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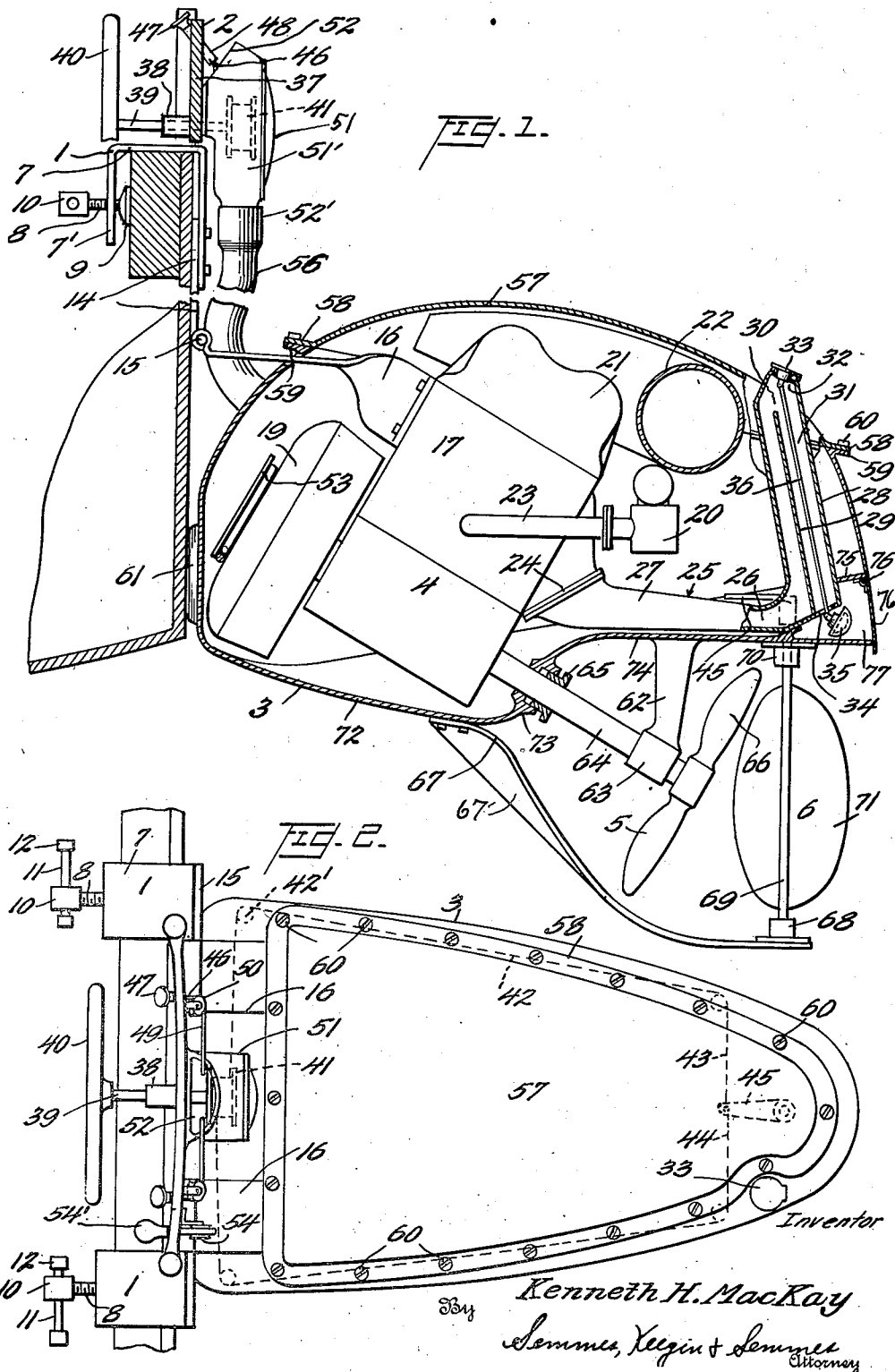
K. H. MacKAY

