Nov. 16, 1937. A. E. LUDERS 2,099,492

BOAT

Filed May 9, 1935 2 Sheets-Sheet 1

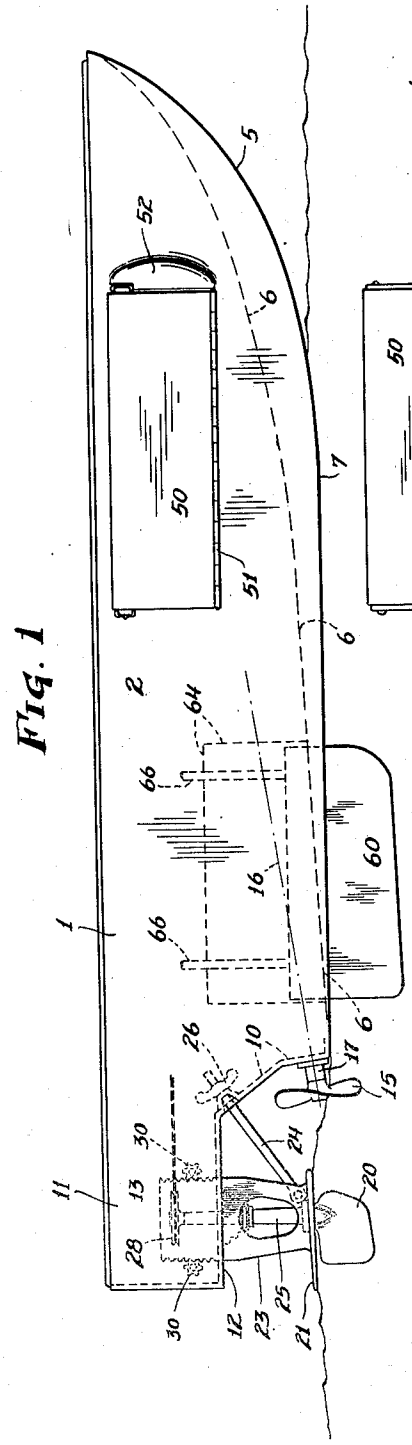


Fig. 1

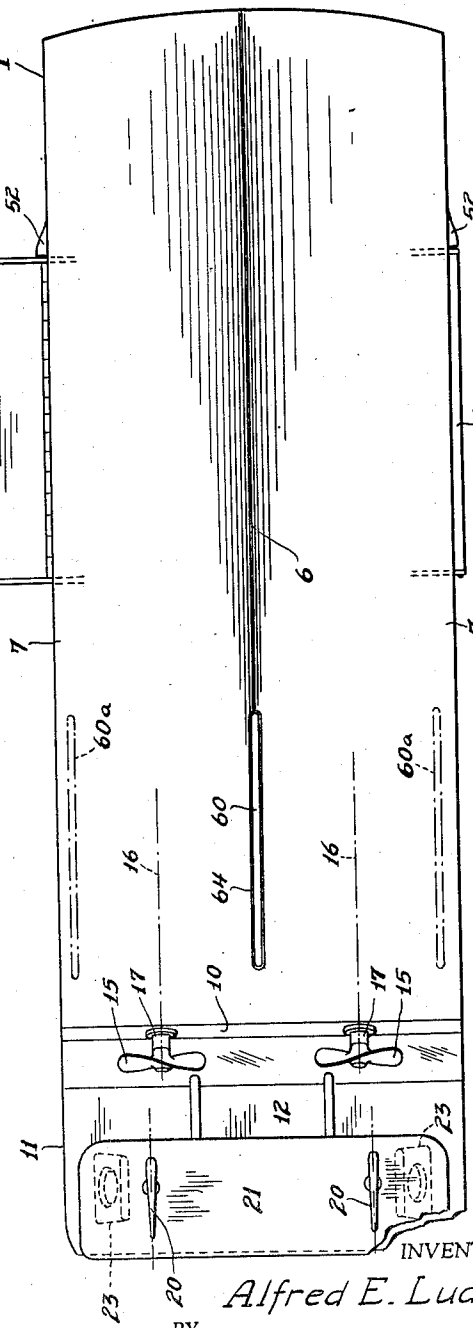


Fig. 2

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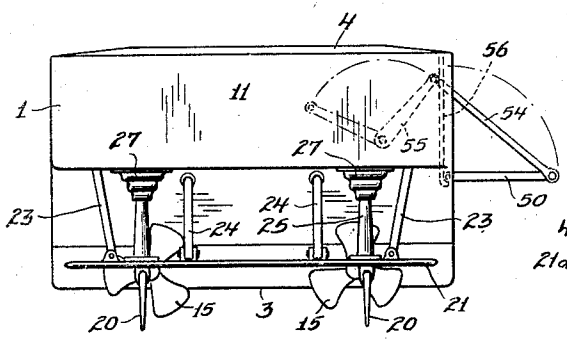


