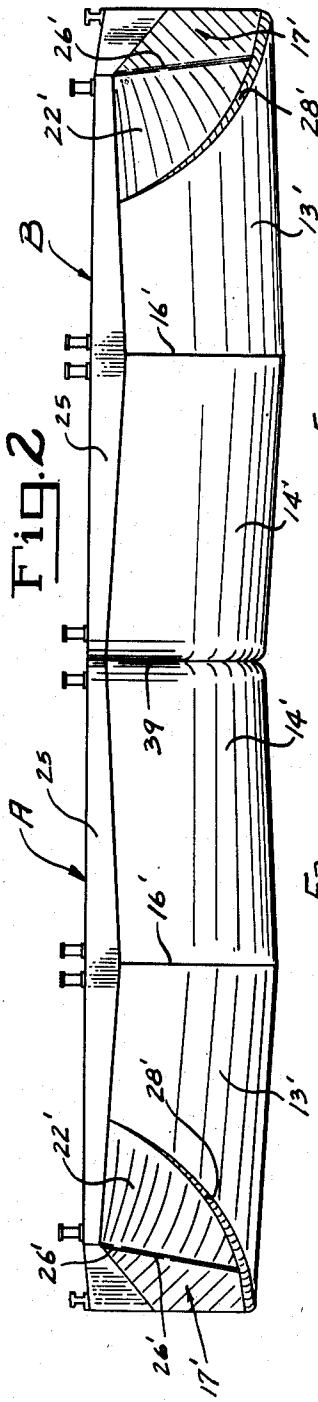


Fig. 2

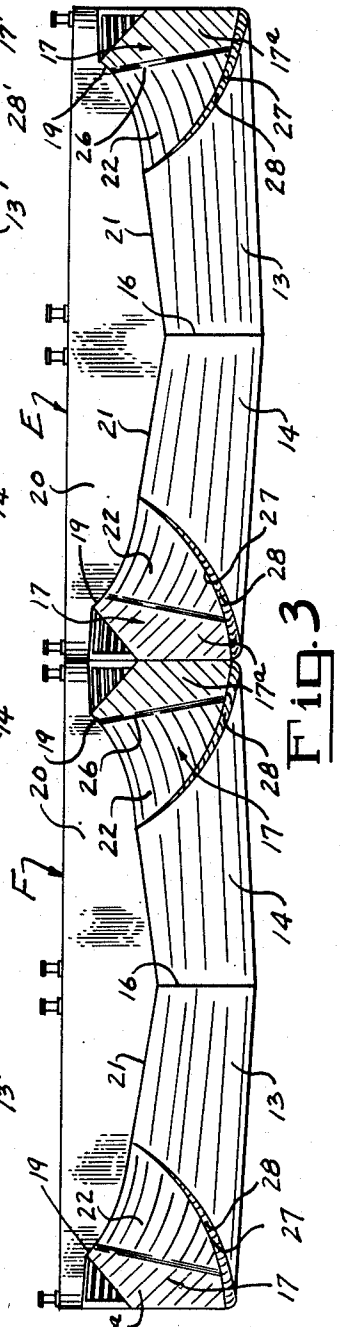


Fig. 3

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INTEGRATED BARGE TOW AND BARGES FOR USE AS COMPONENT VESSELS THEREOF

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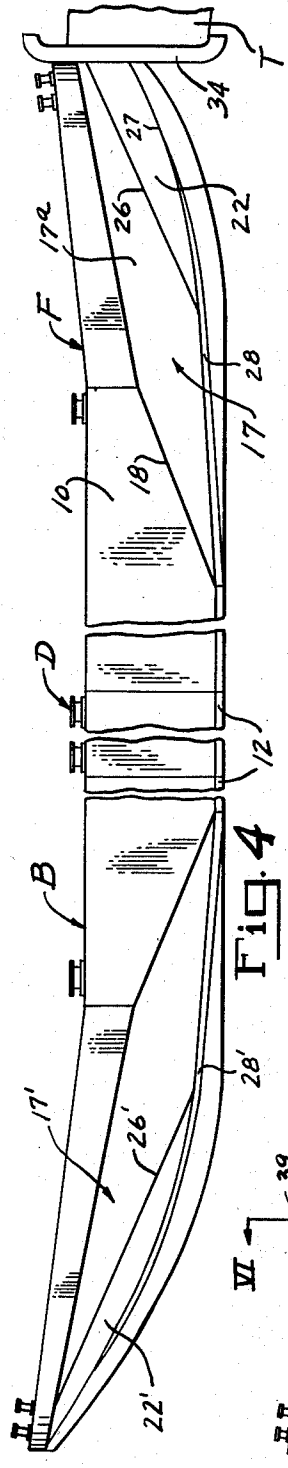


