Sept. 22, 1931. L. J. JOHNSON 1,824,735

OUTBOARD MOTOR

Filed July 24, 1929 2 Sheets-Sheet 1

Fig. 1.

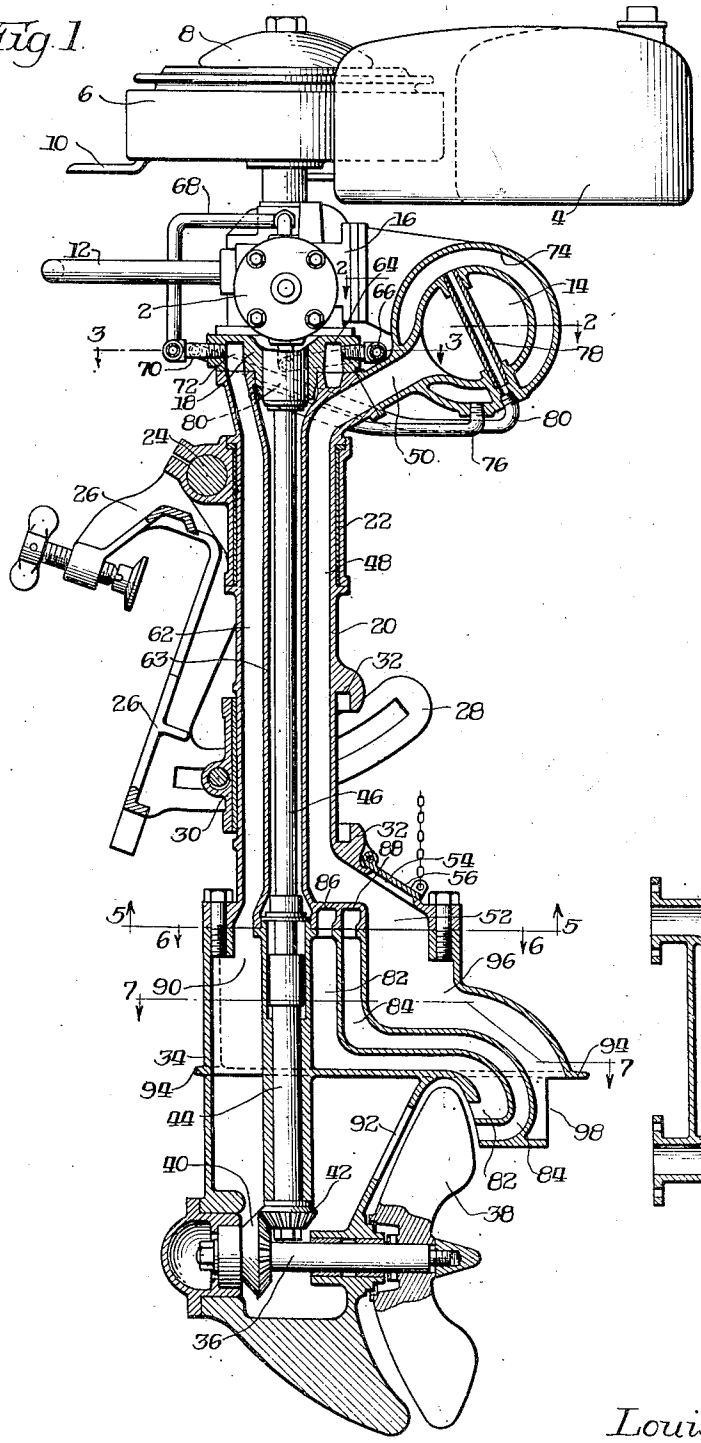
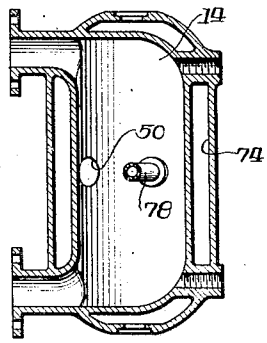


Fig. 2.