FIG. 3

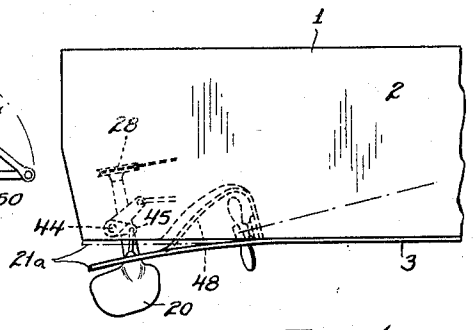


FIG. 6

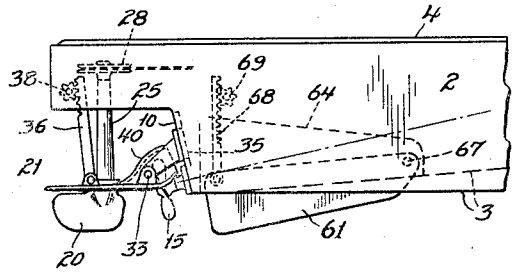


FIG. 4

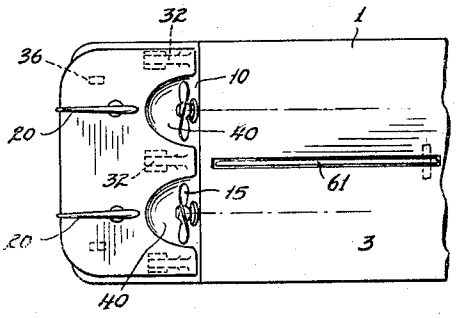


FIG. 5

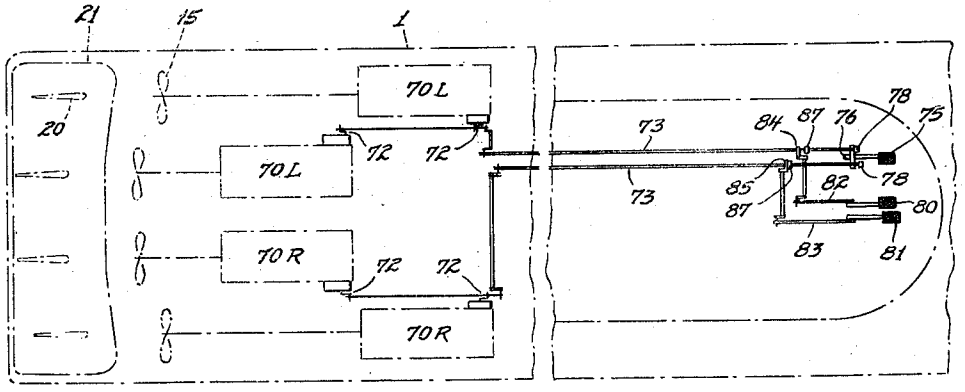


FIG. 7

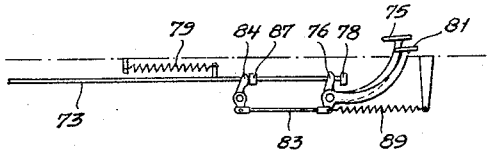


FIG. 8

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2,099,492

BOAT

Alfred E. Luders, Stamford, Conn.

Application May 9, 1935, Serial No. 20,585

10 Claims. (Cl. 114—66.5)

This invention relates to power-driven boats, particularly of the high-speed hollowed-bottom type, adapted to ride nearly on top of the water, or at least having greatly reduced draft at high speed.

Boats of the character mentioned are not as easy to maneuver and control as power-driven boats of more conventional types, and one object of the invention is to provide a boat of the high-speed inverted V-bottom type having improved steering capabilities, as well as provision for preventing yawing in rough weather and upon turning of the boat to steer it. In line with the above, a specific object is to provide an improved steering arrangement for boats of the stern-driven high-speed type. A further object is to provide an improved steering mechanism in conjunction with a semi-submerged propeller. A further object is to provide an improved speed boat with facilities particularly adapted for rescue work.