Fig. 4

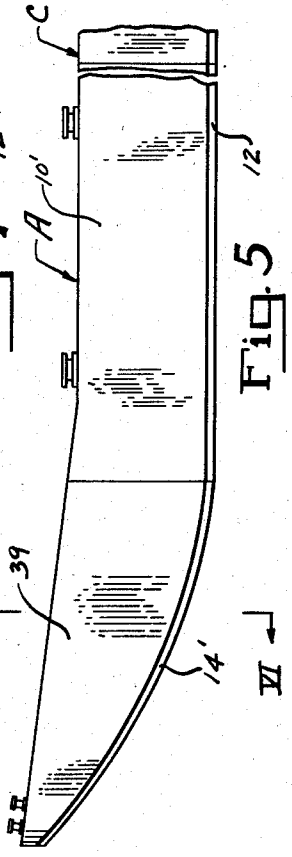


Fig. 5

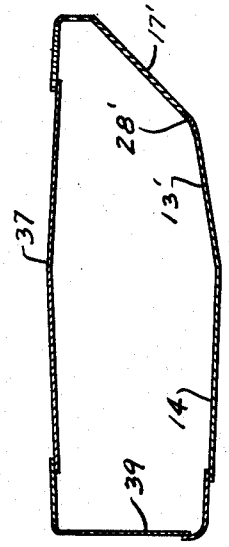


Fig. 6

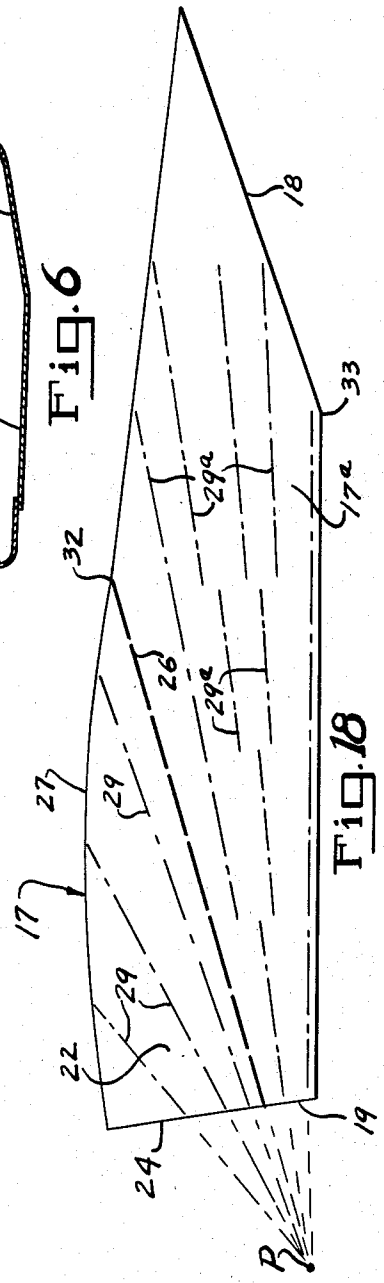


Fig. 18

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INTEGRATED BARGE TOW AND BARGES FOR USE AS COMPONENT VESSELS THEREOF

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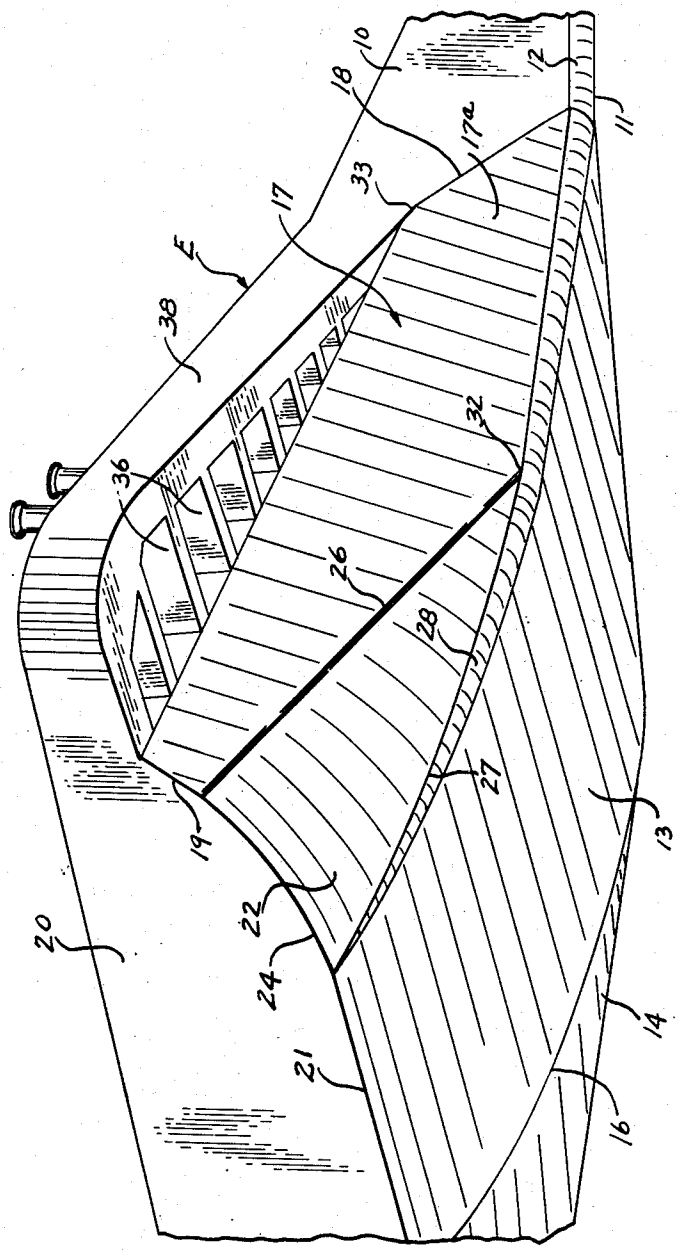


