June 9, 1936. C. M. WELLONS 2,043,276

STEERING DEVICE FOR BOATS

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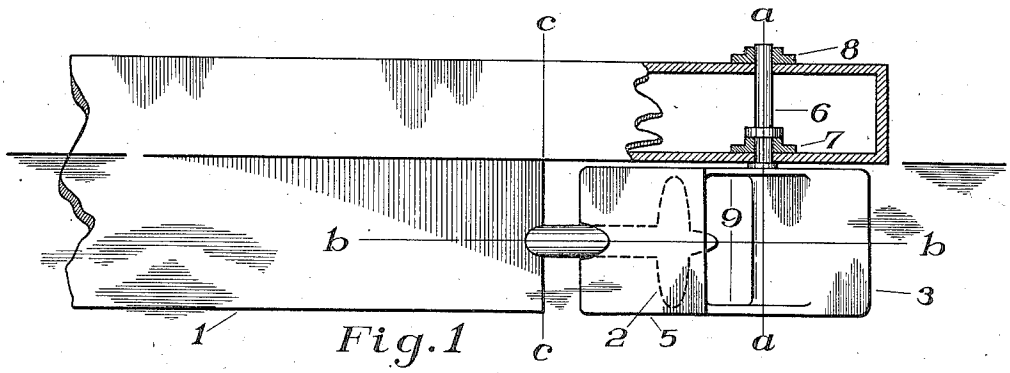


Fig. 1

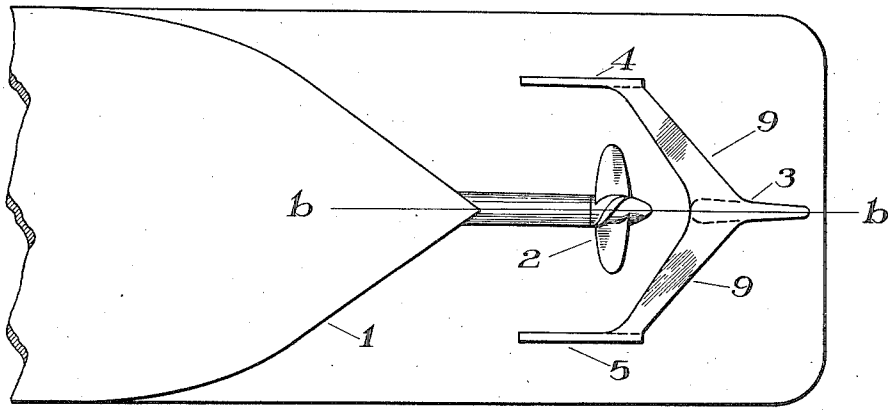


Fig. 2

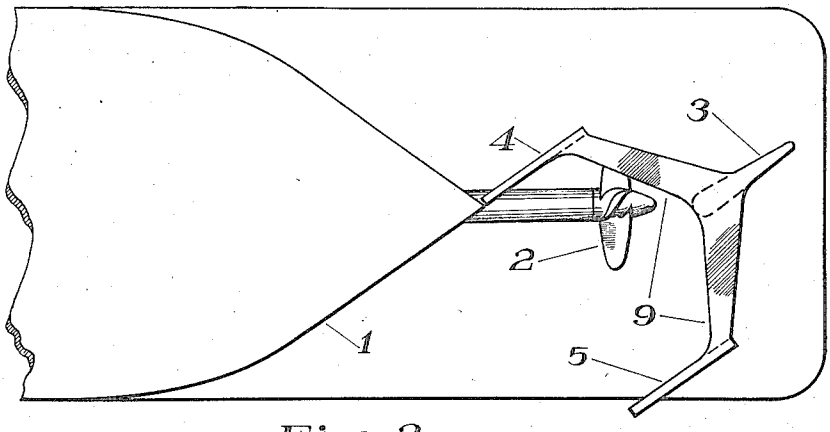


Fig. 3

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STEERING DEVICE FOR BOATS

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3 Claims. (Cl. 114—162)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention generically relates to marine propulsion, more specifically it is directed to towboats of the screw-propeller type having facilities for directing the entire propeller wash so that the maximum in energy delivered by the propeller may be utilized to produce a turning effect upon the boat and its tow.

When towboats are used in strong currents or around locks, it is important that the boat be able to exert a turning force upon the tow while checking its forward movement, a maneuver commonly known as "flanking". In the sternwheel type of towboat in common use this effect is accomplished in a fairly simple manner by placing several rudders at the stern of the boat directly ahead of the wheel where they are acted upon by the full area and force of the wash or slip stream of the wheel when backing.

