

Sept. 22, 1931.

L. J. JOHNSON ET AL

1,824,737

OUTBOARD MOTOR ASSEMBLY

Filed Jan. 28, 1929

3 Sheets-Sheet 1

FIG. 1.

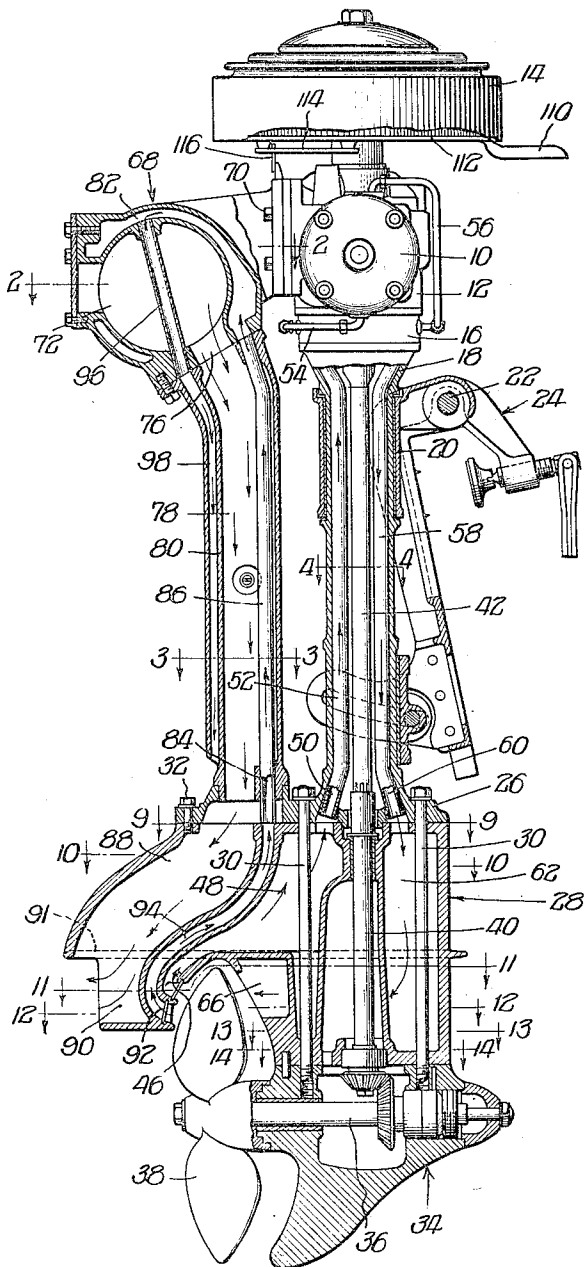


FIG. 2.

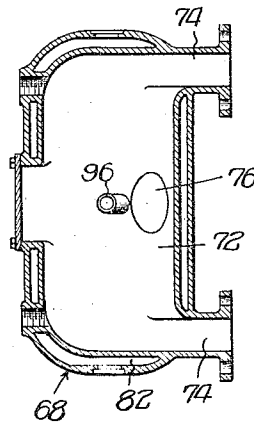


FIG. 3.

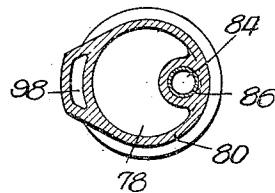
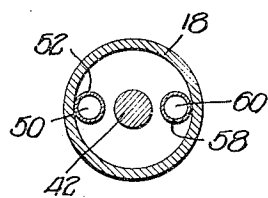


FIG. 4.



INVENTORS:
 LOUIS J. JOHNSON,
 HARRY L. JOHNSON,
 BY *Cheever, Cox & Moore* ATTYS.