Fig. 7

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INTEGRATED BARGE TOW AND BARGES FOR USE AS COMPONENT VESSELS THEREOF

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Fig. 17

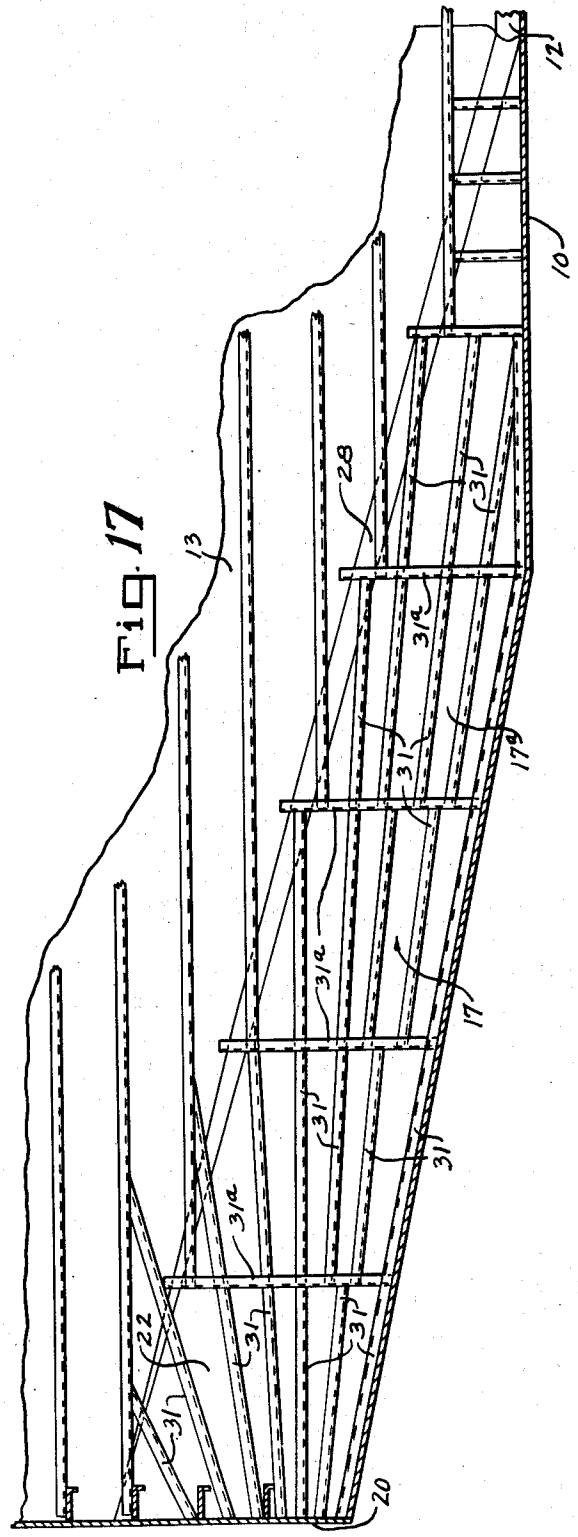
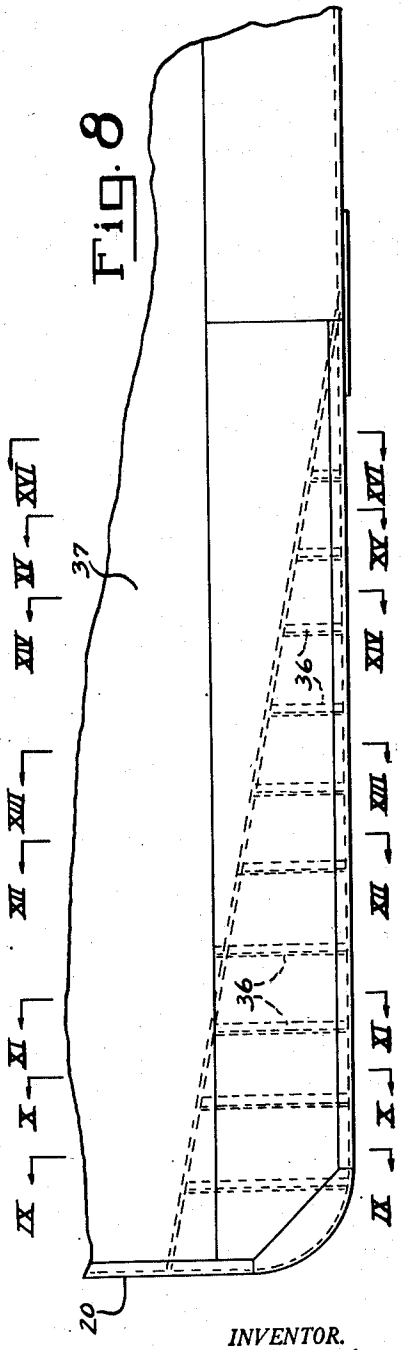