In the case of a screw propeller driven boat of the usual type, it is impossible to swing a rudder immediately ahead of the propeller in such a manner as to receive and deflect the entire wash from the propeller because the propeller shaft or its encasing structure would interfere with the rotation of a rudder so placed. In certain cases however, it is desirable to use the screw-propeller type of propulsion to secure economy in construction or operation or for other reasons; therefore one object of this invention is to provide a hull and rudder construction for towboats of the screw-propeller type which will afford maximum turning effect when maneuvering.

In screw-propeller driven boats of the type commonly used for shallow draft navigation, the stern is formed by a sloping surface or rake rising from the bottom and passing over the screw-propeller and rudders. Water approaching the propeller when driving forward is drawn mainly from under the boat. Likewise, when backing the wash from the propeller is driven under the bottom of the boat. When the depth of water under the bottom of the boat is small the flow of water to and from the propeller is restricted and propulsion and maneuvering is affected. Another object of this invention is therefore to provide a shape of hull and rudder arrangement that permits the water approaching the propeller and rudder to be drawn from or discharged along the sides of the boat, thus minimizing the effect of shallow water upon maneuvering ability.

With these and other objects in view this invention consists in certain novel details of construction, combination and arrangement of parts to be more particularly hereinafter set forth and claimed.

Briefly stated, this invention consists of a rudder composed of three parallel vanes located in laterally offset planes, said rudder being rotatable about an axis in the plane of the middle vane, and mounted with respect to a screw-propeller and a hull of predetermined shape, so that when said rudder is rotated to its extreme position in either direction, one of the outer vanes and one side of the hull form a more or less continuous surface for guiding the stream of water approaching the propeller when driving ahead or leaving it when backing.

Referring more particularly to the accompanying drawing in which corresponding parts are indicated by similar characters:

Fig. 1 is a fragmentary sectionized side elevation illustrating the mounting and arrangement of my improved rudder with respect to the propeller and hull of the towboat;

Fig. 2 is a bottom plan view illustrating the rudder in its intermediate position, and

Fig. 3 is a similar view showing the rudder after it has been rotated in its extreme position in an anti-clockwise direction.

In the illustrated embodiment characterizing this invention, there is shown the after end of the hull (1), a screw-propeller (2), and a rudder (3) composed of a middle vane (3'), outer vanes (4) and (5), and a rudder stock or shaft (6), journalled in rudder stock bearings (7) and (8).

Propeller (2) may be of any type which, when submerged and rotated by the application of sufficient power, will induce or project a flow of water in a direction generally parallel to its axis of rotation. This flow is referred to herein as the wash of the propeller.

That portion of the hull which is normally submerged is shaped so that its side surfaces terminate in an intersection indicated by the line C—C, extending more or less perpendicular to the propeller shaft. An overhanging structure, which may form a part of or attached to the hull, extends aft of the intersection indicated by the line C—C and forms a support for the rudder stock a protection for the rudder and propeller as clearly shown in Fig. 1 of the drawing.

The middle vane (3') of rudder (3), is similar to and functions in the same manner as the type of rudder commonly used for steering screw-propeller driven boats. The side vanes are disposed symmetrically in spaced relation on either side of

the middle vane to which they are parallel and rigidly attached by suitable arms (9). The rudder thus formed is mounted upon and secured to the rudder stock (6), which is arranged to rotate in bearings (7) and (8), which are in turn secured to the overhanging portion of the hull (1). The axis of the rudder stock, indicated by the line *a—a*, intersects the axis of the propeller shaft, indicated by the line *b—b*, and is parallel to the intersection of the sides of the under-water portion of the hull, as clearly shown in Fig. 1 of the drawing.

With this arrangement it is evident when the rudder is rotated in a counter-clockwise direction to its extreme position as shown in Fig. 3, the forward edge of the vane (4), is in contact with the intersection *c—c* and the inboard side of the said vane forms a surface more or less continuous with the starboard side of the hull. Similarly, when the rudder is rotated in a clockwise direction the inboard side of the vane (5) forms a more or less continuous surface with port side of the hull.