2,216,496

MARINE PROPULSION ASSEMBLY

Filed July 29, 1938

3 Sheets-Sheet 1



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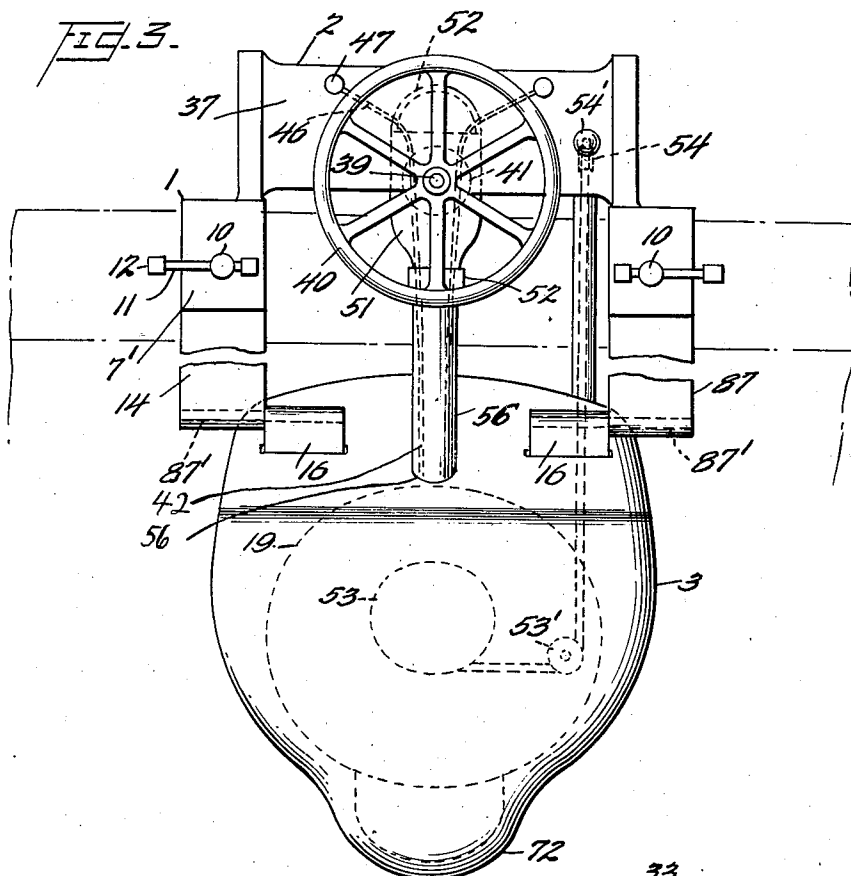
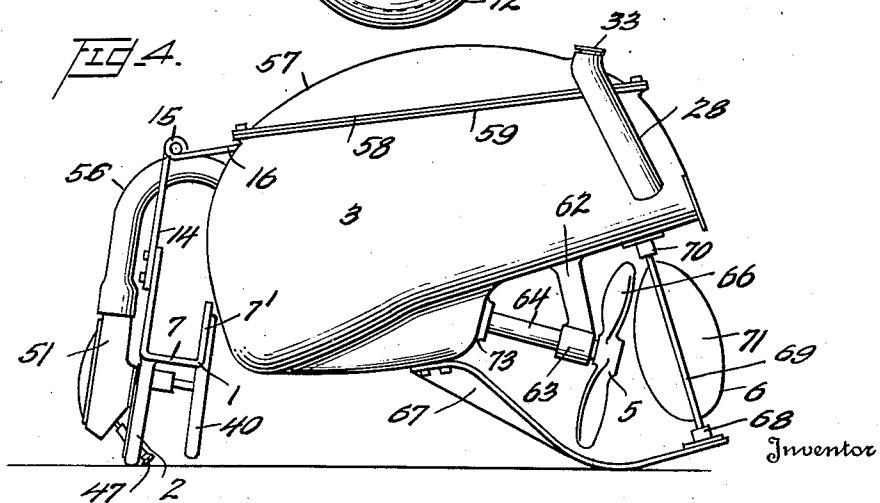
K. H. MacKAY