Still another object is to provide an arrangement facilitating the installation of propeller shafting particularly at the stern transom of a speed boat, and incidentally to improve the hull of a speed boat for sternwise movement in the water.

Another object is to provide an improved control for motor-driven boats, particularly where right and left-hand propellers are used, so that the motors may be independently accelerated and decelerated for synchronizing the driving effect of the various motors, either for maintaining a straight-ahead course or to assist in steering on a turn.

Other objects and features of the invention will become apparent from the following description, relating to the accompanying drawings, showing the preferred forms. The essential characteristics are summarized in the claims.

Referring briefly to the drawings, Fig. 1 is a side elevation of a boat incorporating certain of the improvements hereof; Fig. 2 is a bottom plan view of the same; Fig. 3 is a rear elevation of the boat shown in Fig. 1; Figs. 4 and 5 are respectively fragmentary side elevation and bottom plan views of a boat incorporating modified forms of the invention; Fig. 6 is a fragmentary side elevation of a boat showing a further modified stern arrangement; Fig. 7 is a diagrammatic plan view of a boat, illustrating one form of control arrangement for boats having a plurality of motors, and Fig. 8 is a detail view of a portion of the motor control mechanism.

In the various figures the hull 1 illustrated is of the parallel-sided inverted V-bottom type, the side walls being indicated at 2, the bottom wall at 3, and the deck at 4. The bottom and side walls curve upwardly toward the bow in sled form, as indicated generally at 5. The inverted V bottom (if used) forms a central keel at 5 and chines at 7, and it will be seen that while, forwardly, the keel line is well above the chine lines, the former gradually approaches the chine lines near the stern, as shown particularly in Fig. 1, this resulting from a gradual increase in obtuseness of the angle of the V bottom toward the stern. The bottom surface may be greatly modified; for example, it may be cylindrically or otherwise concave or two or more concavities may be formed side by side.

The stern of the boat is closed by a transom wall 10, and rearwardly from the transom, above it, the hull is extended at 11, forming a hollow cantilever beam having a bottom wall 12, and side walls 13 preferably forming continuations of the side walls of the hull. The transom wall 10 inclines upwardly and rearwardly, at least adjacent the water, to facilitate installation of the propeller shafting, as will later be shown, as well as to improve the maneuverability of the boat in backing up.

The propellers 15, of which there may be any suitable number, are supported on suitable propeller shafts, the axes of which are indicated at 16, the same being downwardly and rearwardly inclined to facilitate disposal of the driving motors within the hull. The propellers are preferably of the semi-submerged type, so as to decrease impingement of the water on the less efficient central portions of the propellers and on their central supporting hubs. Normally, of course, the propellers are practically submerged, but at high speed, when the boat actually rides on the chines, only the outer portions of the blades enter the water, as illustrated in Fig. 1.

The axes of the propeller shafts being inclined for the above stated purpose, the transom wall 10, as shown in Fig. 1, is made substantially perpendicular to the propeller shaft axes, so that the rear supporting bearing brackets 17 may have their surfaces, which are adapted to supportingly engage the transom, normal to the axes of the shafts, thereby facilitating machining of the brackets, as well as permitting them to be mounted on the transom wall in any turned position. The rearwardly and upwardly inclined transom wall also assists in maneuvering the boat rearwardly because it creates less spray, having a tendency to ride over the water.

The rudders, indicated at 20, are preferably

substantially in line with the propellers and correspond in number thereto. They may be positioned as shown in Fig. 2, slightly out of alignment with the propeller shaft axes, or in line therewith, as shown in Fig. 5.

An important feature of the invention resides in the provision of water deflecting surfaces or planes disposed to overhang the rudders. One form of carrying means for such surfaces is indicated at 21 in Figs. 1 and 2 in the form of a plate. A single plate 21 is there shown, which may be co-extensive laterally with the hollow beam 11 and/or the hull or any portion of either.

Any suitable rigid or adjustable support may be provided for the plate 21, and, as shown, there are rigid vertical supports 23, one at each side, and preferably inclined laterally, say as shown in Fig. 3, for lateral bracing and, in addition, there are suitable struts 24 connecting say the forward portions of the plate 21 to any suitable portion of the hull,—as to the transom. As shown, the supporting members 23 and 24 are adjustable, so that the plate may be raised and lowered with relation to the surface of the water and likewise inclined at any suitable angle of incidence relative thereto. Adjustments may be effected during operation of the boat if desired, or the plate may be initially set in the most efficiently operating position for the average speed of travel of the boat.