When the propeller is driving ahead and when the rudder is in the position shown in Fig. 3, water will be excluded from approaching the propeller from the port side, that is to say, the side toward the top of the drawing, and will be drawn from the starboard side, or side toward the bottom of the drawing. Also, water projected aft from the propeller will react upon the middle vane (3'). Both effects act to force the stern of the boat toward the starboard side, thus producing a clockwise turning effect upon the boat. When the propeller is operated to back the boat, water is directed to the propeller from the port side by the vanes and the water projected from the propeller reacts upon the vane (4) and the after portion of the starboard side of the hull. Both of these effects act to produce a counter-clockwise turning effect upon the boat. When the rudder is rotated to its extreme position in the opposite direction, effects that are similar but opposite in direction are produced. When the rudder is rotated to positions intermediate between its extreme and central positions and the propeller is rotated to produce a flow of water relative to the hull and rudder, the turning effects similar to but of lesser force than those described above, are produced.

In the preceding description, the rudder vanes (3), (4) and (5) have been referred to as though they were plane surfaces. While this is the ideal conception, it is to be understood however, that the vanes are to have such thickness and curvature of surface as may be necessary for structural and/or hydraulic reasons.

In the light of the foregoing description, it will be apparent that by virtue of the action of the outer vanes in directing the approach of the water to the propeller, a boat equipped with my invention will have greater steering ability when driving ahead than one equipped with the common device of a single rudder placed aft of the propeller. It will also be evident that when backing, the entire wash of the propeller may be deflected upon the relatively inclined surface formed by the outer rudder vane and the side of the hull, thus obtaining the maximum turning force available from the energy imparted to the flowing water by the propeller. Also it may be readily seen that water may flow freely to or from the propeller from either one or both sides of the boat at all times, irrespective of the depth of water under the bottom of the hull.

Although in the foregoing certain elements have been described as best adapted to perform the functions alloted to them, nevertheless it is to be understood that various minor changes may be resorted to within the scope of the appended claims without departing from or sacrificing any of the principles of this invention.

Having described my invention, what I claim as new and wish to secure by Letters Patent is:

1. In a boat of the screw-propeller type, the combination with a hull formed with underwater surfaces, the latter converging inwardly toward the stern to an intersection on a line lying in a vertical plane and central of the hull, and a propeller disposed to the rear of and having its axis of rotation normal to the plane of said line of the intersection, of a multi-vane rudder located immediately behind the propeller and comprising a middle vane rotatable about an axis longitudinally aligned with and parallel to that of the line of the intersection of the underwater surfaces, and a pair of forwardly and laterally off-set outer vanes disposed in parallel relation whereby rotation of the middle vane about its axis will place the forward edge of one of the outer vanes in juxtaposition with respect to the intersecting line of the underwater surfaces to form a continuation of one of said surfaces and screen the propeller from water flowing along one side of the hull while directing the water flowing along the opposite side to and from the propeller through a restricted channel.

2. In a boat of the screw-propeller type, the combination with a hull formed with a flat-bottom overhang and having its underwater surfaces inwardly converged toward the stern to an intersection on a line located in a plane normal to the bottom of the overhang and central of its opposite sides, and a propeller to the rear of and having its axis of rotation normal to the intersecting line of said underwater surfaces; of a multi-vane rudder located immediately behind the propeller and comprising a middle vane rotatable about an axis disposed in a plane longitudinally aligned with and parallel to that of the intersecting line of the underwater surfaces, and a pair of forwardly and laterally offset outer vanes disposed in parallelism with their upper edges disposed immediately beneath the flat bottom of said overhang whereby rotation of the middle vane about its axis will place the forward edge of one of the outer vanes in juxtaposition with respect to the intersecting line of the underwater surfaces to form a continuation of one of said surfaces and screeen the propeller from water flowing along the opposite side to and from the propeller through a channel defined by the bottom of the overhang and the outer vanes of the rudder.

3. In a boat of the screw-propeller type, the combination with a hull formed with a flat-bottom overhang and having its underwater surfaces converged inwardly toward the stern to an intersection on a line located in a plane normal to that of the bottom of the overhang and having its axis of rotation normal to the intersecting line of the underwater surfaces; of a multi-vane rudder situated immediately behind the propeller and comprising a middle vane and forward and lateral off-set outer vanes, the latter being disposed in planes parallel with each other and with said middle vane and having their upper edges disposed immediately beneath the bottom of the overhang and their lower edges conincident with those of the underwater surfaces, said middle vane

being rotatable about an axis located in a plane longitudinally aligned with and parallel to the line of intersection of said underwater surface whereby rotation of the middle vane about its axis will place the forward edge of one of the outer vanes in juxta-position with respect to the intersecting line of the underwater surfaces to form a continuation of one of said surfaces and to screen the propeller from water flowing along one side of the hull while directing the water flowing along the opposite side to and from the propeller through a channel defined by the bottom of the overhang and the outer vane of the rudder.

CHARLES M. WELLONS.