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MARINE PROPULSION ASSEMBLY

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3 Sheets-Sheet 2



Kenneth H. MacKay

By Lemmer, Keegin & Lemmer  
Attorney

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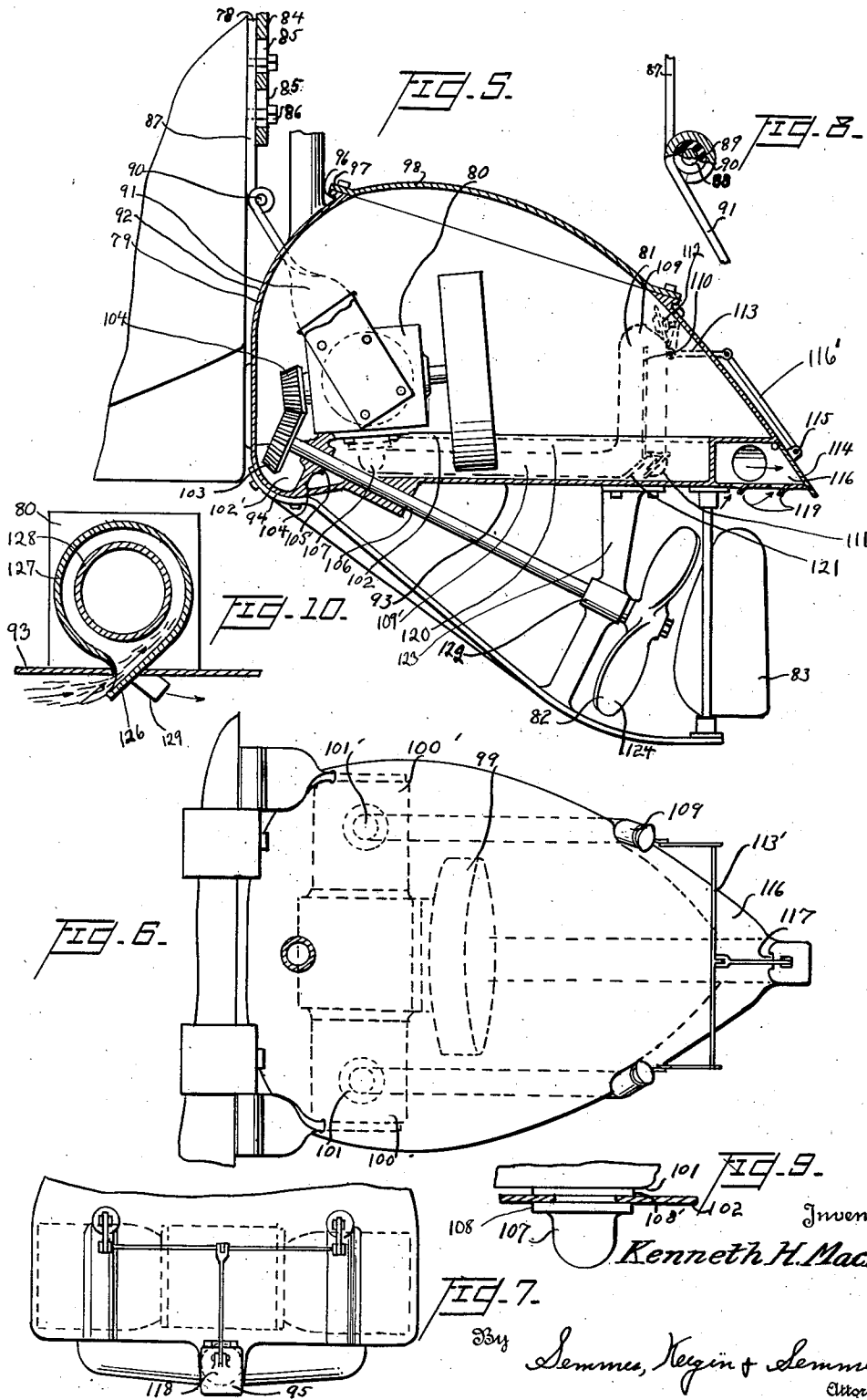
K. H. MacKAY

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MARINE PROPULSION ASSEMBLY

Filed July 29, 1938

3 Sheets-Sheet 3



Inventor  
*Kenneth H. MacKay*

By *Semmes, Nevin & Semmes*  
Attorney

## UNITED STATES PATENT OFFICE

2,216,496

## MARINE PROPULSION ASSEMBLY

Kenneth H. MacKay, Ocala, Fla.

Application July 29, 1938, Serial No. 222,028

6 Claims. (Cl. 115—18)

My invention relates to marine propulsion apparatus, and more particularly to those powered by internal combustion engines, forming with the marine propulsion apparatus a unit readily detachable from the craft it is adapted to propel. One embodiment of the class to which my invention relates is the well known outboard motor, which term will be used to designate the class, although my construction differs in a marked respect from and possesses many advantages over the conventional outboard motor.

In the past the use of outboard motors for propelling water craft has been beset by difficulties greatly diminishing its inherent advantages over the inboard type of power and propulsion mechanism. The present outboard motors are subject to certain disadvantages now to be set forth.

Past outboard motors have released fumes into the air next to the passengers in the boat. Hot cylinder heads and exhaust pipes have been exposed for radiation and connection of heat to the passengers and for direct contact by them. Excessive noise has been transmitted to the passengers due to lack of shielding.

Efforts in the past to overcome, by shielding, fume, heat, and noise discomfort have merely resulted in new difficulties especially that of overheating the shell formed by the shielding. Past efforts to accomplish cooling of the exhaust heated parts by placing them in close proximity to the surface of the water have resulted in excessive resistance to passage through the water or danger of swamping.

