March 24, 1959 J. KJEKSTAD 2,878,772

STABILIZERS FOR SHIPS

Filed Oct. 6, 1954 3 Sheets-Sheet 1

Fig. 1

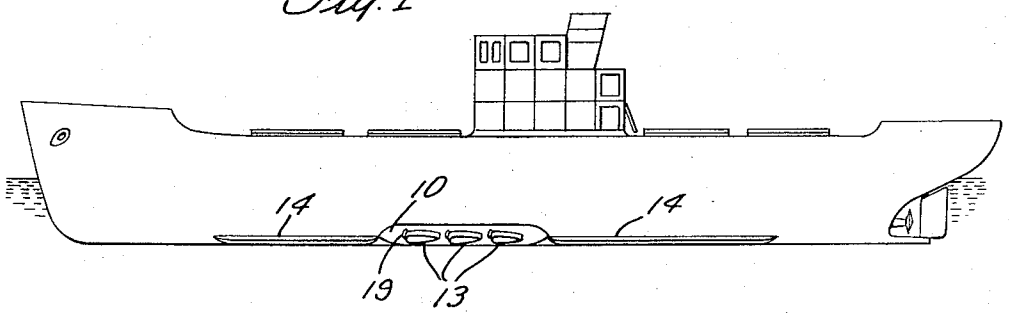
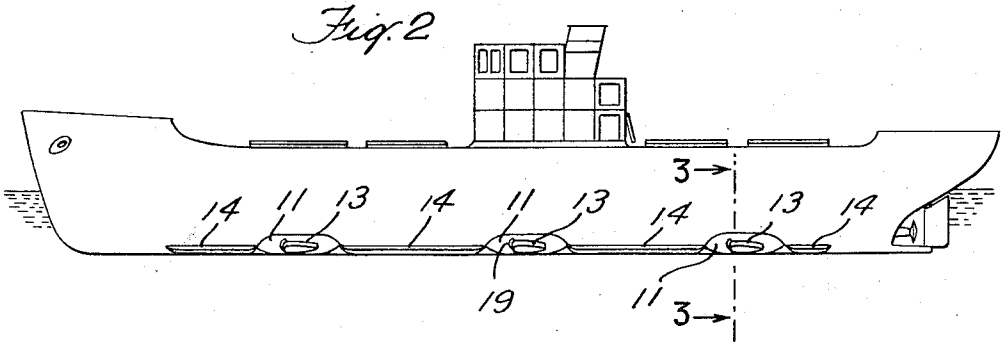


Fig. 2



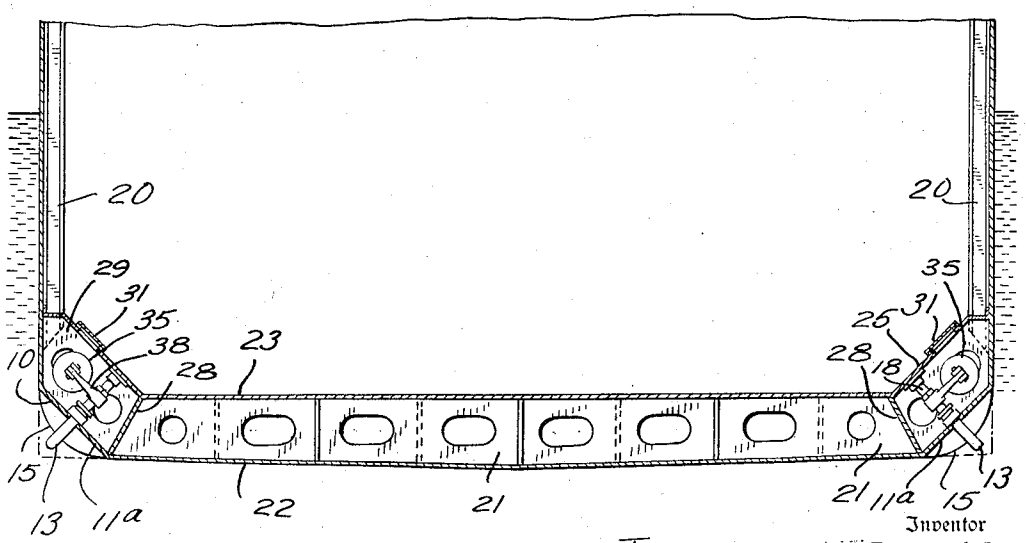


Fig. 3

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March 24, 1959 J. KJEKSTAD 2,878,772