Fig. 8



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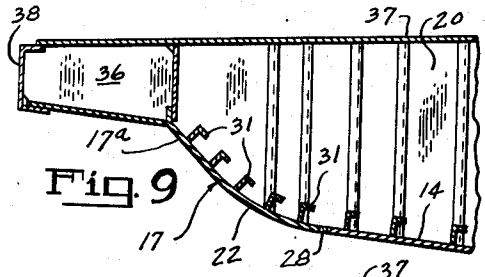


Fig. 9

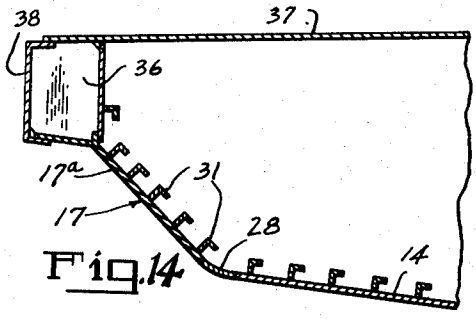


Fig. 14

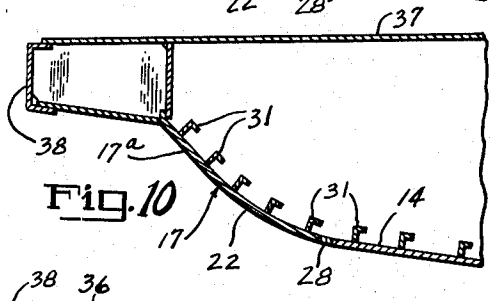


Fig. 10

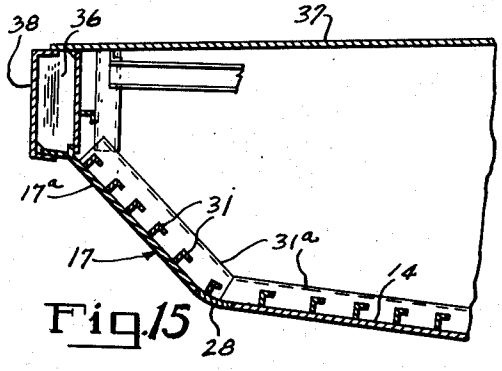


Fig. 15

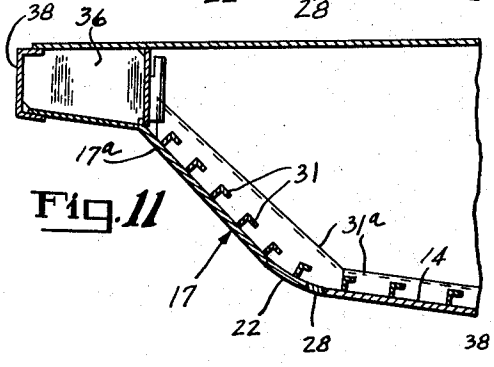


Fig. 11

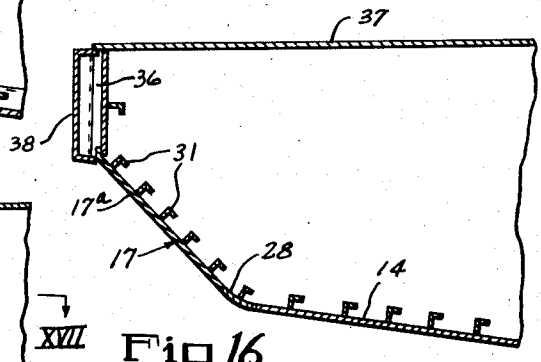


Fig. 16

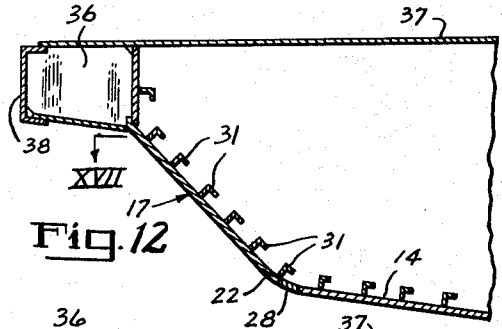


Fig. 12

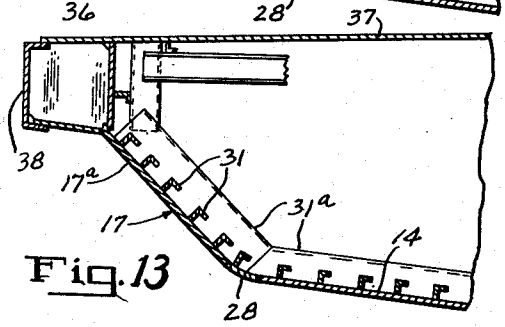


Fig. 13

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Patented Jan. 12, 1954 2,665,656

UNITED STATES PATENT OFFICE

2,665,656

INTEGRATED BARGE TOW AND BARGES FOR USE AS COMPONENT VESSELS THEREOF

Boyce Williamson, Birmingham, Ala., assignor to The Ingalls Shipbuilding Corporation, a corporation of Delaware

Application June 22, 1951, Serial No. 232,992

8 Claims. (Cl. 114—235)

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My invention relates to an integrated tow formed of a plurality of barges and to barges having hulls especially adapting them for inclusion in such a tow, and has for an object the provision of such a tow in which the towing efficiency is increased over integrated tows constituted of barges as heretofore designed.

In my prior Patent No. 2,546,353, dated March 27, 1951, I show, describe and claim an improved bow construction for barges and the like in which the rake bilge plates thereof comprise plate sections warped from the bow of the barge to a point adjacent the aft end of the rake. To date a number of barges have been built in accordance with the above patent and the towing efficiency, ease of construction and suitability of the invention have been fully proven in practice. The present invention relates to an integrated tow of barges embodying in part the invention disclosed in said patent. When two barges embodying the improved bow construction disclosed in said patent are placed side by side and moved along it is found that a considerable improvement in towing efficiency results. However, for use on inland waterways such as rivers it was found that floating logs and other debris tended to collect between the barges at the bows thereof, thus decreasing towing efficiency.