Outboard motors as formerly constructed have caused either a raising of the center of gravity for the boat and motor, or a greatly increased drag in the water.

Former outboard motors have, when suddenly tilting upward over obstacles beneath the boat, subjected the person sitting nearby to the danger of being bruised or burned by contact with the power unit. Formerly marine installations of under water exhaust with an exhaust pipe below the surface of the water have been troubled by entry of water into the cylinders through the exhaust pipe, either through siphoning by the contraction of hot gases or through wave action. In the past, outboard motors have excessively transmitted vibrations to the boat because of too rigid a mounting and because there was insufficient weight of the outboard motor unit adjacent the propeller.

One of the objects of my invention is to overcome the above mentioned defects.

Another object of my invention is to provide an outboard motor, one portion being a compact unit combining power and propelling functions and adapted to lie on the surface of the water with the propelling mechanism below and the power mechanism at least partially above the water surface.

Still another object of my invention is to provide an anti-cavitation plate and cylinder jacket construction adapted to lie in contact with the water surface while maintaining its major portion above such water surface.

Yet another object of my invention is to provide a construction for enabling scoop-feeding of water in quantity sufficient to supply water to both the cylinder jacket construction and to the major portion of the exhaust pipe including that portion adjacent the cylinder jacket, thereby enabling the exhaust to be cooled markedly before reaching the outlet of the expansion chamber.

Still another object of my invention is to provide an exhaust line adapted to terminate below the surface of the water with means for preventing entry of water into the cylinders while the motor is still, and a vent above the water line adapted to relieve back pressure before the motor has acquired operating speed.

Yet another object of my invention is to provide a means of adjustably attaching the power and propelling mechanism to such a support as the transom of a boat, whereby adjustments enable the power and propelling mechanism to be placed at the right height in relation to the surface of the water, regardless of the height of the support above the water surface.

A further object is to provide a bracket support for removably attaching the power and propelling mechanism to the craft to be propelled, a portion of the bracket support being pivotable in relation to said mechanism, said support being adapted to form a tripod-like base with the lowest portion of said mechanism, and said mechanism being pivotable upward in relation to the bracket support when said support is attached to the craft, and the shape of the bottom of said mechanism being adapted for riding up over an obstacle.

A still further object of my invention is to provide a control panel and an air intake mountable upon the craft to be propelled, the control panel and the air intake being flexibly connected to the power and propelling mechanism.

Another object of my invention is to provide a motor adapted to be positioned close to the surface of a body of water, so that the portion of the

exhaust pipe adjacent the cylinders may come into direct contact with said water surface, thus avoiding the necessity for a large cooling pump or a large expansion chamber.

5 Still another object of my invention is to provide a marine propulsion unit adapted to be positioned behind the transom and well behind the top of the transom whereby noise vibrations do not have a direct path to the operator's ear.

10 Another object is to provide a mounting for an outboard motor whereby the power and propelling mechanisms are insulated by rubber from the transom, whereby vibrations are not appreciably transmitted to the craft propelled.

15 Yet another object is to provide a bracket construction and a unit comprising a power and propelling mechanism, for hingeably supporting said mechanism completely behind the transom with a point of hinging that will allow said mechanism to ride up over obstructions without causing any movement of mechanism forward of the transom line.

20 Still another object of my invention is to provide a power unit adapted to ride in direct contact with the surface of a body of water while propelling a water craft securing the advantages, direct cooling especially direct cooling of the exhaust pipe, without being subjected to excessive drag.

30 A further object of my invention is to provide an exhaust pipe cooling and shielding means for preventing the possibility of contact by any person with a hot exhaust pipe, either during operation or during subsequent handling.

35 A still further object of my invention is to provide a waterproof shell for the motor which nevertheless does not overheat due to the fact that the exhaust pipes are outside of the shell.

40 With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangements, without departing from the spirit and scope of the appended claims.

45 In order to make my invention more clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

50 Figure 1 is a side elevational view of my invention partially broken away in longitudinal section.

Figure 2 is a top plan view with dotted lines indicating a steering mechanism.

60 Figure 3 is a front elevational view.

Figure 4 is a side elevational view showing my invention in folded position.

65 Figure 5 is a fragmentary side elevational view of a modification of my invention partially broken away in longitudinal section.

Figure 6 is a top plan view of the modification shown in Figure 5.

70 Figure 7 is a fragmentary rear elevational view of the modification shown in Figure 5.

Figure 8 is an enlarged detail view of the hinge construction, partly in section.