STABILIZERS FOR SHIPS

Filed Oct. 6, 1954 3 Sheets-Sheet 2

Fig. 4

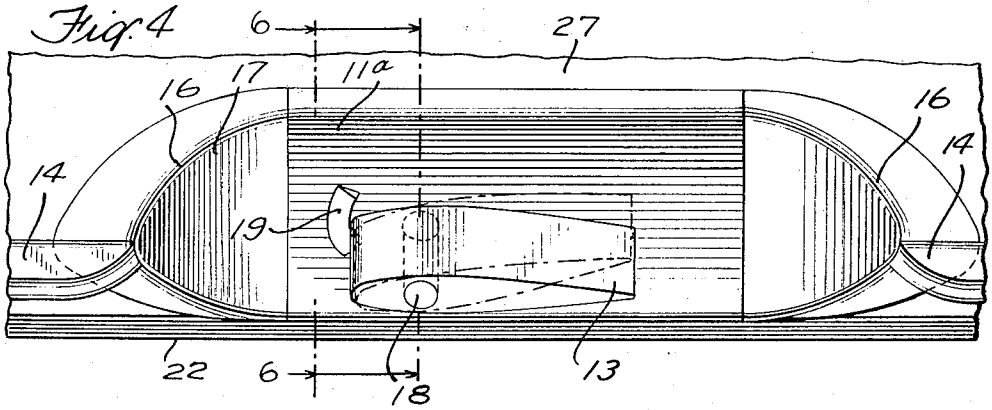
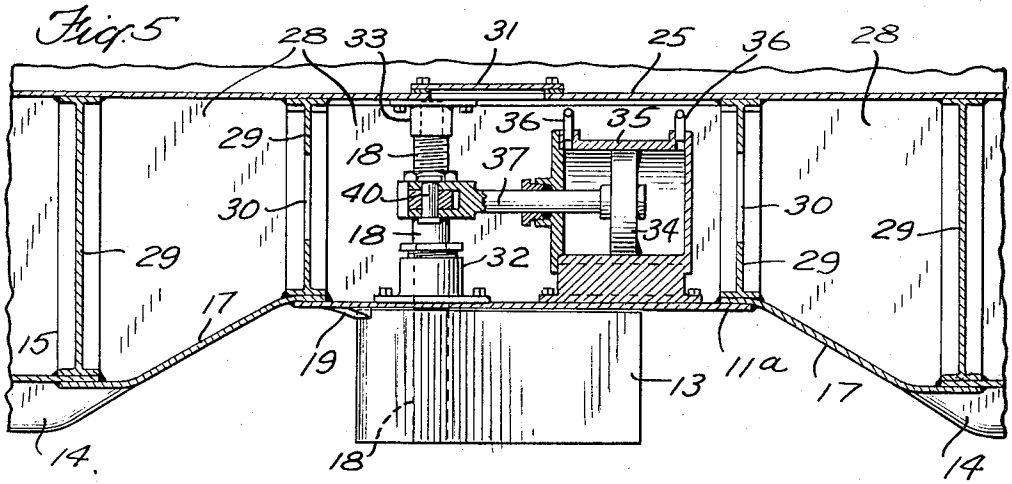


Fig. 5



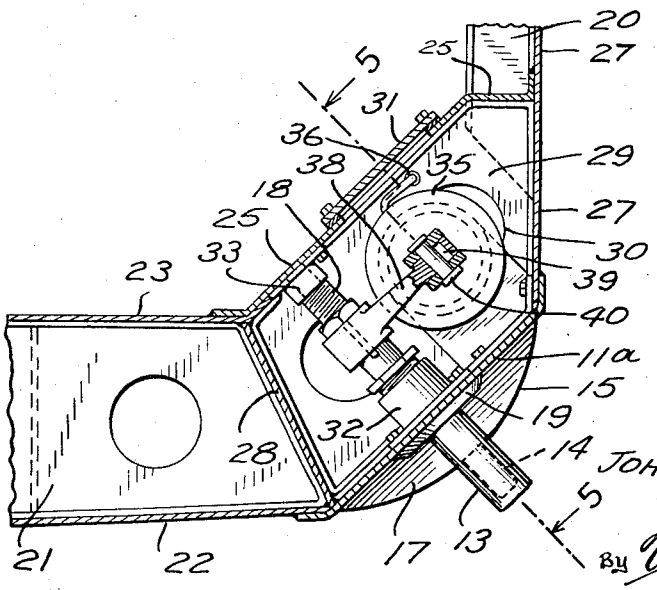


Fig. 6

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March 24, 1959 J. KJEKSTAD 2,878,772