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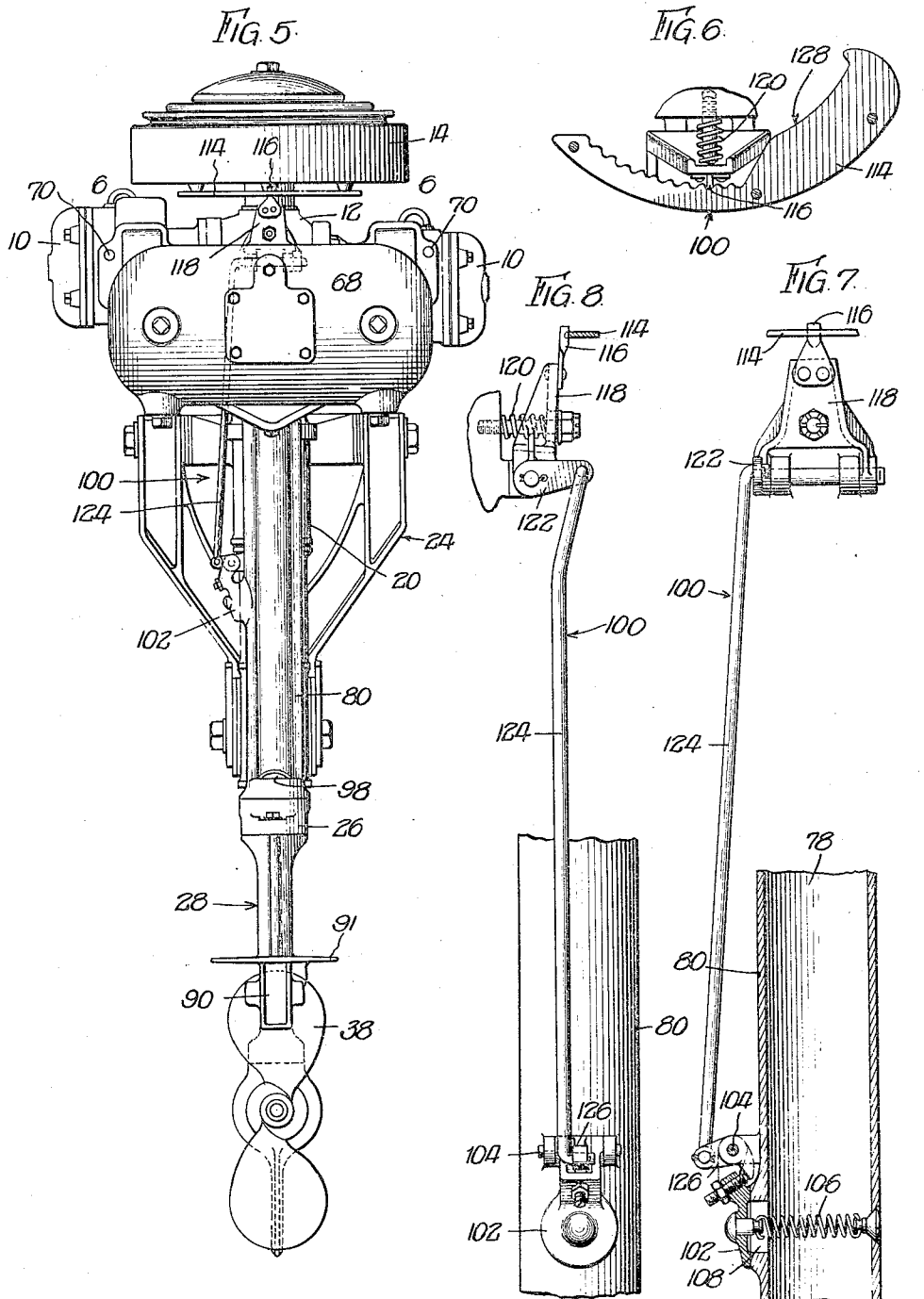
L. J. JOHNSON ET AL

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3 Sheets-Sheet 2



INVENTOR'S
LOUIS J. JOHNSON,
HARRY L. JOHNSON,
By *Cheever Cox & Moore* ATTYS

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OUTBOARD MOTOR ASSEMBLY

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3 Sheets-Sheet 3

FIG. 9.

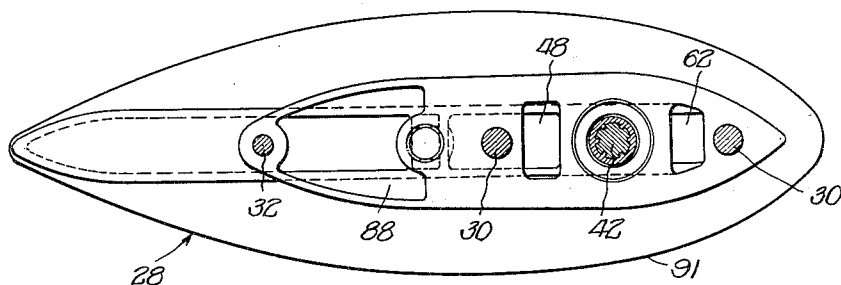


FIG. 10.