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OUTBOARD MOTOR

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Fig. 3

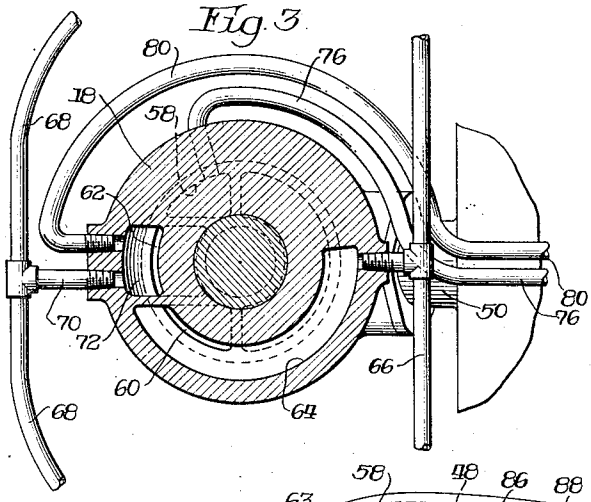


Fig 4

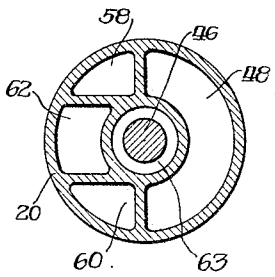


Fig. 5

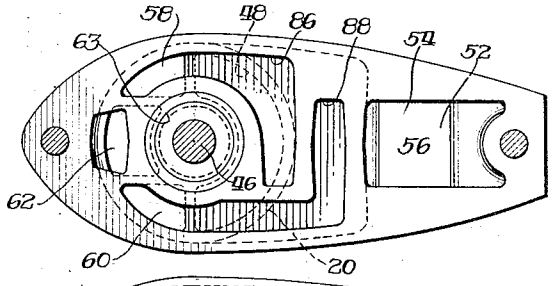


Fig. 6

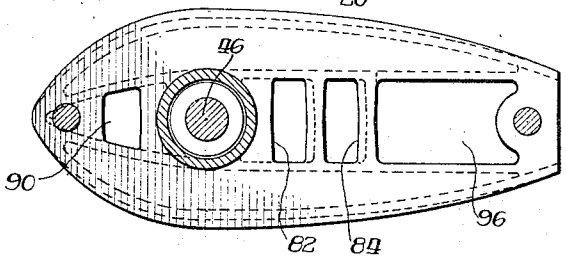
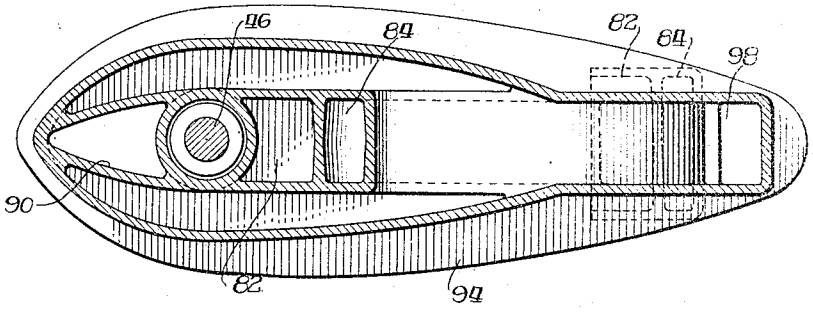


Fig. 7



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Patented Sept. 22, 1931 1,824,735

UNITED STATES PATENT OFFICE

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OUTBOARD MOTOR

Application filed July 24, 1929. Serial No. 380,730.

This invention relates to an outboard motor and has more particularly reference to an under-water exhaust construction which is freely rotatable for reversing and for steering.

One of the objects of the invention is in the provision of means for discharging the engine exhaust gas below normal water level to the rear of the propeller for eliminating objectionable noise and odors.

Another object of the invention is in the provision of a tubular supporting structure for the propeller and drive shaft, which is freely rotatable about a vertical axis for steering and completely rotatable in either direction for reversing the motor when the boat to which it is attached is to be propelled rearwardly.

Still another object of this invention is in the provision of a tubular supporting structure in which there are a number of separate passages for cooling water and for the engine exhaust, all terminating below normal water level.

Another object of the invention is in the provision of an under-water exhaust construction in which there is an automatically operable pressure relief valve above normal water level for relieving back pressure in starting, and during the operation of the motor.

Still another object of the invention is in the provision of a single supporting casing with a plurality of passages for cooling water and the engine exhaust in which the water cools the interior of the casing which would otherwise become excessively heated by the engine exhaust.

Still another object of the invention comprises the provision of separate intake passages for supplying cooling water to the engine and muffler cooling jackets with a common discharge for the water after it has passed through the jackets.

Still another object of the invention is in the provision of a stream line under water support for the propeller having an anti-cavitation plate formed integral with the under water unit extending above the propeller with the exhaust and water passages terminating below normal water level and under the anti-cavitation plate.

Still another object of the invention consists in the provision of an under water unit having a stream-lined submergible gear housing with an integral projecting anti-cavitation plate and with passages having outlets adjacent the front and rear sides of the propeller to induce a flow of cooling water by the action of the propeller, and an under-water exhaust opening to the rear of and below the anti-cavitation plate to receive the rearward thrust of water from the propeller thereby assisting in withdrawing and discharging the exhaust gases.

These and further objects are described in the specification and will be apparent from the drawings which illustrate a preferred improvement of the invention.