STABILIZERS FOR SHIPS

Filed Oct. 6, 1954 3 Sheets-Sheet 3

Fig. 7

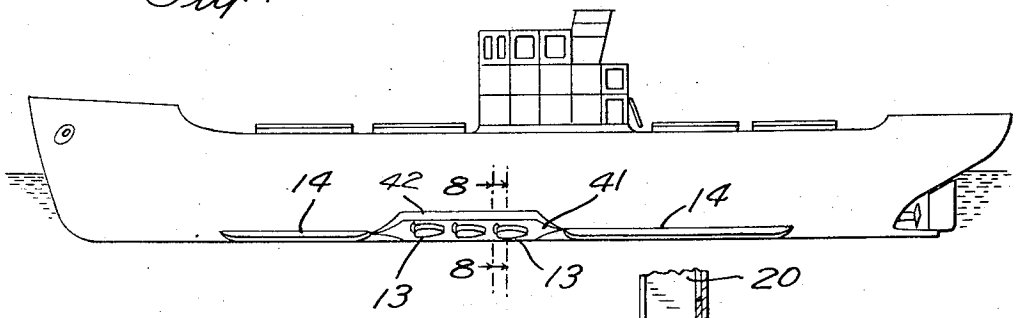


Fig. 8

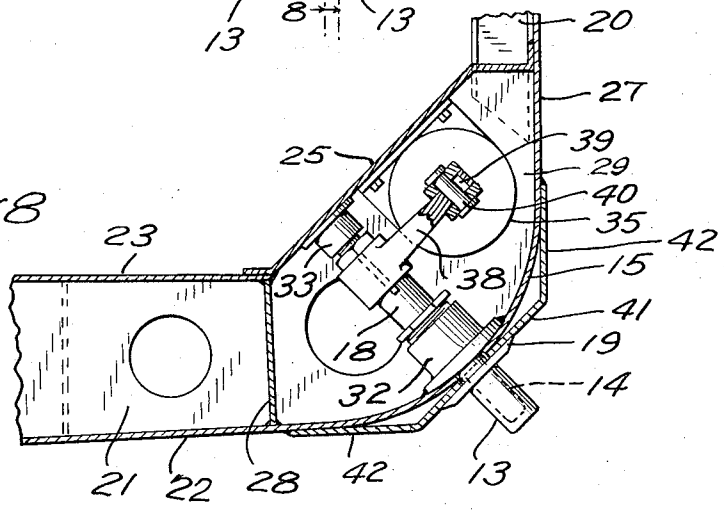


Fig. 9.

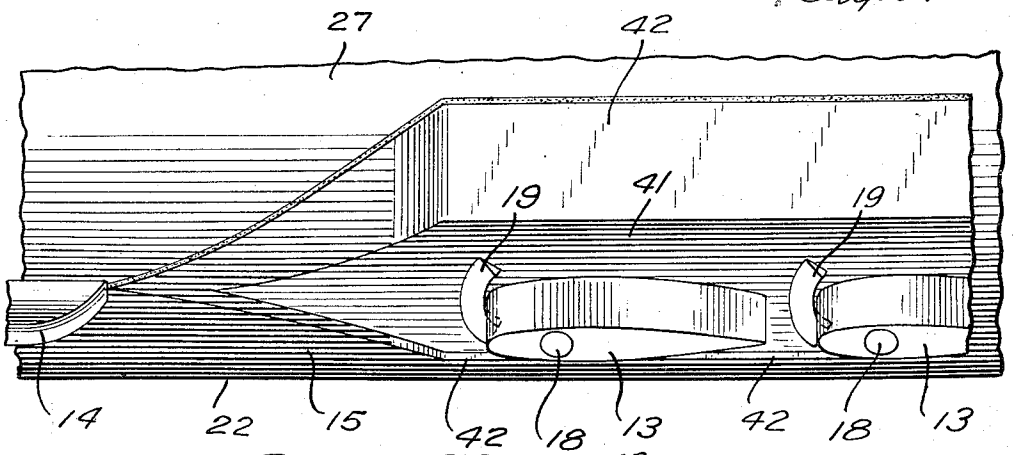
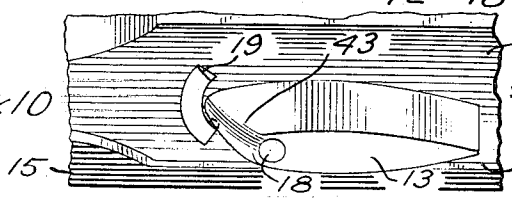