Figure 9 is an enlarged detail view of the exhaust elbow fitting, partly in section.

75 Figure 10 is an enlarged detailed sectional

view of a modification of my cylinder jacket construction.

Referring to Figure 1, I have provided a bracket construction referred to generally as 1. Carried upon this bracket construction is a panel construction 2. Hingeably swung from the lower part of the bracket construction is a casing 3 adapted to contain a power mechanism shown generally as 4. At the rear and bottom of the casing 3 are a propeller mechanism 5 and a 10 rudder mechanism 6.

The bracket construction 1 comprises in my preferred form, U-straps 7 having apertures in their front portions 7' threaded to receive screw clamps 8 having pressure feet 9 and heads 10 15 tunnelled to receive slide bars 11 having stops 12. The dimensions of the U-straps 7 are such as to enable them to fit over the transom of a boat and support the pressure feet 9 against the rear portion 13 of U-straps 7. Adjustably secured 20 by bolting to the lower portion of the rear strap portion 13 is an extension strap 14 having hinges 15 at its lower extremity. Fitting upon the hinges 15 are casing straps 16 carrying the weight of the power mechanism 4 to which it is at- 25 tached, as well as the weight of the casing. The bracket construction 1 is pivotable upon the hinges 15 from its upright position to folded position as shown in Figure 4.

For a power construction, I employ in my preferred form, an internal combustion engine having a cylinder block 17, a fly wheel 18 to which is attached a simplex type starter shown generally as 19, a carburetor 20, an ignition system indicated generally as 21, a water pump (not shown) and other necessary parts. A gasoline tank 22 is suitably secured to the casing 3 and connected for fuel flow to the carburetor 20 by a fuel pipe (not shown). An intake manifold 23 connects carburetor 20 to cylinder block 17. The cylinder block 17 has an exhaust outlet 24 to which is attached the exhaust disposing mechanism indicated generally as 25.

The exhaust disposing mechanism 25 comprises in my preferred form, an L-shaped member 26 of hollow construction having a tubular extremity 27 adapted to interfit with the exhaust outlet 24 and the upward projection 28 having a baffle 29 extending in a vertical plane from one side of the upward projection 28 to the other. 50 Baffle 29 is integrally formed in the member 26 to longitudinally separate the projection 28 except for a longitudinal opening 30 adjacent the top of the projection 28.

The member 26 is preferably cast in one piece 55 together with the baffle 29. At the top of projection 28 and opening into the rear compartment 31 of member 26 is a vent hole 32 adapted to receive vent cap 33. At the bottom of the rear compartment 31 is a discharge opening 34 60 adapted to receive a trap plug 35 which is hingeably mounted, preferably upon the member 26, so as to permit the trap plug to swing into and out of the discharge opening 34. Trap plug 35 is of hollow construction as shown in Figure 1, enabling the combined weight of trap plug 35, trap rod 36 and vent cap 33 to be buoyed upward when trap plug 35 is immersed in a body of water.

The panel construction 2 comprises in my preferred form, panel board 37 suitably secured to the top of U-straps 7 substantially in the same plane with the U-strap rear portions 13. Passing through the center of the panel board 37 near its lower border is a spindle socket 38, aligned perpendicularly to panel board 37. Journalled in 75

the spindle is spindle shaft 39 carrying at its forward end steering wheel 40 suitably attached thereto. At the rearmost end of the spindle shaft 39 is spool 41 suitably attached thereto. The spool 41 has wrapped around it a steering rope 42 which is suitably guided by pulleys 42' so that its ends 43 and 44 attached to a tiller 45 may exert lateral pressure upon the tiller.

As best shown in Figure 2, motor controls 46 having handles 47 and adapted to ride in sleeves 48 are connected to control cords 49. Pulleys 50 permit the control cord 49 to turn toward the air intake assembly designated generally as 51 which is secured to the rear surface of the panel board 37. The control cords 49 are guided preferably by suitable pulleys (not shown) down to mechanism upon the motor 4 such as spark timing, choke and throttle mechanisms. I may make use of a Bowden wire assembly for transmitting control movement down to the motor. The air intake assembly 51 comprises a spool shield 51' having at its forward and upper end an air intake opening 52 which also receives the control cord 49. The opening 53 is preferably below the top of the panel board 37. At the lower end of the spool shield 51' is a depending extension of tubular construction 52'.

As shown in Figures 1, 2 and 3, the simplex starter is connected by starter rope 53, to which it is secured through pulleys 53' and 54 through panel 37 to gripping handle 55.