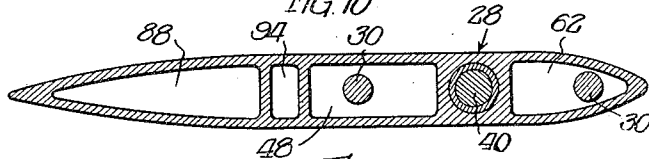


FIG. 11.

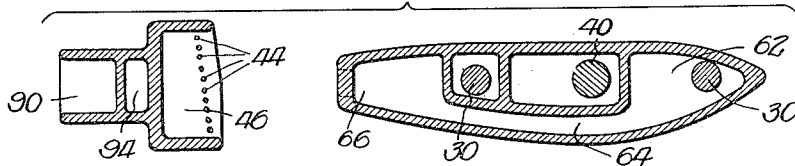


FIG. 12.

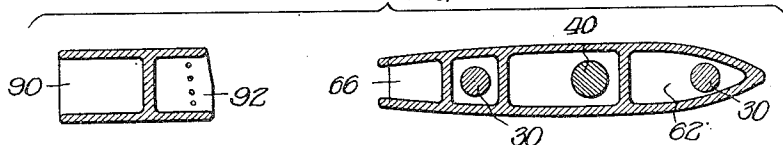


FIG. 13.

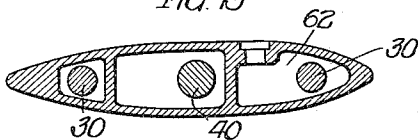
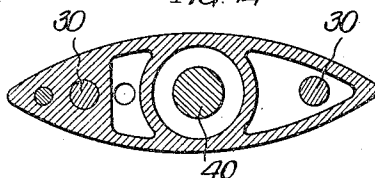


FIG. 14.



INVENTORS;
LOUIS J. JOHNSON,
HARRY L. JOHNSON.
BY *Cleeve, Cox & Moore* ATTYS

UNITED STATES PATENT OFFICE

LOUIS J. JOHNSON, OF SOUTH BEND, INDIANA, AND HARRY L. JOHNSON, OF WAUKEGAN, ILLINOIS, ASSIGNORS TO JOHNSON BROTHERS ENGINEERING CORPORATION, OF SOUTH BEND, INDIANA, A CORPORATION OF INDIANA

OUTBOARD MOTOR ASSEMBLY

Application filed January 28, 1929. Serial No. 335,447.

Our invention relates generally to marine internal combustion engines and particularly to marine motors of the outboard type having means for discharging exhaust gases under-
5 water as also disclosed in our applications Serial No. 327,244 and Serial No. 374,110 and in Serial No. 380,730 of Louis J. Johnson.

It is in general one of the primary objects of our invention to provide an outboard mo-
10 tor which will operate quietly and which will prevent the accumulation of exhaust gases in the immediate vicinity of the motor and to this end our invention contemplates the provision of a motor with an improved under-
15 water exhaust device of durable and practical construction.

Another object of our invention is to preclude the building up of deleterious back pressures within a motor of the above men-
20 tioned type and in order to accomplish this we propose to provide an efficiently operable relief mechanism which is automatically operable when variations in rotative speeds are experienced by the motor.

More specifically, it is an object of our present invention to provide an outboard motor with the above mentioned relief mechanism which is operatively connected with one of the manually operable speed control elements
30 of the motor, whereby positive relief from the building up of back pressures is afforded when the engine is running at relatively low speeds.

Still another object of our invention is to
35 provide an effective underwater exhaust mechanism for an outboard motor having a lower unit which is of substantial stream-line construction and we propose to effect the discharge of exhaust gases from the stream-line
40 housing immediately below and at the rearward end of an anti-cavitation plate, thereby taking advantage of the suction created within the water at this point to expedite the withdrawal of exhaust gases from the motor.

Another object of our invention is to provide an underwater exhaust mechanism comprising a passageway for directing exhaust gases away from the engine muffler which is
50 cooled by the circulation of water through

separate conduits positioned adjacent thereto.

Still another object of our invention is to prevent the outer surface of the muffler of the motor from becoming heated and to accomplish this we provide said muffler with a jacket through which cooling water may be continuously circulated.