Fig. 10



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2,878,772

STABILIZERS FOR SHIPS

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Application October 6, 1954, Serial No. 460,549

2 Claims. (Cl. 114—126)

The invention relates to stabilizers of the fin type designed to counteract and at least partially neutralize the roll of ships. The use of activated fins for this purpose is well known, that is, fins which protrude laterally of the ship at or near the turn of the bilge and are mounted on stocks or shafts similar to rudder stocks so as to be angularly adjustable to vary the presentation angle. Such fins are usually of the retractable type, requiring considerable space inside the hull of the ship to house the fins and operating machinery. Such installations employ either a single fin or a plurality of fins on each side of the ship.

The single fin stabilizers are necessarily large to provide the required area for effective stabilization. Since the width of such fins of necessity is limited, their length is such as to cause them to extend a considerable distance beyond the hull lines of the ship when in operative position, with the result that they are subject to damage from foreign matters in the sea. Such damage may disable the fin so that it cannot be retracted, making it a menace to other vessels as well as to its own ship.

Among the objects of the present invention are the confining of the fins within the normal limits of the bilge keels so as to avoid interference by or damage to the fins when the ship is moored alongside a pier or is in drydock; the positioning of the fins so as to combine maximum stabilizing effect with minimum danger of damage from any cause; the minimizing of the valuable space within the hull required for housing the operating mechanism of the stabilizing fins; the minimizing of turbulence from the fins either in neutral positions or when they are tilted out of their neutral positions; the standardizing of the fins in the interests of economy so that the same type of fins may be used with vessels of greatly varying size and speed; improvement in the effective area of the fins while keeping their protrusion within normal limits of the bilge keels; the provision of stabilizing fin units of standardized sizes and weights which may be manufactured economically by production methods and which may be installed in existing ships as well as in newly constructed ships and will be economical in their original installations and in replacement of damaged fins; and the guarding of the tiltable fins from the encroachment of foreign bodies which may impair the movement of the fins.

The invention contemplates the use of relatively light weight small size stabilizing fins suitable for unit production and installation in sufficient numbers on a ship to give the necessary area for stabilization, each fin permissibly having its individual operating gear which may be automatically controlled by any suitable known servo mechanism operated, for example, by an electro hydraulic system responsive to a gyroscope, or from any suitable central control and operating unit located, for example, on the bridge or in the engine room of the ship.

More specifically the invention contemplates flattened areas on both sides at the turn of the bilge, each area

being of a size to accommodate one or more fins and the fins being mounted on oscillatable stems or shafts which extends through the flattened area normal thereto and support the fins close to the outer surface of the flattened portion. The stems may bear within the bilge and will be operated by power means which may be and preferably is located within the bilge so as not to encroach substantially upon the space within the hull. The fin thus moves with the path of its inner face in a plane proximate and parallel to the flattened area and an arcuate guard is provided on the flattened area in front of the leading edge of the fin to exclude foreign matter, such as rope, steel wire, cable, chain, etc., from entering between the flat area and the fin and fouling the fin.

The invention includes other features of construction and has other objects and advantages as will appear from the following description of embodiments of the invention shown in the accompanying drawings in which:

Fig. 1 is a side elevation of the hull of a ship equipped with stabilizing fins in embodiment of the invention;

Fig. 2 is a view similar to Fig. 1 but showing a different distribution of the stabilizing fins;

Fig. 3 is an enlarged cross sectional elevation taken on the plane of line 3—3 of Fig. 2;

Fig. 4 is an enlarged perspective of one of the stabilizing units of Fig. 2 as it is viewed from the horizontal;

Fig. 5 is a sectional oblique plan of the unit of Fig. 4 taken on the offset planes represented by the broken line 5—5 of Fig. 6 and viewed in the direction of the arrows;

Fig. 6 is a transverse vertical section taken on line 6—6 of Fig. 4;

Fig. 7 is a side elevation of the hull of a ship showing a modified form of bilge plating for the stabilizing unit;

Fig. 8 is an enlarged transverse sectional elevation on the line 8—8 of Fig. 7;

Fig. 9 is a view similar to Fig. 4 of a portion of the stabilizing assembly of Figs. 7 and 8; and

Fig. 10 is an enlarged perspective of a stabilizing assembly embodying a modified fin construction.

