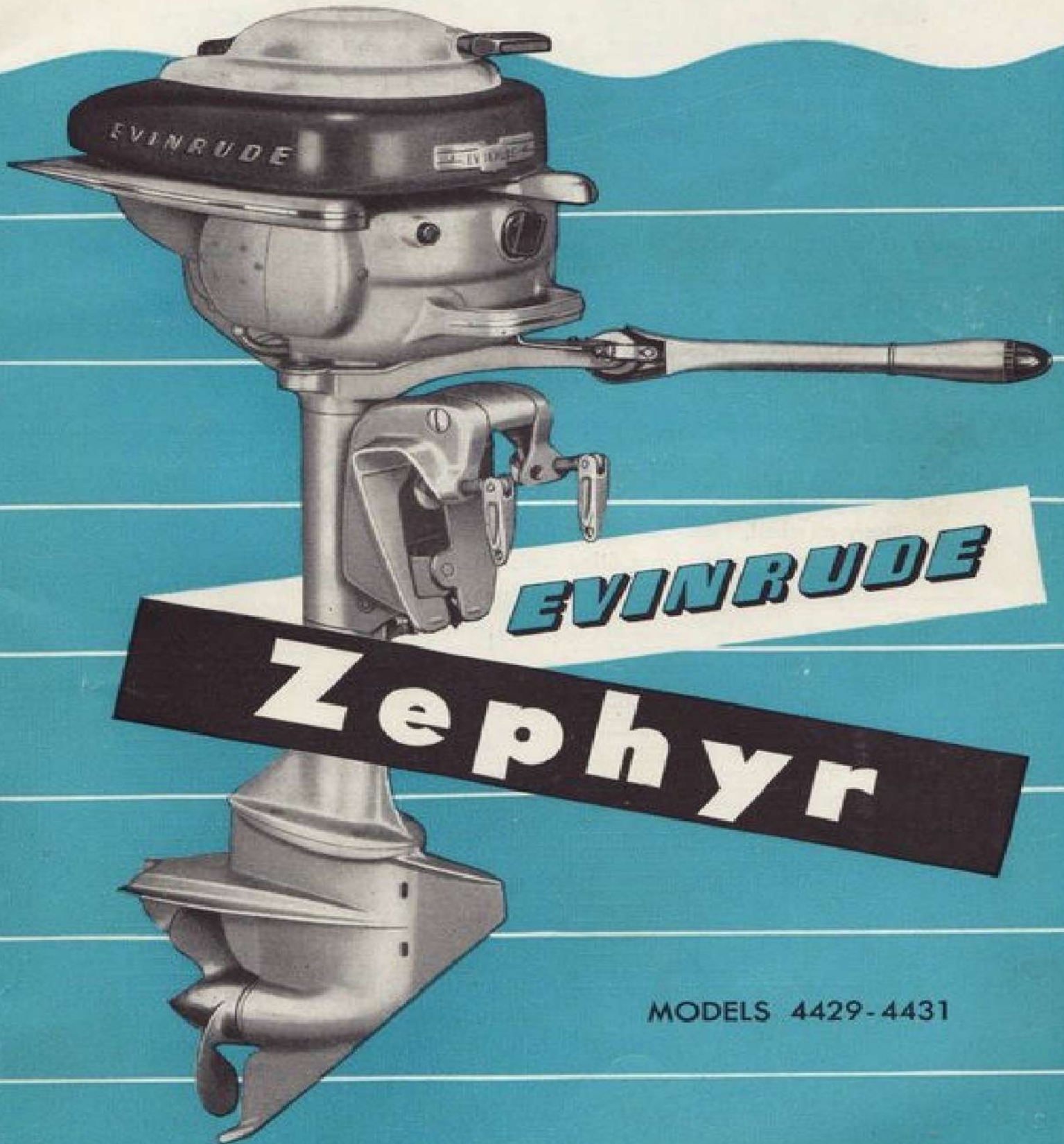


**Operating and General**

# **Instructions**



**MODELS 4429-4431**



# EVINRUDE

# Zephyr

**MODELS 4429-4431**

(For Mechanical Specifications See Page 27)

**FOREWORD** The Evinrude Zephyr is simple to understand, easy to operate, and built to give first-class service, but before you attempt to operate the motor, read pages 2 to 8 carefully. The remaining instructions are for later reference and may be read at leisure.