These and other objects will be more apparent from the following detailed description when considered in connection with the accompanying drawings wherein—

Figure 1 is a central sectional view of an outboard motor embodying features of our invention, certain portions thereof being
65 shown in elevation and certain other structures such as the gasoline tank being removed for the purpose of disclosing parts otherwise hidden;

Figures 2 is a horizontal view of the muffler taken substantially along the line 2—2 of Figure 1;

Figure 3 is a horizontal transverse sectional view of the exhaust casing taken substantially along the line 3—3 of Figure 1;

Figure 4 is a horizontal transverse sectional view of the cylindrical casing which surrounds the water circulating pipes and the engine drive shaft taken on line 4—4 of Figure 1;

Figure 5 is an elevational view of the outboard motor assembly as viewed from the left of Figure 1;

Figure 6 is a fragmentary transverse sectional view taken substantially along the line 6—6 of Figure 5 disclosing the shiftable plate carried by the magneto structure for controlling the actuation of the relief valve;

Figure 7 is an enlarged elevational view of the relief valve actuating device, the valve and associated casing being shown in section;

Figure 8 is a side elevational view of said relief valve actuating device as viewed from the left of Figure 7;

Figure 9 is a horizontal transverse sectional view of the lower stream-line unit taken substantially along the line 9—9 of Figure 1;

Figure 10 is a transverse sectional view taken substantially along the line 10—10 of Figure 1;

Figure 11 is a similar transverse sectional view taken along the line 11—11 of Figure 1;

Figure 12 is a transverse sectional view taken along the line 12—12 of Figure 1;

Figure 13 is a section taken substantially along the line 13—13 of Figure 1; and

Figure 14 is a transverse section taken along the line 14—14 of Figure 1.

Referring now to the drawings more in detail wherein like numerals have been employed to designate similar parts throughout the various figures, it will be observed that for the purpose of disclosing a practical application of our invention we have shown an out-board motor assembly of the opposed cylinder construction, said assembly comprising a pair of opposed cylinders 10 which are suitably mounted to opposite sides of a central crank case 12. The upper portion of this crank case 12 rotatably supports a fly-wheel 14 which houses the usual magneto structure (not shown in detail). This crank case 12 is mounted upon an annular head 16 (Figure 1) which is in turn secured in any suitable manner to the upper extremity of a cylindrical casing 18.

This casing 18 is rotatably mounted within a sleeve 20 which is pivotally mounted at 22 upon a bracket 24. This bracket 24 may be of any conventional design of the type which is adapted for convenient application to the stern of a boat (not shown). It will thus be apparent that the engine proper together with the cylindrical casing 18 is rotatable about a substantially vertical axis within the sleeve or bearing 20 and also tiltable about the substantially horizontal axis 22.

The lower extremity of the sleeve 18 is formed with a flange 26 which is designed to receive and support a stream-line lower unit designated generally by the numeral 28. This lower unit 28 is preferably cast from aluminum or other suitable material and is secured against the lower surface of the flange 26 through the agency of a pair of elongated bolts 30 and a shorter bolt 32. These elongated bolts 30 extend through the casing 28 and are threaded into a propeller shaft housing 34. A shaft 36 mounted within the housing 34 supports a propeller 38 at its outer extremity and rotation is imparted to this shaft 36 by means of a bevel gear connection between this shaft and a vertical drive shaft 40 extending upwardly through the casing 28. This shaft 40 has a spline connection at its upper extremity with the lower end of another drive shaft section 42, the upper extremity of which is operatively connected in any suitable manner with the engine crank shaft (not shown).

The casing 28 is of stream-line construction and in order to obtain a clear understanding of the stream-line structure as well as the arrangement of the various passageways within the unit or casing 28, reference is

made to Figures 9 to 14 inclusive. It will be seen that the rotation of the propeller 38 will cause water to be forced through screening 44 in a water intake mouth 46 (Figures 1 and 11) upwardly into a passageway 48 (Figures 1 and 10) provided within the unit 28. From the passageway 48 the water will be directed through a passageway 50 provided in a pipe 52 which extends upwardly through the cylindrical casing 18. The upper extremity of this pipe 52 terminates within the annular head 16 and from this point the water is directed into the water jacket (not shown) of the cylinders by means of suitable piping 54. The water from the cylinders 10 is returned through suitable piping 56 which is connected in any suitable manner to the upper end of a pipe 58 within the cylindrical casing 18. The passageway 60 within this pipe 58 discharges the water into a chamber 62 (Figures 1 and 10) which chamber connects with a by-pass 64 (Figure 11). This by-pass 64 provides the means of communication between the chamber 62 and a discharge orifice 66 (Figures 1, 11 and 12).