The rudders 20 are carried on the plate 21 and the rudder shafts (not shown) may have suitable tubular housings as shown at 25, rigidly mounted on the plate and extending upwardly through a suitable enlarged opening in the bottom wall 12 of the overhanging hollow beam 11. Such enlarged opening is provided only when adjustment of the plate to tilt it is contemplated, as by manipulation of suitable adjustment means 26 on the struts 24. A flexible boot 27 may be provided for each rudder shaft housing 25, secured in suitable fashion over the opening in the lower wall of the extension or hollow beam 11. The rudder control is illustrated conventionally at 28.

Suitable means for adjusting the plate supporting members 23 vertically may comprise rack and pinion couples conventionally shown at 30 in Fig. 1, the rack teeth being carried on the upward extensions of the supporting members 23 which project inside of the beam 11.

The operation of the plate 21 varies, depending upon the position of the plate with reference to the water back-washing from the propellers. In the position illustrated in Fig. 1, the lower surfaces of the plate 21, crowd the water driven back by the propeller against the side surfaces of the rudder therebeneath, so that steering, which is noticeably bad on the type of boat illustrated, is much more positive and rendered much more effective in maneuvering the boat.

It may be mentioned that the rudder blades may be set at whatever angle is found most effective for a particular design of boats, either to facilitate steering or to maintain the central vertical plane of the boat at the proper angle in making turns. The plate or plates 21 may be positioned at any desired distance from the propeller and may, in fact, as will be hereinafter shown, form actual continuations of the bottom surfaces of the boat, in which case suitable clearance space is provided for the propellers.

Figs. 4 and 5 illustrate that the plate member or members 21 may be attached at its or their forward end or ends to the transom wall 10. As shown, the attachments comprise longitudinally extending brackets 32 disposed laterally of the propellers, as illustrated in Fig. 5, three such brackets being shown. The outer ends of the brackets may be pivoted to the plate member 21 as at 33, and the brackets themselves may be substantially vertically adjustable as on slideways conventionally illustrated at 35, in which the brackets may be suitably locked after adjustment. This arrangement permits the plate member 21 to be adjusted not only to various elevations with relation to the water, but also to be disposed at various angles of incidence relative to the water. Additional supports for the plate 21 may comprise strut elements 36, the upper ends of which may be provided with rack teeth for operation to vertically adjust the plate in cooperation with suitable pinions, conventionally illustrated at 38.

Since portions of the propellers extend above the general plane of the plate 21, suitable openings are necessarily provided to clear them, and if it is desired to deflect all of the water that is driven rearwardly by the propellers to beneath the surfaces of the plate, the propellers may be shrouded by forwardly extending portions 40 of the plate, these having under surfaces directed generally toward the rudders 20, and being preferably either generously curved or rearwardly inclined at such an angle as will not create excessive back pressure.

A further modification of the above described arrangement is shown in Fig. 6, wherein the plate member 21*a* comprises literally an extension of the bottom 3 of the boat. It may be assumed that the material forming the bottom is of flexible nature, as wood or spring metal, and that from a point approximately adjacent the propeller, this flexible bottom plate is disconnected from the hull proper and that the hull has an inner bottom wall underlying the disconnected plate portion. Suitable adjustment means for the plate portion 21*a* may comprise a rock shaft 44, having an arm 45 connected with the plate as by a suitable link, said arm and link being provided with a suitable housing effect (not shown) inside the hull.

The flexible plate has suitable openings to receive the propellers and allow them to dip into the water therebeneath, and these openings may be provided with upwardly extending walls, as at 48, forming shrouding housings for the propellers, as desired. For less resistance to forward movement, the hull may be cut away above the flexible plate, say in the manner shown in Fig. 4, in which event the shrouding for the propellers would preferably be omitted.

The normal position of the flexible bottom member 21*a*, is indicated in broken lines in Fig. 6, and the position thereof, when operating, say at low speed to raise the stern, is illustrated in full lines. In either case, the operation is the same as above described, namely, to crowd the wash of the propellers into operating contact with the rudder surfaces, and thus effect better steering.