In the drawings, Fig. 1 is a view partly in a section of an outboard motor construction made in accordance with the principles of this invention: Fig. 2 is a sectional view of the muffler: Fig. 3 is a sectional view showing the water pipe connections in the top of the tubular casing: Fig. 4 is a section of the tubular casing intermediate its ends: Fig. 5 is a view of the lower end of the casing unit on the line of its connection with the under water housing unit: Fig. 6 is a view of the upper end of the under water housing unit on the line of its connection with the tubular casing and Fig. 7 is a sectional view of the under water housing unit just above the anti-cavitation plate.

Referring more particularly to the drawings, this invention comprises a water propulsion device generally in the form of an inboard or outboard motor and including a power head having engine cylinders 2, a fuel tank 4, a nested fly wheel magneto 6, a starter 8, a spark control lever 10, a tiller handle bracket 12 and a muffler 14, all mounted upon and carried by crankcase 16.

At the under side of the crankcase 16 is a supporting base 18 which is secured to the upper end of a tubular casing 20 which is mounted for free rotation in a split sleeve 22,

and mounted at one side to rotate upon a horizontal pivot 24 carried by an attachment bracket 26, so that the casing is free to rotate in the sleeve 22 about a substantially vertical axis and will swing upon the pivot 24 in a vertical plane. At the lower end of the bracket 26 are slotted guides 28 between which the casing 20 is confined, and adjustable in the slots of these guides is a thrust plate 30 adapted to be engaged by upper and lower recessed lugs 32 formed on the casing 20 for preventing the motor from swinging about the horizontal pivot 24 when the motor is rotated approximately 180 degrees for reversing the direction of movement of a boat to which it is attached.

To the lower end of the tubular casing 20 is attached an under water housing unit 34 which provides a support for a propeller shaft 36 carrying a propeller 38 and having a bevelled gear 40, meshing with a bevelled gear 42 to the lower end of a shaft extension 44 which is connected by a drive shaft 46 extending through the casing 20 with the crankshaft of the engine.

In the casing 20, there are partitions forming a number of passages: a large passage 48 for the engine exhaust connected laterally at its upper end with a discharge port 50 leading to the interior of the muffler 14 and with an extension 52 to the lower end of the casing member having a discharge port 54 located above normal water level and closed by an inclined plate 56 which closes the opening by gravity and is opened by pressure in the exhaust passage, and manually if desired: water inlet passages 58 and 60 leading to the engine and muffler jackets: and a water discharge passage 62 which leads from the engine and muffler jackets combined and discharges in a single passage, and a central passage 63 in which the drive shaft 46 is freely movable, preferably leaving a space between shaft and the wall of the passage 63, so that the shaft will not be heated by direct contact therewith.

At the upper end of the casing 20 is connected the base 18 in which is a passage 64 (Figs. 1 and 3) extending in an arc about base 18 and communicating with the upper end of passage 60 in the casing 20. Connected into this passage 64 is a pipe 66 for conveying cooling water to the under sides of the water jackets of the cylinders 2. Pipes 68 extend from the upper sides of the cylinder and are connected by a short pipe 70 to a bore 72 in the base 18 which communicates directly with the upper end of water discharge passage 62 in casing 20.

To circulate water through the water jacket 74 of the muffler 14 a pipe 76 is connected into a port in the base 18 communicating directly with the upper end of water passage 58 in the casing 20, and this pipe is connected to the bottom of the muffler water jacket 74 as clearly showed in Fig. 1. Extending across the muffler is the pipe 78 connecting the top of the water jacket through the lower end of the muffler with a water discharge pipe 80 which leads to the common water discharge a port 72 which communicates with a water discharge passage 62 in casing 20.

In the lower housing unit 34 are water inlet passages 82 and 84 terminating at the rear of the upper edge of the propeller blades to directly receive the water thrust rearwardly by the propeller. The upper ends of these passages are contained with the lower stream line contour of the lower water unit 34 as shown more clearly in Fig. 6, and they are connected by passages 86 and 88 respectively at the lower end of the casing 20 with up going water passages 58 and 60 respectively as shown more clearly in Fig. 5. A water discharge passage 90 communicates directly with the end of the water discharge passage 62 of the casing 20 for conveying the water downwardly through the housing and out of a port 92 adjacent the upper leading edge of propeller 38, so it will have a suction effect in withdrawing and ejecting the water. An anti-cavitation plate 94 is formed integral with the lower housing unit 34 and extends outwardly therefrom in a plane above the propeller, the water passages opening entirely below the anti-cavitation plate.