Fitting onto the extension 52' is a flexible tube 56 of rubber-like material. The lower end of the tube 56 interfits with an opening 56' in the casing 3 and is suitably secured thereto to provide a water-tight connection through the opening 56' past the control cords 49 and the steering rope 42. The casing 3 I prefer to provide with a cover plate 57 having flange 58 interfitting with rim 59 surrounding the opening to be covered by the cover plate 57. The flange 58 and the rim 59 are removably held together preferably by bolts 60. It will be noted that there is an indentation of the flange 58 and the rim 59 to avoid upward projection 28. A handle may be provided at the top of plate 57 strong enough to carry the weight of my entire invention.

At the forward end of the casing 3 are positioned yielding contact pads 61 which may be made of rubber or other suitable material. Pads 61 are adapted to take the rear surface of the transom of a boat and reduce the transmission of vibration from the motor to the boat. My propeller mechanism 5 preferably comprises a strut 62 secured to the bottom of the casing 3 carrying the outboard bearing 63 in which is journaled the propeller shaft 64. The propeller shaft is suitably connected to the power mechanism 4 and passing through stuffing box 65 and outboard bearing 63 is secured to the propeller 66 by suitable means such as a key (not shown). Attached forwardly of the stuffing box 65 to the bottom of the casing 3 is a skeg 67 shaped to clear the propeller 66 having attached at its end farthest from the casing 3, a socket 68. Skeg 67 thereby engages the rudder bar 69 with mutually bracing results. A rib 67' on skeg 67 adds to the stiffness of the construction.

The rudder mechanism 6 comprises in my preferred form, the tiller 45, already mentioned, secured to the top of the rudder bar 69, already mentioned. The rudder bar 69 is journaled in a packing box 70 attached to the underside of the casing 3 immediately behind the propeller 66. Suitable means for preventing the rudder bar 69

from riding out of the socket 68 such as a stop (not shown) is attached to the rudder bar 69. A rudder blade 71 is attached to the rudder bar.

In the preferred form of my invention, I provide at the bottom of my casing 3 a depending protrusion 72 inclined downward from the front of the casing 3 to a point substantially adjacent the stuffing box 65. As shown in Figure 3, this protrusion 72 is longitudinally positioned equally distant from the two sides of the casing 3 and has a width, in the form I have selected for illustration, of approximately half the width of the entire casing 3. Immediately adjacent the stuffing box 65 is the upward and rearwardly inclined portion 73 of the casing 3. Adjoining the rearward part of the portion 73 is a flat portion 74 of casing 3 having an upturned concave portion 75 joining portion 74 to the rearmost wall of the casing 3.

The portion 75 receives into an opening formed therein the bottom rear part of the L-shaped member 26 including the discharge opening 34. The member 26 is secured as by bolting to the portion 75, suitable water sealing being provided as by a gasket (not shown). Secured to the back of the casing 3 at the rear of portion 75 is a hinge 76 carrying a flap 76' swingable upwardly and rearwardly and forming with portions 74 and 75 an expansion chamber 77.

Referring to Figure 5, I have shown a modification of my invention employing a bracket construction indicated generally as 78, a casing shown generally as 79, an internal combustion engine shown generally as 80, an exhaust disposal mechanism shown generally as 81, a propeller mechanism shown generally as 82, and a rudder mechanism shown generally as 83.

The bracket mechanism comprises U-straps and clamps (not shown) to the rear of which are attached rear portions shown in part as 84, having slots 85 adapted to receive bolts 86. Adjustably joined to the portions 84 by the bolts 86 are extension straps 87 having laterally tunneled ends 87' shown in Figure 8, carrying pins 88 having rubber sheathings 89 as shown in Figure 8. Pins 88 extend through tunneled ends 90 of pivoting straps 91. As I have shown in Figure 5, the ends 87' and 90 are joined laterally by the pins 88, the straps 91 being outside of the straps 87.

The casing 79 is shown in the form I have chosen for purposes of illustration as having a top portion 92 of tear-drop-like proportions and a bottom portion 93 of much more flattened proportions adapted to ride at the surface of a body of water. The bottom portion 93 has a downward protrusion 94 disposed centrally at its forward edge. Disposed longitudinally of the bottom 93 and between the protrusion 94 and the rear edge of the bottom 93 is a downwardly projecting ridge 95, as best shown in Figure 7. It will be noted that in the form illustrated, the bottom 93 slopes upward slightly at each side of the ridge 95.