**MAKE WARRANTY EFFECTIVE NOW** MAKE OUR WARRANTY ON YOUR MOTOR EFFECTIVE by filling out Registration Card (packed in tool carton) and mailing immediately. BE SURE CORRECT MOTOR NUMBER, located on right side of stern bracket, appears on card.

**ASSEMBLY INSTRUCTIONS FOR MOTOR PACKED IN CARTON** (*Right and Left Are Designated While Facing Motor on carburetor side*) The motor, as packed for shipment, comes completely assembled ready to be attached to boat. The spark plugs are in place in cylinders and wires are properly attached.

The Gear Housing has been filled with OIL.

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## ASSEMBLY INSTRUCTIONS FOR MOTOR PACKED IN WOOD BOX

Remove corks from spark plug holes.

Remove spark plugs and wrench from tool kit. Insert spark plugs into cylinders with gaskets in proper place and tighten securely, as loose plugs may cause pre-ignition or possible piston damage. Since spark plug holes are at an angle, be careful not to cross threads when inserting plugs.

Now, fasten spark plug wires to proper plugs. Note that upper wires are marked with bands. Wires should hang downward to clear hood and nuts should be tightened with pliers. Fasten hood to motor.

### ATTACHING MOTOR TO BOAT

Our motors are designed for transoms that conform to S.A.E. boat standards. (See illustration, Fig. 1.) "A" denotes pitch or angle; "B", maximum transom thickness; "C", vertical transom height, not including keel.

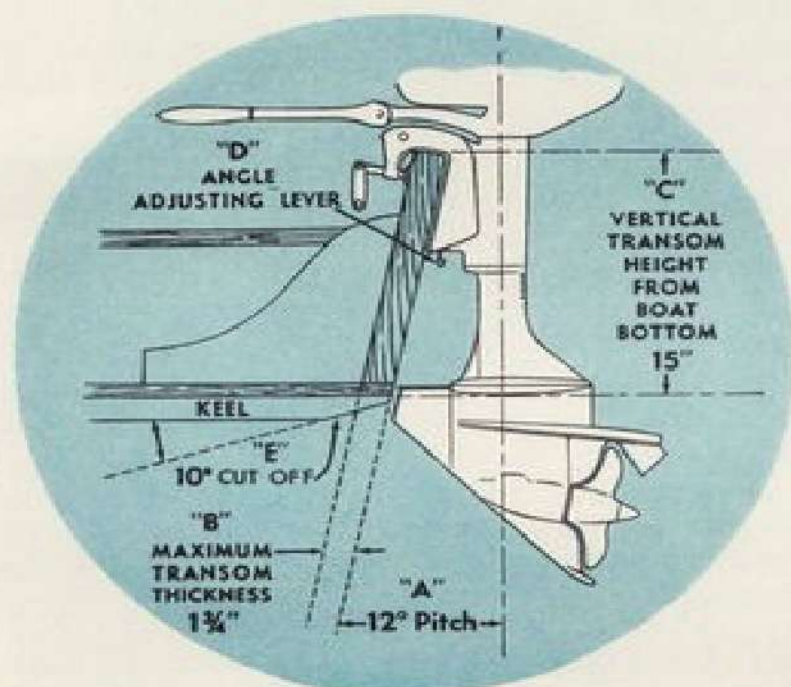


Fig. 1

It is advisable not to use a transom over 15 inches high, as this may cause (cavitation) propeller slippage. However, if boat has an extremely high transom and it is not desirable to cut to 15 inches, a Zephyr with 5 inch longer shaft is offered at moderate extra cost.

With boat afloat, place motor on transom, preferably in center, and **SECURELY TIGHTEN CLAMP SCREWS BY HAND. USE NO TOOLS FOR THIS.**

**CAUTION:** It is "good insurance" to tie motor to boat with stout rope so that if motor becomes loose accidentally, rope will prevent its loss overboard. There is a hole provided for this purpose on front of motor bracket.

Holes are provided in clamp screw handles through which a padlock may be applied.

**WEEDLESS HOUSING:** The angle of this housing requires that motor be operated in a vertical position; therefore, a provision for adjusting angle has been made. See Illustration "D" ANGLE ADJUSTING LEVER (Transom trigger). By tilting motor slightly and then lifting up on the lever and moving it either ahead or back, motor can be instantly adjusted to the desired angle.

Where weeds are exceptionally thick, it is even better to have housing tilted slightly away from boat transom as this permits weeds to slide downward and not clump or gather on leading edge of housing. It is also best to operate motor at a reduced speed especially in very thick weeds.