It will be seen that a muffler or what might be termed a combine manifold and muffler 68 is secured to the rear side of the cylinders 10 as by means of suitable bolts 70. This muffler 68 includes a cylindrical chamber 72 which communicates with the cylinders 10 by means of suitable passageways 74 (Figure 2) and the lower central portion of said muffler is formed with an opening 76 through which exhaust gases may pass into an exhaust passageway 78 which is enclosed within an elongated casing 80. The muffler chamber 72 is enclosed within a casing provided with a water jacket 82 and water is supplied to this jacket from a passageway 84 (Figure 1) presented within a pipe 86 which is housed within the casing 80. The lower end of the casing 80 is supported within the rearwardly extending portion of the flange 26.

The rearward portion of the stream-line casing or unit 28 is formed with a passageway 88 (Figures 1 and 10) which communicates at its upper extremity with the lower end of the passageway 78 provided within the casing 80. It will thus be apparent that exhaust gases from the muffler chamber 72 may pass downwardly through the passageway 78, into the passageway 88 and then through a discharge orifice 90 into the water. Water circulation within the pipe 86 and the muffler water jacket 82 is occasioned through the actuation of the propeller 38 which causes water to be forced through a screened intake mouth 92 and upwardly through a passageway 94. This passageway 94 communicates with the passageway 84 within the pipe 86. Water is withdrawn from the water jacket 82 through a return pipe 96 which traverses the muffler chamber 72 and communicates with the upper end of a passageway 98 positioned adjacent

the exhaust passageway 78. The lower extremity of this water discharge passageway 98 terminates at a point immediately above the rearward end of the flange 26.

5 We provide an anti-cavitation plate 91 (Figures 1, 5 and 9), the rearward extremity of which terminates immediately above the discharge opening 90. By having the discharge opening 90 thus positioned with respect to the anti-cavitation plate 91, we are
10 able to take advantage of the partial vacuum or suction which is present in this vicinity when the motor assembly is being driven through the water at normal operating speeds. This suction is sufficient to greatly expedite
15 the positive withdrawal of the exhaust gases from the muffler and associated passageways and to insure the disposition of the exhaust gases below the surface of the water. In this
20 manner the presence of exhaust gases in the vicinity of the motor assembly while in use is eliminated and the positive and continuous discharge of the gases into the water is insured.

25 In order to prevent the building up of back pressures by the exhaust gases we provide a relief mechanism designated generally by the numeral 100 which is shown in detail in Figures 6 to 8 inclusive. This relief mechanism
30 comprises a suitable relief valve 102 which is pivotally mounted at 104 to the side of the casing 80. Resilient means such as a coil spring 106 is provided to normally urge said valve toward its closed position shown in Figure 7. When the valve occupies this position
35 exhaust gases within the casing 80 will pass uninterruptedly through the chamber 78 and will be discharged underwater. When said valve is open, these exhaust gases will be
40 free to discharge into the atmosphere through an opening 108 provided in the casing 80 (Figure 7). The tendency for back pressures to be built up is obviously greater when the engine is running at low speeds and hence
45 it is desirable to maintain the valve 102 open when the engine is operating under such slow speed conditions. In order to automatically open the valve 102 when the engine is running slowly, we have operatively connected said
50 chamber through a leverage system with one of the speed control elements such as the spark control handle 110 (Figure 1). This handle 110 is usually mounted upon a plate 112 which supports the magneto structures
55 (not shown) and which is rotatable independently of the rotation of the fly-wheel 14. Secured beneath the rearward portion of the magneto plate 112 is a segment or plate 114. This plate is configured along its inner
60 margin as clearly shown in Figure 6. A finger 116 supported at the upper extremity of a pivoted arm 118 is maintained in engagement with the configured edge of the plate or segment 114 by means of a coil spring 120
65 as clearly shown in Figures 6 and 8. Movement occasioned by the arm 118 is transmitted

to the valve 102 by means of an arm 122, a crank 124 and a bell crank 126. Thus when the finger 116 engages the serrated portion of the inner edge of the plate 114, as shown in Figure 6, the valve 102 will be closed but
70 when the plate is shifted to the left (Figure 6) in response to the manual manipulation of the control handle 110, a cam portion 128 of the plate 114 will be moved against the finger 116 so as to effect the opening of the valve 102. When the plate 114 is shifted to the left in this manner and the edge portion 128 actuates the finger 116, the control handle 110, Figure 1, will occupy the position at which the ignition spark is retarded. When the finger 116
80 engages the serrated portion of the serrated edge of the plate 114, the ignition spark will be advanced. In other words, when the motor is running at speeds which are high enough to positively insure the discharge of
85 exhaust gases into the water without the development of back pressures, the valve 102 will remain closed. When the motor is running at slower speeds there is a much greater tendency for back pressures to be established and at this time the valve will automatically be open. Obviously the valve 102 might be operatively connected with other speed control elements without departing from the spirit and scope of the present invention.