In seeking to overcome the above mentioned tendency of debris to gather at the inboard corners of the bows, I have conceived that for integrated tows the lead barges should have the above mentioned improved bow bilge plate construction on the outboard corners and standard, square shaped bilge construction on the inboard corners. In this manner and as has been proven by tests with scale models, the towing efficiency remains high while the tendency to gather debris is practically eliminated. As a further aid in increasing towing efficiency I have found it desirable to "pull in" the outboard corners of the lead barge. That is to say, the plates forming the bilges of the outboard corners are inwardly directed. This construction, therefore, results in a barge having one square bow corner and the other is partially pointed. A further result of this construction is that when such barges are placed side by side the composite bow of the tow is somewhat pointed. The sterns of the trailing barges preferably are provided with the improved rake bilge plate construction shown in the above patent and the same are directed inwardly. To afford more surface against which the tug may push the tow, I prefer to extend

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the transoms of the trailing barges the full width of the barges and deck over the space which results from pulling in the sterns.

In view of all the foregoing it is another object of my invention to provide barges adapted to be disposed side by side for towing in which the outboard rake bilge plates thereof embody a plate section warped from a point adjacent the aft end of the rake forward, thereby providing bilge plates in which there are plane surfaces emanating from a common point adjacent the outboard corner of the barge, on which lines are laid stiffeners for the plates.

Another object is to provide outboard rake bilge construction for the bows of the lead barges of side by side integrated tows in which the plates forming the same converge inwardly toward the longitudinal center line of the barge, providing a partially pointed bow effective to increase towing efficiency and to construct the inboard bows of said barges in more or less conventional manner, that is of upwardly curving rake plates providing inboard bows substantially square as viewed in plan. When the inboard corners of two such barges are brought together they present a surface which is not apt to gather debris as the barges move along.

A further and more general object of my invention is to provide barges of the character indicated which shall be economical of construction and in which the decked over portion of the stern of the trailing barges are effective to provide a substantially continuous deck surface between the barges, eliminating the likelihood of workmen falling through and into the path of the tug boat.