Should weeds gather on leading point of housing, this indicates that point is too low, thus bringing it below line of boat bottom. Therefore, it is important that boat transom measures not LESS than 15 inches, as illustrated.

On some boats it may be necessary to correct angle adjustment when changing from one to more passengers to maintain motor in a vertical position. Always try to arrange load so boat runs on an even keel.

**LUBRICATION AND FUEL INSTRUCTIONS** Correct lubrication is the most important factor in the operation of an internal combustion engine, as it insures longer life and satisfactory performance.

In the Zephyr's two cycle engine, the lubrication of pistons, cylinders, crankshaft and connecting rod bearings is solely supplied by oil which must be thoroughly MIXED into gasoline BEFORE it is poured into fuel tank. NEVER POUR CLEAR GASOLINE OR OIL INTO FUEL TANK.

**TYPE OF GASOLINE:** Use a good grade of regular gasoline (such as used in automobiles). High octane or leaded fuel gives no advantage.

**LUBRICANT:** We recommend Mobiloil Outboard or another outboard oil, or a regular SAE 30 grade automotive engine oil. Avoid use of low price third grade (ML) oils.

**QUANTITY OF OIL REQUIRED:** For the first four hours of operation run motor at approximately  $\frac{3}{4}$  speed using  $\frac{3}{4}$  pint of oil to each gallon of gasoline, and thereafter reduce quantity of oil to  $\frac{1}{2}$  pint to each gallon.

**TROLLING:** When trolling for long periods, quantity of oil may be reduced to  $\frac{1}{3}$  pint to each gallon of gasoline, but care should be taken not to operate motor at too high a speed with this mixture.

**STRAIN ALL FUEL:** Due to condensation, water is often present in gasoline when you get it from the vendors. But it may also accumulate in your own fuel container from condensation due to changes in temperature.

Because the presence of water in fuel is a frequent cause of hard starting, all gasoline should be poured through a fine mesh strainer. This will eliminate the water and also any dirt which might otherwise clog fuel passages. USE METAL CONTAINERS ONLY.

**GEAR LUBRICATION** The Zephyr's new design weedless gear case uses oil instead of grease. Check gear case for oil after the first five hours of operation to make sure it is filled. Then check periodically at least every 50 hours. Drain and refill the end of the season (page 21).

Remove plug on right hand side marked "LUB". Also remove the lower drain plug on same side and, with motor in a vertical position, permit lubricant to drain. Replace drain plug, then fill gear case through the lubrication plug with a pump-type oil can, using Mobilube GX-90, or any other good grade SAE 90 automotive hypoid gear lubricant. If hypoid lubricant is not available in emergency use Mobiloil Outboard or other SAE engine oil until recommended lubricant can be obtained.

## **STARTING AND OPERATING INSTRUCTIONS**

*(See Illustration, Fig. 2)*

1. Fully open FUEL SHUT-OFF VALVE below tank on right side.



2. Turn FUEL DIAL at front of motor hood fully to left to "COLD START" position.
3. Place SPARK LEVER located above hood to "START" position as indicated
4. Turn SPEED CONTROL GRIP located on steering handle to "START" position as indicated.
5. Push PRIMER 3 times (in cold weather 4 or 5 times).