On the top portion 92 of the casing 79 is a flange rim 96 bordering an opening. Flanges 97 of a cover plate 98 enable the cover plate 98 to be secured to the top portion 92. Also formed in the top portion 92 are suitable openings along the lines illustrated in Figures 1 and 2 for air intake for control mechanism, and, as was discussed in connection with Figures 1 and 2, an opening for permitting the fuel tank to be filled.

The motor 8 comprises in this embodiment of my invention a fly wheel 99 and opposed cylinders 100 and 100' secured at their outer ends to pivoting straps 91 as by bolting. Cylinders 100

and 190' have apertured bosses 101 and 101'. Suitable accessories such as a gasoline tank, carburetor and ignition mechanism are provided.

Immediately below the cylinders 190 and 190', and running the width and length of the casing 79 is a floor 102 having a recessed portion 102' adapted to receive a bevel gear 103 of the propeller mechanism driven by gear 104 which is driven by the motor 8. The rear wall 105 of the recess 102 has a suitable stuffing box 105' to enclose and permit rotation of the shaft 106 which is driven by gear 103. Another suitable recess in the floor 102 receives the fly wheel. Other apertures are provided to suitably permit projection therethrough of the exhaust mechanism 81 as will later be explained.

Referring to Figure 9, boss 101 receives in its aperture, elbow 107 having flange ring 108. Ring 108 is pressed against floor 102 by the elbow 107 which is screwed into the aperture of boss 101. Washer 108' fits between ring 108 and boss 101 to make a water-tight seal.

My exhaust disposal mechanism 81 comprises, in the form shown in Figure 5, L-shaped members 109 of the same general construction as the member 26 shown in Figure 1, having long connecting pipe portions 109', and including baffles 110 similar to baffle 29, hollow trap plugs 111 similar to trap plug 35, and vent caps 112 similar to vent cap 33.

Vent caps 112 are hinged to the members 109 and actuated by toggle levers 113 hinged to members 109. As shown in Figure 6, levers 113 have the cross bar 113'.

It will be noted that an exhaust expansion chamber 116 extends rearwardly from openings in the members 109 adjacent the trap plugs 111 toward the center and rear of the portion 93 to the rear portion 117 of chamber 116, having exhaust opening 118. Into the rear portion 117 open louvers 119 which are formed in the rear part of portion 93. Louvers 119 spray water into expansion chamber 116 to cool the exhaust gases or reduce their volume.

Surrounding the connecting pipe 109' is a water bath chamber 120 formed by floor 102, portion 93, wall 105, the lower parts of portion 92 and a plate 121 adjoining the upright portion of the L-shaped members 109. Means to supply and exhaust water for the chamber 120, such as scoops and exit apertures (not shown) are positioned in the portion 93 between the wall 105 and the plate 121. I might employ a pump instead of a scoop for supplying water. I might provide apertures in plate 121 to allow water to travel from chamber 120 to chamber 116.

A back flap 114 pivotally attached at its upper edge to the rear of the top portion 92 of casing 79 projects below and beyond the bottom portion 93. Suitably joined to the outside surface of flap 114 below its point of pivoting is a wing-eared member 115. Rod 116' pivotally joins member 115 to toggle lever 113. Hence, the rearward movement of back flap 114 will cause vent cap 112 to pivot to its "in" position to yieldably reduce the size of opening 118.

Propeller mechanism 82 comprises the gear 103 and the shaft 106 already mentioned. Shaft 106 passes through a bearing 122 in strut 123 and has secured to it the propeller 124. Skeg 125 joined to the front of protrusion 94 braces strut 123.

Rudder mechanism 83 is constructed along lines similar to rudder mechanism 6 as shown in Figure 1.

Referring to Figure 10, in one of my modifica-

tions, casing bottom portion 93 has an aperture into which fits the scooping edge 126 of the integral water jacket 127 surrounding cylinder 128. Another aperture in portion 93 receives the outlet pipe 129 from water jacket 127.

I may employ a bracket construction having extension straps between the hinges and the panel board, similar to that shown in Figure 1, with the difference that the extension strap, in the variation now being explained, will extend upward to join and support the panel board. The U-straps in the variation are adjustably secured to the forward or transom side of the extension straps, leaving the height of the panel board above the casing unaffected by any adjustments of the height of the U-straps.

It will be understood that I may employ variations in the construction of my casings and means for sealing against the entry of spray or water into the motor chamber itself. Necessary gaskets and washers may be employed for example between the rims and flanges at the junction of the cover plate with the casing, at the point where the straps attached to the motor enter the casing, at the point of entry of the control tube, the gasoline tank neck, and the L-shaped members.