Barges illustrating the features of my invention are shown in the accompanying drawings forming a part of this application in which:

Fig. 1 is a plan view of a six barge, integrated tow;

Fig. 2 is an enlarged front elevational view of the lead barges thereof taken in the direction of line II—II of Fig. 1;

Fig. 3 is an enlarged stern view of the trailing barges looking in the direction of arrows III—III of Fig. 1;

Fig. 4 is an enlarged fragmental side elevational view of the composite tow shown in Fig. 1;

Fig. 5 is an elevational view of the inboard bow of the starboard lead barge shown in Fig. 1;

Fig. 6 is a detail sectional view taken generally along line VI—VI of Fig. 5;

Fig. 7 is a fragmental perspective view looking at a corner of the stern of a trailing barge, the

view being taken from somewhat underneath the corner of the stern;

Fig. 8 is a fragmental plan view of one of the corners of a trailing barge;

Figs. 9 to 16, inclusive, are detail sectional views taken generally along the respective section lines indicated on Fig. 8;

Fig. 17 is an enlarged fragmental plan view of a corner of a trailing barge, the view being taken generally along a line such as XVII—XVII of Fig. 12; and,

Fig. 18 is a developed plan view of one of the improved rake bilge and side plates, the dot-dash lines laid thereon indicating the center lines for the stiffeners.

Referring now to the drawings for a better understanding of my invention I show in Fig. 1 an integrated tow formed of six barges placed two abreast and in tandem. The lead barges A and B are provided with outboard rake bilge constructions of the improved type to be described herein. The inboard rake bilge constructions of the bows of barges A and B may, as will later appear, be of any desired construction but preferably are such as to afford a hull section which is substantially square as viewed in plan.

The intermediate barge sections C and D may be rectangular, box-like barges disposed to fit with their bows against the square sterns of barges A and B.

Barges E and F are the trailing barges and are provided with bows matching the sterns of the barges C and D. As best illustrated in Fig. 4 the sterns of barges A and B may be rectangular in elevation, matching the bows of barges C and D. Correspondingly, the sterns of barges C and D may be square in plan and elevation, to match the similarly shaped bows of barges E and F. The sterns of barges E and F are such that the hull sides are pulled inwardly, providing somewhat sharpened bow sections.

Referring more particularly to Figs. 3 and 7 of the drawing it will be seen that the stern sections of the barges E and F are identical. Further the inboard and outboard stern sections are identically formed. Therefore, the description of one corner of one stern section will suffice for all. For the sake of simplicity of description, the sterns of barges E and F will be described as if they were the bows thereof. Thus, when I refer to the "aft" end of plate 17, for instance, I mean that end of the same nearest the mid-ships section of the barge and the term "forward end" is used to mean that end nearest the transom. The side plating of the barge E, indicated by the numeral 10, is arranged to provide with the bottom plating 11 a barge having a substantially rectangular mid-ships section. If desired the mid-section may be provided with a continuously extending bilge knuckle plate 12.

The mid-section end of the inboard and outboard sterns comprises upwardly sloping plating 13 and 14 which may slope athwart-ships along the mid-ships line to be joined at 16, providing a somewhat V-shape bottom for the barge including stern sections. The stern of the hull is pulled inwardly by the provision of a plate section 17. The plate 17 embodies a flat section 17*a* sloping inwardly at an angle of approximately 45° to the horizontal. The aft end 17*a* of plate section 17 is joined along the line 18 to the main body side plating 10. At the forward end the section 17*a* of plate 17 is joined along the line 19 to a section of the transom 20. The forward end of plates 13 and 14 are joined to the transom 20 along the line 21.

The remaining forward portion of the stern plate section 17 is completed by the provision of a warped plate section 22. This section is in the shape generally described in the above mentioned patent. As stated in said patent the section 22 is warped from its aft end to its forward end where it joins along the line 24 to the transom 20. The upper chine line of the plate section 22 is defined by the bend line 26, where it joins the lower edge of the forward portion 17*a* of plate 17. The lower chine line of plate section 22 is joined along the line 27 to a bilge knuckle plate 28, forming in effect a continuation of the knuckle plate 12. The knuckle plate 28 may taper from the end adjacent the end of knuckle plate 12 toward the transom 20 as illustrated in Fig. 7.

As best shown in Figs. 9 through 18, inclusive, the plate section 22 forming the rake bilges is so warped as to provide coplanar surfaces along the length thereof. These surfaces are indicated by the dot-dash lines 29 laid on Fig. 18, which represents the approximate centers for stiffeners 31 to be laid along said lines, as illustrated in Figs. 9 to 17, inclusive. As clearly shown in Fig. 18 the lines 29 emanate from a theoretical point P adjacent the corner of the stern. Thus, the stiffeners 31 may be laid on the plate 22 without the necessity of forming or bending them. In like manner I lay on the plate section 17*a* similar stiffeners 31, these being laid on along line 29*a* which preferably also emanate from the point P.

Referring especially to the developed view Fig. 18, it will be seen that along its lower chine line the plate section 17 is straight up to the point 32. From the point 32 to the forward end 24 the lower chine line 27 is slightly curved. The upper chine line of the plate 17 is straight for the greater part of its length from the end 24 to the point 33. From the point 33 the plate 17 tapers back to the aft end thereof.