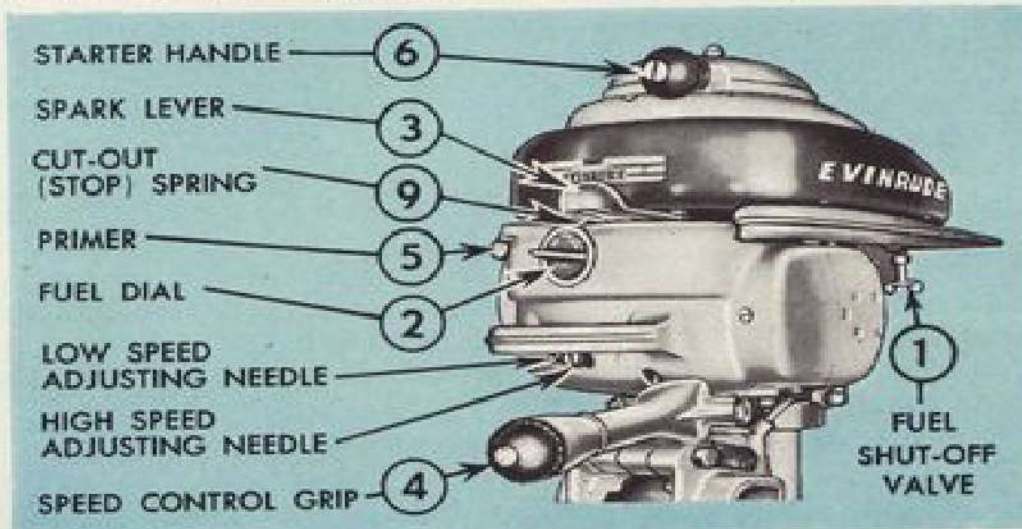


Fig. 2

6. Pull STARTER HANDLE slowly until starter engages, then pull forcibly (do not pull cord out more than 30 inches), repeat until motor starts. Allow starter cord to rewind before you release handle. Premature release of handle may injure fuel tank or cord.
7. After starting slowly turn FUEL DIAL to "RUN" position.
8. To control speed move SPARK LEVER to "FAST", also turn SPEED CONTROL GRIP to "FAST". For slow speed, turn GRIP to "SLOW" and for extreme slow or trolling speed move SPARK LEVER toward "SLOW" position as indicated.
9. To STOP press and hold CUT-OUT SPRING under SPARK LEVER.
10. When motor is not in operation, it is advisable to shut off fuel by turning FUEL DIAL to "SHUT-OFF" position.
11. STARTING HOT MOTOR: With FUEL DIAL set at "RUN" and SPARK LEVER and SPEED CONTROL GRIP both on "START" position, pull STARTER HANDLE until motor starts. DO NOT PRIME.
12. STARTING WARM MOTOR: Place controls same as starting HOT MOTOR. If motor refuses to start after one or two pulls then turn FUEL DIAL to "COLD START", returning it to "RUN" position immediately after starting. DO NOT PRIME. (SEE FLOODING, ALSO PROPER CARBURETOR ADJUSTMENTS ON PAGE 6.)

## NECESSARY EQUIPMENT WHEN OUTBOARDING

Although the following articles may not always be needed, it is advisable to have them aboard when motoring.

An extra can of fuel, properly mixed. The fuel capacity is about 7 pints and



should run motor from 1 to 1¼ hours, depending upon type of boat and also boat load.

Funnel with strainer.

Extra spark plug.

Tools.

Starting cord (see page 7).

Propeller shear-off pins.

Rope to tie motor to boat.

Oars and any equipment required by law when outboarding in federal waters.

See page 26.

**REVERSE** The Zephyr motor permits full 360° steering. Reversing is accomplished by turning motor one-half turn. First raise the steering handle and then turn motor either left or right by the handle. A special lock arrangement built into the drive housing locks the motor against tilting while reversing. **CAUTION**, it is advisable to reduce motor to approximately ⅓ speed, before reversing.

**TILTING OF MOTOR** The tilting feature becomes very necessary in many situations. It enables mounting of motor onto boat before launching, and prevents possible damage to lower unit when beaching or docking in shallow waters. Tilting is accomplished by placing both hands on dome of motor and pulling motor toward you.

**CAUTION:** Never attempt to tilt motor by bearing down on steering handle.

**FLOODING** Flooding is a condition which can be created by **OVER PRIMING** or sometimes cranking a warm or hot motor which may cause too much fuel to be drawn into crankcase and cylinders. The fuel mixture thus becomes too rich for combustion.

To correct, first note the approximate setting of the carburetor **HIGH SPEED** adjusting needle, then gently close it and pull starter handle until motor starts, allowing it to run until it stops. Now, reset adjusting needle back to its original setting and follow instructions relative to starting **WARM** motor.

**PROPER CARBURETOR ADJUSTMENTS** Although both **HIGH** and **LOW** speed carburetor adjusting needles (as marked on front of motor hood directly beneath fuel dial) are adjusted at factory, due to different altitudes, climatic conditions, and a possible change in fuel mixture, it may be necessary to readjust them under actual running conditions to obtain best performance. After motor gets under way, with **SPARK LEVER** fully advanced and **SPEED CONTROL GRIP** opened to "**FAST**" position, it is advisable to adjust the **HIGH SPEED** needle by turning slowly to the Left for richer and Right for leaner, until motor runs smoothly at its highest speed.

To adjust the **LOW SPEED** needle, turn **SPEED CONTROL GRIP** to "**SLOW**" and then slowly move **SPARK LEVER** toward "**SLOW**" position, then adjust the **LOW SPEED** needle by turning very slowly left or right until motor runs smoothly at its lowest speed. This needle is rather delicate and care must be used so as not to force or bend it while adjusting or closing it.