To the rear of the housing member 34 is a passage 96 which communicates with the lower end 52 of the exhaust passage 48 of the tubular casing 20 and this passage 96 extends through the anti-cavitation plate 94 with a discharge opening 98 below the anti-cavitation plate and at the rear of the propeller where it will have the advantage of the suction produced by the propeller in throwing water rearwardly and withdrawing the exhaust from the muffler.

With this construction, it will be readily understood the operation of the motor or engine drives the propeller and the muffler receives the exhaust gases from the engine cylinders; the operation of the propeller induces a flow of cooling water from the rear of the propeller through the separate passages in the lower unit and in the tubular casing through the jackets of the engine and the muffler and downwardly through a common discharge passage to a suction outlet in advance of the propeller. The exhaust gases from the muffler are conducted downwardly through the same tubular casing in which water passes to and from the cooling jackets and thus cools the interior of the casing, and the passage containing the driving shaft 46 and prevents undue heating of the casing 20 by means of the exhaust gases.

When the motor is at rest in starting, the lower end of the exhaust passage is under water and in order to prevent objectionable back pressure in the muffler and in the ex-

haust passage, a relief valve is provided above the normal water level through which the exhaust gases may escape automatically into the atmosphere, or the relief valve may be opened manually either in starting or while running.

The mounting and connection of a single tubular casing which encloses the driveshaft and provides passages for the cooling water and the engine exhaust permits a full pivot steering about the engine drive shaft as an axis and the rotation of the entire motor in either direction to reverse the direct movement of a boat to which it is attached.

By enclosing the driveshaft without direct contact with the tubular casing, it is less liable to become unduly heated and will not grip the casing or expand it to interfere with its proper operation. By making the shaft in sections, the lower unit may be assembled in the underwater housing 34, the power head may be assembled upon the base 18 and these two units are easily casing 20 which is assembled with the supporting bracket 26.

I claim:

1. An outboard motor having a jacketed combustion engine, a jacketed muffler, under-water driving means connected with the engine, and a single support casing for said means, having water inlet passages to the engine and muffler and a common water discharge passage and an exhaust passage from the muffler terminating below the normal water level.

2. An outboard motor having a jacketed combustion engine and a jacketed muffler, a propeller having driving connection with the engine, and a single support for the propeller having separate water passages for the engine and muffler and an exhaust passage for the muffler all terminating below the normal water level.

3. A marine motor having a combustion engine and a muffler therefor, each provided with a water jacket, a propeller shaft and a propeller connected to the motor, and a single support for enclosing the shaft and supporting the propeller, the support having a number of passages terminating adjacent the propeller for inducing a flow of cooling water through the engine and muffler jackets and having a separate passage from the muffler for the engine exhaust discharging at the rear of the propeller.

4. In an outboard motor having a jacketed combustion engine, a jacketed muffler therefor, and a propeller having driving connection with the engine, means forming an enclosing casing for supporting the propeller and for providing a number of passages terminating adjacent the propeller for inducing a flow of cooling water through the engine and muffler jackets, due to the action of the propeller and a passage for exhaust gases from the muffler terminating at the rear of the propeller and withdrawn by suction produced by the propeller.

5. In an outboard motor having a combustion engine and a muffler therefor and a propeller having a driving connection with the engine, means forming a support for the propeller having an exhaust passage from the muffler terminating below the normal water level and a closable relief valve in the passage above normal water level for opening the passage to the atmosphere to relieve back pressure.

6. In an outboard motor, a combustion engine and a muffler therefor, a propeller and a driving shaft therefor connected to the engine, means for supporting the propeller and enclosing the drive shaft, said means including a number of water cooling passages extending from openings adjacent the propeller to the engine and muffler, and an exhaust gas passage extending from the muffler and terminating below normal water level to the rear of the propeller, the water passages in the supporting means also cooling it and the exhaust gas passage therein.

7. An outboard motor having a jacketed engine and a jacketed muffler therefor, a driving shaft and a propeller connected to the motor, means for enclosing the driving shaft and supporting the propeller, said means comprising a single tubular casing having a number of passages therethrough, one of the passages extending from the muffler and terminating to the rear of the propeller for conducting the exhaust gases into the propeller race and other passages extending to the engine and muffler jackets from adjacent the propeller whereby a flow of cooling water is induced through the engine and muffler jackets also cooling the tubular casing through which the hot exhaust gases pass from the muffler.

8. An outboard motor having a jacketed combustion engine and a jacketed muffler therefor, depending drive shaft and propeller connected to the motor, enclosing means for the shaft and for supporting the propeller comprising a single tubular casing having a plurality of passages therein terminating adjacent the propeller and below normal water level for causing an induced flow of cooling water through the engine and muffler jackets and for withdrawing the exhaust from the muffler and means for mounting the tubular casing to swing about a horizontal pivot and to rotate freely about a vertical axis for steering and reversing.