For operation, my invention is secured to the transom of a boat by the bracket construction and the casing hinges down into the water until it rests with its supporting pads against the rear surface of the transom. Adjustments are made if necessary in the height of the U-strap from the hinges to place the bottom of the casing in line with the slip of water from the bottom of the boat. The water line may be somewhat altered between stopped and running conditions.

My construction is started, adjusted for temperature and speed, and steered all from the control panel as has already been described.

Siphoning of water into the cylinder upon cooling of the hot gases in the engine when stopped is prevented by vent holes covered by the vent caps during running of the motor. In my first described modification the hollow trap plug 35 floats upward when the expansion chamber is filled with water forcing open the vent cap 33. When the casing is moving through the water, water is drained out of the expansion chamber and trap plug 35 drops by gravity, carrying vent cap 33 to its closed position. During the movement of the casing through the water flap 76' rides upward in response to gas pressure and maintaining the release of exhaust gases at the waters edge.

In the second mentioned embodiment of my invention, trap plug 111 floats upward independently of vent cap 112 when water enters the expansion chamber. Vent cap 112 is pulled open by the weight of flap 114 when the casing is not moving through the water. When the casing is in forward motion, the flap 114 pivots upward and rearward to urge vent cap 112 to its closed position. The flow of water in chamber 120 and through louvers 119 has already been described.

It will be seen from the above description that I have invented an outboard motor having the beneficial features outlined in my objects of invention and also combining the advantages inherent in both inboard and outboard installations of power units in boats. My construction secures the inboard advantages of withdrawing the motor from a high level in the boat and placing it down near the propeller stream, so that

passengers are not conscious of noise, heat or fumes. Another advantage usually confined to inboard installations is the lowering of the center of gravity possessed by the boat and the motor—  
 5 an advantage that I have secured in my construction. Also, my construction is as thoroughly waterproof and as free from swamping as inboard installations.

At the same time, my invention provides a  
 10 readily attachable and detachable power and propeller unit which possesses the advantages inherent in outboard motor installations. The reduction of fire hazard is carried to a degree not heretofore found even in outboard motors, since  
 15 the gasoline tank in my construction is enclosed in a casing adjacent the water's surface, and not above the transom or in the boat.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. In an outboard motor, a shield adapted to move with shallow draft through the surface of  
 30 a body of water, an internal combustion engine positioned immediately above the shield, a propeller mechanism below the shield, connecting means passing through the shield to drive the propeller mechanism, an exhaust pipe for said  
 35 engine, a water scoop connected to the outer end of the exhaust pipe for supplying water thereto, and means to prevent entry of water into the inner end of the exhaust pipe.

2. A casing for an outboard motor having a  
 40 streamlined shape of roughly tear-drop proportions having a downward longitudinal bulge of less width than half the maximum width of the casing, said bulge increasing progressively in depth in rearward direction, and tapering rearward from approximately the front of the casing  
 45 to approximately half the length of the casing.

3. In an outboard motor, a support construction comprising an upper frame portion, a lower frame portion and a hinge-like portion connecting said upper and lower frame portions, a power  
 5 mechanism supported by said lower frame portion, means on said upper portion adapted to secure the frame to the transom of a boat, means secured to said upper portion for controlling the power mechanism, said upper portion being pivotable downward in relation to the power mechanism to form with the bottom of the power  
 10 mechanism a tripod-like base.

4. In an outboard motor, a shield adapted to move with shallow draft through the surface of a body of water, an internal combustion engine  
 15 positioned immediately above the shield, a propeller below the shield, connecting means passing through the shield to drive the propeller, an exhaust pipe for said engine, and a water scoop connected to the outer end of the exhaust pipe  
 20 for supplying water thereto.

5. In an outboard motor, a shield adapted to move with shallow draft through the surface of a body of water, an internal combustion engine  
 25 positioned immediately above the shield, a propeller mechanism below the shield, connecting means passing through the shield to drive the propeller mechanism, an exhaust pipe for said engine, a water scoop connected to the outer end of the exhaust pipe for supplying water thereto, and valve means to prevent entry of water into the inner end of the exhaust pipe.

6. In an outboard motor, a shield adapted to move with shallow draft through the surface of a body of water, an internal combustion engine  
 35 positioned immediately above the shield, a propeller mechanism below the shield, connecting means passing through the shield to drive the propeller mechanism, an exhaust pipe for said engine, means connected to the outer end of the exhaust pipe for supplying water thereto, and  
 40 additional means to prevent entry of water into the inner end of the exhaust pipe.

KENNETH H. MacKAY. 45