As shown, when in place on a barge, adjacent its forward end plate 17 slopes downwardly at approximately a 45° angle to the horizontal and thence the portion 22 thereof joins along the curved lower chine line 27 to the knuckle plate 28. Adjacent the aft end of section 17*a* of plate 17, as exemplified in Figs. 12 to 16, the plate is substantially flat. The degree of curvature of the section 22 of plate 17 intermediate the forward and aft ends thereof will be readily seen from an inspection of the intermediate sectional views, Figs. 9 to 12, inclusive. It will be apparent from the drawings that the end 32 of plate section 22 lies at an angle to the horizontal. The end joining the transom along line 24 lies generally at less angle to the horizontal than does end 32. This relationship comes about due to warping of the section 22 as fully described in my prior Patent No. 2,546,353.

As shown in Fig. 17 some of the stiffeners 31 run substantially the full length of the plate 17 while others thereof are intermittent, being joined edgewise by cross bracing 31*a*. These may well be watertight bulkheads, but for the sake of clarity, the plating for the bulkheads is omitted.

It will be noted that by pulling in or inwardly directing the sides of the sterns of the barges E and F if the decks thereof followed the contour of the hull as viewed in plan there would be an opening at the stern through which operators and workmen on the barges could fall or through which equipment could be dropped. Further, when towing the barges they usually are pushed by means of a tug T and if the space

at the inboard corners of the stern were not closed provision would have to be made for receiving the knees 34 of the tug. In order to eliminate this difficulty I so construct the stern corners of the decks of the trailing barges that they overhang the resultant space just mentioned and close the same. As shown in Fig. 7 I extend the deck over the corners by means of a plurality of outwardly disposed beams 36. These are suitably braced so as to take the propelling push imparted by the tug. The deck proper indicated by the numeral 37 is laid over the beams and the ends thereof may be joined by plating 38. Thus, when the sterns of barges constructed as explained are placed together they present a substantially continuous deck and transom section covering the openings which would result if the deck followed the contour of the hull as viewed in plan. As is shown clearly in Figs. 1 and 3, I prefer to carry out the inboard construction for the sterns of the trailing barges on the outboard stern corners thereof in order to provide more deck surface.

Referring now particularly to Figs. 1, 2, 5 and 6, it will be seen that the bows of the barges A and B embody at their outboard corners substantially the identical flat and warped plate construction already described. The only difference between the rake bilge plates of the outboard corners of the barges A and B and the corners of the sterns of the barges E and F is that the rake bilge plates 17' and sections 22' thereof for the outboard corners of the lead barges are longer than the plates 17 for the rear barges. In other words, plates 17' and the warped sections 22' thereof for the outboard corners of the barges A and B are also formed substantially identically as described in my above mentioned Patent No. 2,546,353. The only exception in this connection is that the barge hulls shown in the present application embody rake bilge plates 17' which are directed inwardly, thus to provide a somewhat pointed bow. The sections 22' are warped so as to provide coplanar surfaces emanating from common points adjacent the corners of the barge in the same manner illustrated for the barges E and F and as already explained. It will be understood that stiffeners, not shown, similar to the stiffeners 31, are laid on the rake bilge plates 17'. The plates 17' are joined to a bilge knuckle plate 28' along the lower chine lines thereof. The upper chine lines of the sections 22' are defined as already explained, by the bend lines 26'. The remainder of the plate sections 17' is plane and is disposed at an angle to the horizontal of approximately 45°. The midsection bottom plating 13' is joined to the knuckle plate 28' as illustrated at the outboard corners of the leading barges. The forward end of sections 22' and the forward ends of bottom plates 13' and 14' are joined to headlog plates 25 as shown in Fig. 2.

The inboard corners of the lead barges as indicated in Figs. 2 and 6 are substantially square as viewed in front elevation and in plan. Thus, the side plating 39 for the inboard corners is substantially vertical and in alignment with the mid-ships side plates 10' while the bottom plating 14' is curved upwardly. The bottom plates 14' are joined along the center line 16' to the bottom plates 13', and may be disposed at an angle to form a V-bottom barge.

When barges constructed in accordance with my invention are integrated for towing as shown

in Fig. 1, the tug T is placed with the knees 34 thereof abutting the transoms 20 of the trailing barges. Due to the overhanging corner deck and transom sections it will be apparent that the knees rest in part against the portions of the transom projecting inwardly of the hull lines, thus to transmit the propelling thrust to the barges. In tests on models I have found that pulling in the outboard corners of the lead barges and pulling in the inboard and outboard corners of both of the trailing barges gives a considerable increase in towing efficiency. Furthermore, I have found that the barges A and B may, in an emergency, be used separately since apparently the difference in the port and starboard bow constructions thereof does not too adversely affect the towing characteristics thereof when used separately. I have found in tests on models that there is very little tendency of such a barge A or B to skew when used alone. The substantially square inboard bow construction of the barges A and B eliminates the tendency of the barges to gather floating logs, sticks and the like, eliminating the necessity of having to clean out between the barges at frequent intervals.