9. In an outboard motor the combination with a combustion engine and a muffler therefor, of a drive shaft and a propeller in connection with the motor, means forming an exhaust passage from the muffler terminating below normal water level and including a closable relief valve disposed above normal

water level and adapted to open automatically, due to a pre-determined pressure in the exhaust passage and to relieve back pressure therein in starting and running the motor.

10. In an outboard motor a jacketed combustion engine and a jacketed muffler therefor, a drive shaft and a propeller in connection with the motor, supporting means for the propeller and shaft comprising a single tubular casing having a plurality of passages therein, one of the passages enclosing the drive shaft free from contact with the walls thereof, two passages extending from the rear of the propeller for conducting cooling water to the engine and muffler jackets, another passage terminating in advance of the propeller and receiving the cooling water after it has passed through the engine and muffler jackets, and a large exhaust passage extending from the muffler and terminating below normal water level to the rear of the propeller, the water passages being operative to cool the casing surrounding the shaft and also to cool the exhaust passage.

11. In an outboard motor having jacketed combustion engine and a jacketed muffler therefor, a drive shaft and a propeller connected to the motor, means forming passages having openings adjacent the propeller for inducing a separate flow of cooling water to the engine jacket and to the muffler jacket with a common discharge passage terminating in front of the propeller to receive the suction effect of the propeller.

12. An outboard motor completely rotatable about a vertical axis for reversing and steering comprising a jacketed combustion engine and a jacketed muffler therefor, a drive shaft and a propeller, means forming a single tubular support for the motor and propeller, the tubular support comprising a plurality of water passages leading to and from the muffler and engine jackets and terminating adjacent the propeller, an exhaust passage leading from the muffler through the tubular support and terminating to the rear of the propeller mounting means comprising a sleeve surrounding the tubular casing for permitting a free rotation about a vertical axis, a horizontal pivot upon which a sleeve and the casing is rotatable in a vertical plane and guiding means including a thrust plate and projection extending partially around the tubular casing for engaging the thrust plate to prevent rotation of the casing in said vertical plane when it is turned in the sleeve for driving in a reversing direction.

13. A marine motor comprising a combustion engine, a propeller and a drive shaft connecting it to the engine, a hollow casing for supporting the propeller and inclosing the shaft having integral longitudinal partitions forming passages therein, one for the engine exhaust, and one or more for circulating water therein to cool the engine exhaust passage and the casing by contacting directly with the partitions.

14. A marine motor having a combustion engine, a drive shaft and a propeller, a propeller casing having integral longitudinal partitions forming an exhaust passage and circulating water passage therein, and means dependent upon the operation of the engine for water cooling the exhaust passageway and the interior of the casing by directly contacting with the interior partitions thereof.

15. An outboard combustion engine having a water jacket, a water jacketed muffler therefor, and means dependent upon the operation of the engine for circulating water separately through the engine jacket and the muffler jacket.

16. An outboard motor comprising water jacketed cylinders, a water jacketed muffler, and a douple water cooling system for cooling the cylinders and muffler.

17. A device of the class described having an internal combustion engine power plant formed with a substantially vertically depending drive shaft, a tubular housing surrounding said drive shaft, means for supporting said tubular housing for turning movement about said drive shaft as an axis, a propeller carrying casing mounted on the lower end of said tubular housing, and means therein for operating the propeller from said drive shaft, said propeller carrying casing having an internal passage providing an underwater exhaust, and means passing through said tubular housing and connecting with the underwater exhaust and with the discharge from the gas engine, whereby the exhaust gases from the gas engine may be discharged beneath the normal water level without interfering with the proper turning of the lower unit for steering.

18. In a device of the class described, the combination of an internal combustion engine provided with a vertically depending drive shaft and a tubular housing surrounding the same, a propeller carrying casing rigidly connected to said tubular housing, means in the casing for driving the propeller from said drive shaft, said casing having an anti-cavitation plate overlying the path of travel of the propeller blades, said tubular housing and said casing being constructed and arranged to form a continuous passage for conducting the cylinder exhaust gases downwardly through the tubular casing, through the propeller carrying casing and for discharging the same beneath the anti-cavitation plate and to the rear of the path of travel of the propeller blades.

19. In a device of the class described, the combination of an internal combustion engine provided with a substantially vertical depending drive shaft and including a tubular casing surrounding said drive shaft, a

propeller carrying casing mounted on the lower end of the tubular casing and being of stream-line contour to a point above normal water level, said propeller carrying casing having a passage formed internally therein and disposed at the rear of the casing and within the stream-line thereof, said passage terminating in an open discharge mouth located below normal water level and to the rear of the path of travel of the propeller blades, said passage communicating with a passage formed in the tubular casing, the upper portion of said last mentioned passage communicating with the cylinder exhaust.