The number of stabilizing fins used on each side of a ship is determined by the characteristics of the ship, but for the purpose of illustration the number chosen is three. These may all be assembled on a common flattened area **10** at the turn of the bilge, as shown in Fig. 1, or they may be spaced along the bilge, each on its own individual flattened area **11**, as shown in Fig. 2. The fins **13** are mounted in immediate association with these flattened areas, as shown and as will be described.

The spaced stabilizing fin construction of Fig. 2 is selected for further detailed illustration and explanation. As shown in Fig. 3 the fins are disposed on each side of the hull, the opposing fins being oppositely tilted in known manner. In addition to the activated fins **13** the hull may be provided at the turn of the bilge with the usual bilge keel **14**.

In the construction shown in Figs. 1 to 6, inclusive, the flattened areas **11** are formed by the use of flat bilge plates **11***a* which are disposed at an angle of substantially 45° to the horizontal and set within the otherwise rounded turn **15** of the bilge as a chord of the arc of the turn. The area between the break **16** from the rounded bilge plates at the curved portions **15** of the turn and the flat bilge plates **11***a* at each end of the flat bottom recess is occupied by rounded end plates **17**. The flat bilge plates and the round end plates have marginal flanges overlapping and welded to the curved bilge plates.

The fins **13** are elongated streamlined hydrofoils to minimize turbulence and drag on the ship, the fins having each a flat edge which is disposed adjacent and in cooper-

ative relation with the respective flat bilge plate. They are mounted on posts or stems **18** which pass through the flat bilge plates **11***a* normal thereto and bear within the bilge where they are operatively connected to oscillatory power means as will be described.

The fins are disposed with their long axes at right angles to their stems and with their flat edges close to their respective flat plates **11***a* and means, comprising an arcuate guard **19** concentric with the stem **18**, is welded or otherwise secured to the flat plate **11***a* in front of each fin to exclude foreign bodies from the space between the fin and its flat plate.

The ship has the usual side frames **20** and bottom floor or deep frame plates **21**, the framing being shown as transverse although obviously the ship may be longitudinally framed. In addition to the outer bottom shell **22** there is the tank top **23** forming the usual double bottom.

A water tight compartment is formed for housing the motive mechanisms of the fins. In the case of the multiple unit arrangement of Fig. 1 this compartment will be of a size to house three motive mechanisms, while in the single unit arrangement of Fig. 2 the compartment will house a single motive mechanism.

As shown in Figs. 3, 5 and 6, the water tight compartment has the flat bilge plate **11***a* for its outer wall, and the tank top **23** is joined to the side frames **20** and plate **27** on each side by an inner plate **25** which is parallel to bilge plate **11***a*. The other two sides of the compartment are formed by the side plate **27** and margin plate **28**. The ends of the compartment are closed by bilge brackets **29** which are disposed at the same intervals as the floor or deep frames **21**, the inner ones being provided with manholes **30** to afford access to all parts of the compartment. The inner plate **25** is also provided with a manhole having a removable cover **31**.

The stem **18** has its bearings within this compartment. As shown it extends through a stuffing box **32** on the inner face of flat bilge plate **11***a* into a thrust bearing **33** on the inner face of plate **25**.

The power means for oscillating the stem **18** is a suitable servo mechanism shown as a reciprocating piston **34** in cylinder **35** which is mounted on a base on the flat bilge-plate **11***a*. The piston may be actuated by air, steam or hydraulic fluid admitted through pressure lines **36**. The tilting of the stabilizing fins may of course be effected by other servo means such as an electric motor, and operated, for example, in response to gyroscopic means which function according to both the angle and speed of roll in known manner.

The piston **34** is connected to the stem **18** through connecting rod **37** and crank arm **38** on the stem, the crank arm having a slotted opening **39** for the connecting wrist pin **40**.

Thus movement of the piston **34** is transmitted to the stem **18**, and tilts the fin **13** in the proper direction and the proper amount to counteract the roll and effectively stabilize the ship. In neutral position the fin is in line with the bilge keel but in an off-neutral position pressure, depending upon the angle of the fin and the speed of the ship, is exerted on the fin in the direction of approximately right angle to the shaft or stem of the fin and concentric to the roll axis of the ship. Due to opposite setting of the fins on the two sides of the ship, they will produce opposing moments about the axis of roll and cooperate in their stabilizing effect.