It should be mentioned that in any forms of plate members 21, these members may be used to assist in maintaining the boat on an even keel fore and aft. It is well known that speed boats of practically all types have a tendency to ride high at the bow, particularly at low speeds. The plate members 21 may be adjusted during operation so that even at low speed an even keel may be had,—in other words, the boat may be made to ride level at any speed. The arrangement, particularly in forms similar to that illustrated in Figs. 1 and 2, may also be used to purposely depress the aft

portion of the boat in the water if this is desired for any purpose, as in making a quick turn.

When a boat of the type shown is used for rescue work, say in relieving the predicament of a stranded seaplane or distressed small boat or raft, it is exceedingly difficult to rescue injured persons and personnel from nearby water level on account of the high freeboard of the boat. I therefore provide rescue platforms, such as shown in Figs. 1 and 2, at **50**, hinged at their lower edges as at **51** to the side walls of the boat. These are preferably located near the bow, and when not in use are folded inwardly and upwardly against the bow, as illustrated in Fig. 1, and at the lower portion of Fig. 2. The platforms in their inoperative positions may be flush with the side wall surfaces, or wood or metal deflectors **52** may be provided forwardly thereof in case the side walls are not recessed to receive the platforms. Any suitable supports for the platform may be provided in addition to the hinges; for example, pairs of brackets, rods, bands or struts. A suitable strut is illutrated at **54** in Fig. 3, the upper end being connected with say an adjustable arm **55** inside the hull and operable say by a suitable rock-shaft and hand wheel (not shown) for raising and lowering the platform. Fig. 3 indicates at **56** the manner in which the side wall may be recessed, so that the platform swings flush with the boat side in the non-operating position.

In order to improve handling of the boat having the type of hull shown, this being unusually difficult in a following or cross-sea, I propose to install a raisable plate of suitable material, such as wood or metal, in the bottom, preferably adjacent the stern and ahead of the transom, one form of such plate being illustrated at **60** in Figs. 1 and 2, and another being illustrated at **61** in Figs. 4 and 5. The plate may be mounted in a suitable recess illustrated in dotted lines at **64**, in which recesses the plate **60** or **61** may fit reasonably loosely so that the plate will move freely notwithstanding the presence of water in the recess.

Suitable adjustment means for the plate **60** (Fig. 1) may comprise rods **66** with appropriate operating means within the hull, (not shown) adapted for raising and lowering the rods to adjust the plate in accordance with the condition of the sea. In Fig. 4, the plate **61** is shown as pivoted at **67** at one end, the opposite end being provided with raising means, including, as illustrated, a rack bar **68** and a pinion **69** within the hull and above the recess.

Any suitable number of such plates may be provided, and the location is determined by the nature of the bottom of the boat. The plate **60**, as illustrated in Fig. 2, is at the keel line, but two of such plates may be provided, for example, as illustrated in dot and dash lines at **60***a*. The plate or plates may be located at any intermediate point as well.

Referring now particularly to Figs. 7 and 8, Fig. 7 shows, diagrammatically and in plan, a boat provided with four propellers **15**, and respective motors which are diagrammatically indicated at **70R** at one side and **70L** at the opposite side. Assuming the motors **70R** rotate their propellers to the right and **70L** to the left (in order to balance the steering effect and driving action on the water), I propose to control these motors so that the right-hand turning propellers may be accellerated or retarded, as desired, with respect to the speed of the left-hand turning propellers.

Assuming that all of the motors have control arrangements, such as carburetor throttles and levers, and for spark control arrangements when necessary, the general position of which parts is indicated at **72**, in each case all of these throttle control parts of each pair of motors may be linked together and to respective operating rods **73**, extending to the helmsman's position in the boat. The connections from the throttle e. g. control parts **72** to the respective rods may be permanent and comprise the usual rock shafts and levers common in internal combustion motor design; it being therefore unnecessary to illustrate such in detail.

Assuming a foot control at the helmsman's position is desired, a suitable foot pedal **75** may be coupled with the control rods **73**, as by rock arms **76**. The couplings may comprise sliding connections, including abutment members **78** on the rods, which the arms **76** simultaneously engage when the pedal is depressed, the rods being returned after actuation, to idle the motors, by suitable springs, one being shown at **79**, Fig. 8. This arrangement operates to control both rods **73** for simultaneous acceleration and deceleration of all the motors, but in the event any accident occurs the boat is automatically decelerated when foot pressure on the pedal is relieved.