20. An outboard motor comprising a self-contained power plant including an internal combustion engine formed with a vertically depending drive shaft and provided with a surrounding tubular housing including a central sleeve concentrically surrounding the drive shaft, said tubular housing being formed to provide water passages on each side of the concentric sleeve and an exhaust passage, means connecting the water passages with the water jacket of the engine, means connecting the exhaust passages with the cylinder exhaust, and a propeller carrying casing mounted on the lower end of said tubular casing, said propeller carrying casing being of stream-line contour and having internal passages providing water passages connecting with the water passage in the tubular housing, and an exhaust passage connecting with the exhaust passage in the tubular housing, all of the passages in the propeller carrying casing being constructed and arranged to terminate below normal water level.

21. An outboard motor having a gas engine of the water jacketed type having a tubular casing surrounding the vertically depending drive shaft, a propeller carrying casing rigidly mounted on the lower end of said tubular casing, means for turning the casing for steering, said lower casing being of stream-line contour, said tubular casing and lower casing having registering passages for the cylinder exhaust gases and the water circulating system, said passages terminating in an outlet located below normal water level.

22. An outboard motor having a vertically depending drive shaft and a tubular housing surrounding the same, a propeller carrying casing mounted on the lower end of said tubular housing, means for turning the same for steering, said tubular housing and lower casing being formed to provide a continuous internal passage for discharging the cylinder exhaust gases below normal water level, and means formed in the tubular housing for discharging the exhaust gases above normal water level.

23. An outboard motor having a water jacketed engine and expansion chamber for the cylinder exhaust gases, and means for circulating water through the cylinder jacket and expansion jackets, said means passing through the tubular housing surrounding the vertically depending drive shaft of the outboard motor.

24. In an outboard motor, the combination of a water jacketed internal combustion engine having a crank case provided with an extension including an expansion chamber, said expansion chamber being water jacketed, means connecting the water jacket of the engine with the water jacket of the expansion chamber, said expansion chamber having an exhaust port, a tubular sleeve connected to the crank case of the engine and surrounding the vertically depending drive shaft thereof, said tubular sleeve having water passages formed therein communicating with the water jacket of the expansion chamber, said tubular sleeve having an exhaust gas passage therein communicating with the exhaust port of the expansion chamber, a propeller carrying housing carried at the lower end of the tubular sleeve and having water passages and an exhaust passage formed therein communicating with their respective passages in the tubular sleeve, said passages in the propeller carrying casing opening below normal water level.

25. An outboard motor comprising in combination with the water jacketed engine having a vertically depending drive shaft, a tubular sleeve connected to the crank casing of the engine and concentrically surrounding said drive shaft, said tubular sleeve having a central bore in which the drive shaft is housed, and said tubular sleeve having internal walls surrounding said central bore and providing passages on diametrically opposite sides thereof, and providing exhaust passages on each side of the central bore and adjacent the water passages, a propeller carrying casing mounted on the lower end of said tubular casing and having driving means therein connected with the drive shaft of the engine, said propeller carrying casing being provided with internal water conducting passages and an exhaust passage communicating respectively with the passages in the tubular housing, there being a connection from the cylinder exhaust to the exhaust passage in the tubular housing at the upper end thereof.

26. In a device of the class described, the combination of an internal combustion engine provided with a vertically depending drive shaft and having a tubular housing concentrically surrounding said drive shaft and provided with an exhaust passage from the engine downwardly through the tubular housing, a propeller carrying casing of stream-like formation throughout its height, rigidly attached to the lower end of said tubular housing, means for turning said tubular

housing for steering, said propeller carrying housing embodying an anti-cavitation plate disposed below the normal water level, the upper rear portion of said propeller carrying casing being provided with a reaward streamline extension merging into the anti-cavitation plate and providing a internal exhaust passage communicating with a passage in the tubular casing, the lower end of said internal passage passing through the anti-cavitation plate and being provided with a rearwardly extending nozzle underlying the anti-cavitation plate, said nozzle having a substantially horizontal bottom and having laterally extending wings, said nozzle being directly in the rear of a water gathering mouth formed so as to face in a forward direction on the propeller carrying casing, said water gathering mouth communicating with an internal passage in said propeller carrying casing and said water gathering mouth lying adjacent to and directly in the rear of the path of travel of the propeller blades, and means connecting said water passage with a water passage in the tubular housing connecting with the watere jacket of the engine.

27. An outboard motor having an internal combustion engine, a vertically depending driveshaft, a tubular housing around the shaft also having an integral partition forming cooling water and exhaust passages therein, means for supporting the housing for free rotative movement about a vertical axis for steering, and an exhaust connection from the engine to the top of the housing to discharge the exhaust through the passage and from the lower end of the housing below normal water level.