The warping of the plates in the manner illustrated affords a simple means for constructing barge bows and sterns. The construction herein described entirely eliminates the necessity of a mold loft and the resultant bow or stern construction compares very favorably in towing characteristics with a spoon bow, which can be formed only in a mold loft. By warping the sections 22 and 22' of the plates 17 and 17' as described I am enabled to lay on the stiffeners 31 without any forming whatever since the coplanar surfaces indicated by the lines 29 are provided for receiving the stiffeners. This results in a considerable saving in construction cost.

It will be apparent that while I have described the plate sections 22 and 22' as being "plate sections" the same may be formed of a plurality of plates welded edgewise together in order to provide a plate section large enough to form the rake bilge of the bow or stern. Also, while I have described the outboard corners of the barges A and B as being made in accordance with my above mentioned patent and the sterns of the barges E and F as being likewise made, it will be apparent that a spoon bow or any form of bow in which the sides are brought in and shaped to improve towing efficiency may be used in combination with the substantially rectangular inboard bow corner sections of the barges A and B. Aside from the increase in towing efficiency produced by bringing in the sides of the bows of the barges A and B, the turned in bow sections facilitate the entry of the barges into locks or the like since the pulled in sides offer a tapering bow section.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In an integrated tow embodying at least four barges each having a substantially rectangular mid-ships section formed of side and bottom plates and disposed two abreast and in

tandem, inboard bow corners for the lead barges comprising upwardly sloping bottom plates, substantially vertical inboard bow side plates joining the upwardly sloping bottom plates and disposed substantially parallel to the side plates of the mid-ships section, outboard bow corners for the lead barges comprising upwardly sloping bottom plates, inwardly directed bow side plates joined along their aft ends to the outboard side plates of the mid-ships section and adjacent their lower edges of the adjacent bottom bow plates, sterns for each trailing barge embodying upwardly directed stern bottom plates, and inwardly directed stern side plates joined to the adjacent side plates of the mid-ships section and to the stern bottom plates.

2. A barge tow as defined in claim 1 in which the trailing barges are provided with transoms and decks, and lateral extensions of the decks at the rear corners of the trailing barges overlying the inwardly directed stern side plates.

3. A barge tow as defined in claim 1 in which the trailing barges are provided with transoms and decks, and lateral extensions of the transoms and decks extending over the inwardly directed sterns whereby the stern decks are substantially the width of the decks of the mid-ships section of the trailing barges.

4. In an integrated barge tow embodying at least two barges in side by side relation, the improvements comprising outboard bow corner bilge construction for the barges embodying bilge plate sections warped from the aft ends thereof forwardly, the aft ends of said plates lying at an angle to the horizontal and the forward ends thereof being inclined to the horizontal less than said aft ends, and inboard bow bilge construction for the barges embodying upwardly sloping bottom plating and substantially vertical side plating, thereby providing substantially square inboard bow corners for the barges.

5. In an integrated barge tow embodying at least two barges in side by side relation, the improvements comprising bow construction having a rake, rake bilge plates for the outboard bow bilges of each barge each comprising a plate warped from its aft end toward the forward end, said aft end lying at an angle to the horizontal and the forward end being inclined to the horizontal less than the aft end, headlog plates to which the forward end of the bilge plate is connected, means connecting the bilge plate along the upper and lower chine lines thereof to bow side and bottom plates, respectively, inboard bow

construction for each barge embodying upwardly sloping bottom plates equaling in width substantially the width of the mid-ships section of the barge, and substantially vertical inboard bow side plates joined to the adjacent bottom plates and forming therewith inboard bow corners for each barge which are substantially square as viewed in plan.

6. In barges adapted for towing in side by side relation, bow construction for each barge comprising inwardly directed outboard rake bilge plates, inboard rake bilge plates substantially aligned with the side plates of the mid-ships section of the barge, upwardly sloping inboard and outboard rake bottom plates connected to the inboard and outboard rake bilge plates, headlog plates to which the forward end of the outboard bilge plates are connected, and means connecting the inboard bottom plates of the bow to the headlog plate.

7. In a barge, a substantially rectangular mid-ships section formed of connected side and bottom plates, inwardly directed side plates for one corner of the bow, an inwardly directed bow rake bilge plate at said corner of the bow, bow side plates at the other corner of the bow forming a substantially straight continuation of the mid-ships section side plating, bottom plates for the bow, means connecting the inwardly directed bilge plate along its lower chine line to the adjacent bottom plates and to the inwardly directed side plates along its upper chine line, and means connecting the bow side plates of the said other corner to the adjacent bottom plates.

8. A barge as defined in claim 7 in which the inwardly directed rake bilge plates are warped substantially throughout their lengths to provide plane surfaces lying along lines emanating from common points near the adjacent corners of the barge, and stiffeners secured to said plates along said lines.

BOYCE WILLIAMSON.

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