Now, in order to selectively control the motors on either side for accelerating or decelerating them with reference to the motors on the other side, the helmsman may be provided with auxiliary pedals, as at **80** and **81**, these being coupled with the respective control rods **73**, as by links **82** and **83** and suitable rock shafts having respective arms **84** and **85**. These arms operate the rods **73** in one direction only by engaging respective abutments **87** on the rods, so that the depression of the pedal **80** operates only the left-hand control rod **73** and depression of the pedal **81** operates only the right-hand rod, and does this irrespective of the position of the pedal **75** normally controlling both rods. The helmsman may thus selectively accelerate one set of motors by rocking one foot from one of the pedals (**80**, **81**) to the other, meanwhile maintaining the speed of the other set of motors by means of his other foot on the pedal **75**. The auxiliary pedals **80** and **81** and linkage thereof may have individual return springs, as at **89**, Fig. 8, for returning the auxiliary pedals to raised position.

I contemplate that a similar arrangement may be provided so that the main throttle and/or spark controls are hand-actuated, or, similarly, the auxiliary controls may be hand-actuated. Also, one part of the system may be hand-actuated and the other adapted for foot actuation, or all hand operated.

I claim:

1. In a boat of the sled type, having a propeller disposed aft of the hull with its axis substantially at normal water line at high speed, a plate disposed rearwardly from the hull adapted to contact with the water in the wake of the boat, a rudder disposed beneath the plate aft of the propeller, and an opening in the plate normally embracing the propeller.

2. In a boat having a hull of the sled type and a semi-submerged propeller disposed aft, a rudder in the wake of the propeller and adjustable means supporting the rudder and having an under surface substantially merging with the bottom surface of the boat and extending aft of the propeller into overhanging relation with the rudder.

3. In a boat having a generally flat bottom near the stern, a transom, and a propeller sup-

ported by the transom and having blades which are partially submerged in the water in the wake of the boat, a plate disposed to contact with the surface of the water rearwardly from the transom, means to adjust the plate in a manner to change the angle of incidence between the plate and such surface, and a rudder carried by the plate underneath the same.

4. In a boat having a generally flat bottom surface near the stern, propulsion means rearwardly from said surface, a plate disposed rearwardly from the propulsion means and substantially in the plane of said surface, a rudder supported by the plate beneath the same and means for adjusting the position of the plate with reference to the water.

5. In a speed boat, having a stern transom and a propeller adjacent thereto, a beam overhanging the water rearwardly from the transom, a plate secured to the beam and disposed in a generally horizontal plane therebelow and adapted to engage the water in the wake of the propeller, and a rudder carried by the plate on its under side.

6. In a speed boat of the class described, having stern propulsion means, the hull of the boat having a transom, a hollow beam rearwardly overhanging the transom above the water, a plate suspended beneath the beam and adapted to contact with the water aft of the transom, said plate carrying a rudder on its underside, and means projecting upwardly from the plate and connected with the rudder, said means extending within the hollow beam for controlling the position of the rudder to steer the boat.

7. In a boat of the type having a substantially flat aft lower surface, a propeller and a rudder in the wake thereof, water deflecting means aft of the hull and substantially in the plane of its lower surface, said means having a surface overhanging the rudder at least on one side thereof to crowd the water delivered by the propeller against one of the steering surfaces of the rudder, a portion of said means overhanging the propeller, the under surface of said portion merging with the aforesaid surface which overhangs the rudder.

8. In a boat of the type having a generally flattened bottom adapted to ride on the water surface at high speed, a stern propeller and a rudder in the wake of the propeller, a stern-elevating plane overhanging the rudder and having its front edge substantially at the level of the center of the propeller and substantially in line with said flattened bottom, arranged to crowd the water delivered from the propeller against one of the steering surfaces of the rudder.

9. In a speed boat of the type having a semi-submerged propeller disposed aft and a relatively wide substantially flat bottom portion at the stern whereby the boat tends to plane on the water surface at high speed, generally horizontally disposed means substantially in line with said bottom portion and behind the propeller, said means acting to plane on the water surface and crowd downwardly the water delivered by the propeller at the high speed of the boat.

10. In a boat, the combination of a hull of the inverted V-bottom type, a propeller, a rudder in the wake thereof, and water deflecting means behind the propeller, arranged to contact with water which normally rises aft of the stern when the boat is driven forwardly, said means overhanging the rudder on one side thereof in a manner to crowd the water delivered by the propeller against the steering surface on the same side of the rudder.

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