The width of the flattened areas is enough to contain the arc of movement of the trailing end of the fin in its extreme position in either direction from neutral. Therefore the fin never leaves the flat surface and the space between the fin and bilge plate throughout the length of the fin is constant in any position of the fin. No space is therefore opened up between the fin and bilge in the angular settings of the fin to cause turbulence and receive foreign bodies to foul the fin, as would be the case if it moved with respect to a curved bilge plate.

As shown by the intersecting broken lines in Fig. 3 which form virtual continuation of the side and bottom shells, the fins **13** do not project beyond the normal limits of the bilge keels and therefore do not interfere with the berthing of the ship and there is no need to retract them. Moreover the effective area of the fins is increased, as compared to fins protruding from curved bilge plates, by reason of the increase in length represented by the radial length between the curved bilge plate at the turn **15** and the chord represented by the flattened area. The recessed areas in which the fins are mounted create no appreciable turbulence.

However, instead of recessing the flattened areas, it may be desirable, especially in equipping existing ships with the stabilizing fins of the invention, to build up the flat surface on the curved turn of the bilge, as by a flat plate or bulb or blister on the rounded bilge plates. Such a construction has the advantage of economy as well as ready availability for existing ships.

Figs. 7, 8 and 9 show one way in which the flat area may be built up on the curved plates at the turn of the bilge. As shown, a plate having a flat portion **41** is secured at an angle of 45° on the curved bilge plates at the turn **15**, being provided for this purpose with lateral flange portions **42** which are welded to the side and bottom shells, the ends of the plate structure being brought to a point and curved to fit to the curved bilge plates and thus streamline the plate. The stem **18** passes through the flat plate and through the curved bilge plate into a water tight compartment within which it bears and is operated as in the previously described construction.

To minimize the likelihood of the fins catching on to foreign bodies, for example, on to the fishing nets of fishing boats and trawlers on which the fin assemblies of the invention are used, it is contemplated that the leading edge of the fins may be rounded or chamfered as shown at **43** in Fig. 10, from their clearance of the guards **19** to their outer faces, thereby streamlining the fins in their longitudinal as well as their transverse planes. This additional streamlining further reduces the turbulence caused by the fins.

Many boats such as fishing boats have a different cross sectional contour from that illustrated, being for example continuously curved from gunwale to keel without a distinct turn of the bilge from substantially flat sides to more or less flat bottoms. However it is obvious that the invention is equally applicable to such boats, the hulls having flattened areas to provide locations for the fins, such areas being of a size to embrace the travel of the fins. The turn of the bilge when used herein is intended to contemplate such areas on such boats.

Fishing boats and many other boats are commonly of wood and do not have steel plates. It will be understood, therefore, that the use of the term plates herein is intended to comprehend any type of construction of hulls. Other modifications than those shown in the drawings and above particularly described will readily occur to those skilled in the art within the principle and scope of the invention as defined in the following claims.

What is claimed is:

1. In combination with the side and bottom frames of a ship, a stabilizer for the ship comprising, in combination, a bilge having double bottom plating comprising an outer bottom shell and a tank top, a flat bilge plate connecting the outer bottom shell to the side of the ship at the turn of the bilge, an inner plate spaced from and opposing the flat bilge plate connected to the tank top and to the side of the ship, a margin plate connecting the two said plates at their sides opposite the side of the ship, thereby forming a compartment, a fin stem extending through the flat bilge plate normal thereto into the said compartment, bearings within the compartment for the stem, a fin having a flat edge and attached to the

stem with its long axis at right angles to the stem and with its flat edge cooperating with and adjacent the flat plate, and power means within the compartment operatively connected to oscillate the stem.

2. In combination with the side and bottom frames of a ship, a stabilizer for the ship comprising, in combination, a bilge having double bottom plating and a water tight compartment at the turn of the bilge having a flat bilge plate at the turn of the bilge at an angle of substantially 45° to the side and bottom of the ship and an inner plate substantially parallel to the flat bilge plate connected to the double bottom plating and to the side plating and having a longitudinal margin plate connected at its ends to bottom frames and at its upper side to the said inner plate and at its lower side to the flat bilge plate, a fin stem extending through the flat bilge plate normal thereto into the said compartment, bearings within the compartment for the stem, a fin attached to the stem

externally of and immediately adjacent the flat bilge plate, and power means within the compartment operatively connected to oscillate the stem.

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