From the foregoing it will be observed that our invention contemplates the provision of an outboard motor assembly which is rotatable about a substantially vertical axis and which is tiltable about a substantially horizontal axis, the lower portion of said assembly being of stream-line construction and having a gas discharge orifice positioned adjacent and to the rear of the propeller. By discharging the gases at a point located to the rear of the propeller and immediately beneath the rearward portion of the anti-cavitation plate, said gases are positively withdrawn and discharged beneath the water level. The relief mechanism provides a very effective means for relieving against the development of back pressures within the motor and further supplies a means which is operable in response to a speed control element or lever. Thus when the motor is slowed down to a speed at which the resistance of the water might be sufficient to develop back pressures, the discharge passageway is opened to the atmosphere, thereby permitting the free discharge of the gases above the water level. By circulating the cooling water through the muffler jacket, said muffler is prevented from becoming heated thereby eliminating the possibility of injury to an operator. The cooling water which is circulated through the muffler jacket not only prevents the heating of said muffler but also serves to cool the exhaust gases as they are being conducted from
130

the muffler to the point of discharge beneath the water level.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In an outboard motor assembly, the combination with a support, of a motor mounted thereon having a lower turnable unit, a drive shaft casing connecting the motor and said unit, an expansion chamber for receiving exhaust gases from the motor and means forming a passage way from the chamber to the unit separate from the casing, the lower unit having a passage communicating therewith for discharging exhaust gases at the rear of the unit and below normal water level.
2. In an outboard motor assembly, the combination with a support of water jacketed motor mounted thereon having a lower turnable unit, a drive shaft casing connecting the motor and lower unit, an expansion chamber for receiving exhaust gases from the motor having a separate discharge pipe extending therefrom to the lower unit, the lower unit having a discharge passage for exhaust gases at the rear end below normal water level, and means for circulating water through the drive shaft casing for cooling the motor.
3. In an outboard motor assembly, the combination with a support, of a motor mounted thereon having lower turnable unit, a drive shaft casing connecting the motor and the lower unit, means forming a jacketed expansion chamber for receiving exhaust gases from the motor and a tubular passage extending from said chamber to the lower unit independent of the drive shaft casing, the lower unit having an exhaust passage communicating therewith and opening at the rear thereof below normal water level, and means for circulating water adjacent said passage way and through the expansion chamber water jacket.
4. In an outboard motor assembly, the combination with a support, of a water jacketed motor mounted thereon having a lower turnable unit, a casing extending between the motor and the unit, means forming a jacketed exhaust chamber for receiving gases from the motor, a separate casing extending from the expansion chamber to the lower unit and discharging exhaust gases at the rear thereof, and means for circulating water from the lower unit separately to the motor water jacket and to the exhaust water jacket through the separate casings connecting them with the lower unit.
5. In an outboard motor assembly, the combination with a support, of a water jacketed motor mounted thereon having a lower turnable unit, a drive shaft casing connecting the motor and lower unit, a drive shaft, propeller shaft and propeller connected to the motor and mounted in the lower unit, a water jack-

eted exhaust chamber connected with the motor a separate casing extending from the chamber to the lower unit, the lower unit being of streamline cross section and having an integral anti-cavitation plate extending above the propeller, the lower unit having a passage connecting with the exhaust casing to discharge gases below the plate at the rear of the propeller, and means extending from the rear of the propeller and below the anti-cavitation plate in the lower unit for conveying cooling water in separate passages through the said casings to cool the motor and the exhaust chamber through the water jackets thereof respectively.

6. In an outboard motor assembly, the combination with a support having a pair of spaced parallel guide arms and a thrust plate, of a motor mounted thereon having a lower turnable unit, a drive shaft casing connecting the motor and the lower unit and rotatable in the support between the said guide arms in engagement with the thrust plate, means forming an expansion chamber for receiving exhaust gases from the motor a casing extending from the chamber to the lower unit at a distance from the drive shaft casing to allow the latter to turn between the support arms without engaging the exhaust casing, the lower unit having a passage communicating with the exhaust casing and discharging at the rear end of the unit.

In witness whereof, we have hereunder subscribed our names.

LOUIS J. JOHNSON.
HARRY L. JOHNSON.