28. An outboard motor having an internal combustion engine, a vertically depending driveshaft, a housing around the shaft having integrally formed exhaust gas and cooling wafer passages therein, a propeller operated by the shaft and an anti-cavitation plate in a plane above the propeller, means connecting the exhaust of the engine to the upper end of the said exhaust gas passage, and means forming an outlet form the lower end of said passage below and at the rear of the said plate.

29. A water propulsion motor having an internal combustion engine, a propeller and its shaft connected to the engine by a vertical shaft, housing means rotatable about the shaft for steering and enclosing the vertical shaft and the propeller shaft and also having integral means forming a cooling water passage and an exhaust gas passage therein terminating in an open mouth disposed below normal water level and opening rearwardly behind the propeller, and means connecting the upper end of the exhaust gas passage to the engine exhaust.

30. A water propulsion motor comprising a jacketed internal combustion engine, a vertical shaft and a propeller connected thereto by the shaft, housing means including a tubular vertical casing rotatable about a vertical axis for steering and enclosing the shaft and the propeller shaft, the casing having an integral partition forming separate passages therein for cooling water and the engine exhaust, means connecting the water passages with the jacket, means connecting the exhaust passage with the engine exhaust, and the lower ends of all of the passages being constructed and arranged to terminate below normal water level.

31. An outboard motor having a water jacketed gas engine with a vertically depending driveshaft and a casing surrounding the shaft and rotatable independently thereof for steering, the casing having an integral partition forming separate passages for the cooling water and the engine exhaust connected at the upper end to the engine and terminating at the lower end below the normal water level, and supporting means for hinging the casing about a horizontal axis and permitting rotation of the casing about a vertical axis for steering and reversing.

32. A water propulsion motor having a water jacketed engine and a water jacketed muffler connected, a driveshaft and a propeller operated thereby, casing means for the driveshaft having water inlet and outlet passages terminating adjacent to and on opposite sides of the propeller and connected to the jackets for circulating water therethrough, the propeller inducing a flow of water through the passages.

33. An outboard motor having a water jacket gas engine and a connected water jacket muffler, a vertical shaft and a propeller driven thereby, an enclosing casing for the shaft and propeller, the casing having an anti-cavitation plate in a plane above the propeller and passages terminating below the plate and in front, behind and opening rearwardly from the propeller, the upper ends of the passages being connected to the muffler jacket, the engine jacket, and the muffler outlet, and being operative when the propeller is rotating in the water to circulate water through the water jackets and to withdraw exhaust gases from the exhaust gas passage and the muffler.

34. An outboard motor having a combustion engine, a jacketed muffler therefore, a vertical engine shaft, and an enclosing housing for the shaft having passages therein for cooling water for the muffler jacket.

35. An outboard combustion motor having a water jacketed muffler, and means including a unitary casing rotatable for steering having means integral with said casing forming a passage extending below water level for delivering cooling water to the jacket of the muffler and a passage for discharging

exhaust gas from the muffler below water level.

36. A marine combustion motor having a vertically extending drive shaft, a casing surrounding the shaft and relatively rotatable for steering having a passage for carrying the motor exhaust therethrough, and means comprising another passage in the casing for water cooling it, said passages being formed by a partition integral with said casing.

37. A marine combustion motor having an extending drive shaft, a casing surrounding the shaft having integrally formed passages for the exhaust and for the cooling water, and means for causing a flow of water through the passages for cooling.

38. An outboard motor having a combustion engine, a depending shaft and a driving propeller, a casing therefore having an anti-cavitation plate in a plane above the propeller, and an integrally formed cooling water passage and a gas discharge passage in the casing, the engine discharging exhaust gas through the gas discharge passage below the anti-cavitation plate.

39. In an outboard motor assembly, the combination of a support, a motor mounted thereon having a lower turnable unit of stream-line cross section, a horizontally disposed propeller shaft mounted at the lower portion of said unit, a propeller carried thereby, a vertically disposed drive shaft connected with said propeller shaft and driven by said motor, an anti-cavitation plate extending transversely of said lower unit, means for discharging exhaust gases at a point immediately beneath and at the rearward portion of said anti-cavitation plate, and means for effecting the circulation of water to effect the cooling of said exhaust gases.

40. In an outboard motor assembly, the combination of a support, a motor mounted thereon having a lower turnable unit of stream-line construction, said unit being provided with an anti-cavitation plate, means for effecting the discharge of exhaust gases through and at the rear of said anti-cavitation plate, whereby gases may be effectively disposed of beneath the surface of the water, and means above the anti-cavitation plate and above the surface of the water for relieving against the development of back pressures by the exhaust gases within the motor.

41. In an outboard motor assembly, the combination of a support, a motor mounted thereon, an expansion chamber adapted to receive exhaust gases from said motor, and means independent of any motor cooling means for circulating water adjacent said expansion chamber for cooling purposes.

42. In an outboard motor assembly, the combination of a support, a motor mounted thereon, an expansion chamber associated with said motor for receiving exhaust gases therefrom, a water jacket surrounding said expansion chamber, and means independent of any motor cooling means for circulating cooling water through said water jacket.

43. In an outboard motor assembly, the combination of a support, a motor mounted thereon, an expansion chamber for receiving exhaust gases from said motor, a passageway connecting said expansion chamber with a discharge opening positioned below the normal water level, and means for circulating water adjacent said passageway and said expansion chamber for cooling purposes.

44. In an outboard motor assembly, the combination of a support, a motor mounted thereon having a lower turnable unit of stream-line cross section, an anti-cavitation plate provided on said lower turnable unit, a horizontally disposed propeller shaft mounted within said unit, a propeller carried thereby, a vertically disposed drive shaft connected with said propeller shaft and driven by said motor, a housing connecting the motor and lower unit for said vertical drive shaft, and means integral with said unit forming passageways in said unit for cooling water and for directing exhaust gases from the motor through the anti-cavitation plate to a discharge opening at the rear of said anti-cavitation plate in the path of water thrust rearwardly by the propeller whereby said exhaust gases may be effectively discharged beneath the surface of the water.

45. In an outboard motor assembly, the combination of a support, a motor mounted thereon having a lower turnable unit of stream-line cross section, an anti-cavitation plate provided on said lower turnable unit, a horizontally disposed propeller shaft mounted within said unit, a propeller carried thereby, a vertically disposed drive shaft connected with said propeller shaft and driven by said motor, a housing for said vertical drive shaft connecting the motor and the lower unit, an expansion chamber for receiving exhaust gases from the motor, and means integral with said unit forming passageways in the unit for cooling water and for gases from said expansion chamber to discharge through and at the rear of the anti-cavitation plate and to the rear of the propeller in the path of water therefrom, whereby said exhaust gases may be effectively discharged beneath the surface of the water.

46. In an outboard motor assembly, the combination of a support, a motor mounted thereon having a lower turnable unit of stream-line cross section, an anti-cavitation plate provided on said lower turnable unit, a horizontally disposed propeller shaft mounted within said unit, a propeller carried thereby, a vertically disposed drive shaft connected with said propeller shaft and driven by said motor, a housing for said vertical drive shaft, a water jacketed expansion chamber for receiving exhaust gases from the mo-

tor, and a passageway for directing exhaust gases from said expansion chamber to a discharge opening positioned at a point beneath the anti-cavitation plate and to the rear of the propeller, whereby said exhaust gases may be effectively discharged beneath the surface of the water, said propeller serving also as a means for circulating cooling water through the water jacket of the expansion chamber.

47. In a motor assembly for propelling a vehicle through water, the combination of a support, a motor mounted thereon having a lower turnable unit, said unit being of stream-line construction and provided with an anti-cavitation plate, and means formed integrally with said unit for effecting the movement of cooling water therein and for the discharge of exhaust gases from said unit through the plate and below the water level.

48. In a motor assembly for propelling a vehicle through water, the combination of a support, a motor mounted thereon having a lower turnable unit provided with a stream-line anti-cavitation plate and a propeller located below the plate, a stream-line water cutting section and a stream-line gearcase, and means formed integrally with said unit for effecting the movement of cooling water therein and the discharge of exhaust gases at the rearward portion of said unit at the rear of the propeller and through the anti-cavitation plate, whereby, said gases may be disposed of beneath the surface of the water to receive the suction advantage produced by the anti-cavitation plate and the stream-line passage through the water.

49. A marine combustion engine having means forming an exhaust outlet below normal water level and an exhaust outlet above water level, and automatic opening and closing means for effecting the discharge of the engine gases from the above water exhaust outlet dependent for operation upon under water exhaust resistance.

50. A marine combustion engine having means forming an exhaust outlet below normal water level and an exhaust outlet above normal water level, and automatic opening and closing means for discharging the exhaust gases through the above water discharge outlet dependent upon the variations of the pressure of the under water exhaust.

51. In an outboard motor assembly, the combination of a support, a motor mounted thereon, means connected with the motor for effecting the discharge of exhaust gases under water, and automatically controlled relieving means operable to cause exhaust gases to be discharged into the atmosphere when the motor is running slowly so as to relieve against the development of back pressures by the exhaust gases, and further operable to effect the discharge of the exhaust gases under the water when the motor is running above a predetermined speed.

In witness whereof, I have hereunder subscribed my name.

LOUIS J. JOHNSON.