It may be necessary to again slightly readjust the **HIGH** speed needle after low speed is properly adjusted.

The approximate setting of the **HIGH SPEED** adjusting needle is one full turn open from closed position.

The approximate setting of the **LOW SPEED** adjusting needle is ¾ turn open from closed position.



**CAUTION:** To eliminate the necessity of readjusting the carburetor adjusting needles every time motor is used, it is advisable to measure the quantity of lubricating oil mixed with the gasoline very accurately. Also care should be taken that the same grade and type of both oil and gasoline are always used.

**PROPELLER SHEAR-OFF PIN** The propeller shear-off pin prevents damage to the motor if you strike a submerged rock or other obstruction in the water. This is a soft "safety" pin which passes through the propeller shaft. When propeller strikes a solid obstruction while running at full speed, this pin shears off, disengaging the propeller from the driving mechanism, thus preventing the gears, shafting and other mechanism from being damaged.

When this happens, the motor continues to run without the propeller rotating. Naturally the boat does not move. In such a case, stop motor immediately. Remove the rubber propeller cap from end of shaft (see Fig. 3). Turn propeller so that shear-pin hole lines up same as cotter pin. It is not necessary to remove cotter or washer.



Fig. 3

Drive out the sections of sheared pin and insert a new pin, several of which are included in motor tool kit. If you have no spare shear-off pin, use a nail in emergencies. Fragments of the old pin, may also be used by placing large section in one side of hub hole and the two smaller sections on other side. Replace rubber cap, which holds pin in place.

Propeller shear-off pin size is  $\frac{3}{16}$ " x  $2\frac{7}{32}$ " long, H.H. brass.

## **SIMPLEX STARTER — EMERGENCY STARTING**

If starter breaks or jams, it may be removed by first removing the 3 screws and the motor started by winding a length of  $\frac{1}{4}$ " rope with knot tied on one end, clockwise around starter pulley on flywheel.

If starter housing has been removed, be extremely careful when replacing it to be sure that starter pawls on underside of starter pulley engage with ratchet on top of starting pulley on flywheel. Pulling starter handle out slowly while placing starter on tank will assist in engaging pawls. After pawls are engaged, starter should be absolutely flat on tank. Replace three starter screws and tighten. Pull starter handle; if starter binds, unscrew starter screws and shift starter housing one way or the other to align starter properly. When starter is aligned, tighten starter screws.

**REMOVING MOTOR FROM BOAT** When removing motor from boat keep powerhead higher than lower unit to prevent water from entering into cylinders and crankcase through exhaust ports.

Therefore, while lifting motor off boat, hold in an upright position until all water has drained from lower unit.



## TO AVOID FUEL LEAKAGE WHEN CARRYING OR HANDLING MOTOR

It is important that the FUEL SHUT-OFF VALVE is fully closed. This is located on right side of motor, below Fuel Tank. It is also important to turn Fuel Dial on motor hood to "SHUT-OFF" position. Be sure that Fuel Filler Cap on fuel tank is screwed down securely.

Toward end of run, just before stopping motor, close the FUEL SHUT-OFF VALVE below fuel tank and then permit motor to run for a minute or two, until it stops. This will drain the carburetor and fuel line. Now close Fuel Dial and motor can then be carried without leakage. For complete safety, always empty fuel tank when transporting motor.

*The following instructions may be read at leisure.*

**CARBURETOR** (See Figs. 4, 5, 6) The carburetor is commonly known as a floatfeed, throttle valve type. It is, however, actually as though two separate carburetors were combined into one.

At high speed carburetion is controlled by a horizontal rotary throttle valve (see Fig. 4). A single fuel jet supplies the fuel mixture to two openings or throats, one leading to the upper and one to the lower section of the crankcase, through the crankshaft rotary valve. A separate high speed adjusting needle regulates this mixture.

The low speed carburetion is entirely separated from the high speed. It is located in the center of carburetor (see Fig. 6) between the two large high speed openings. It has no throttle, but has a fixed small opening and jet for high velocity fuel mixture travel during low speed operation.

A choke valve located in the high speed air opening (see Fig. 4) is operated by the "FUEL DIAL" on motor hood. This is for use only when starting a cold motor.

This fuel mixture enters the upper and lower crankcase section at the crankshaft center bearing through separate small rotary valve openings in crankshaft which pick up the mixture from the hole in the center bearing. This mixture is also regulated by a separate low speed adjusting needle.

During high speed operation both jets are supplying mixture, but at low speed, the high speed rotary valve in carburetor closes com-

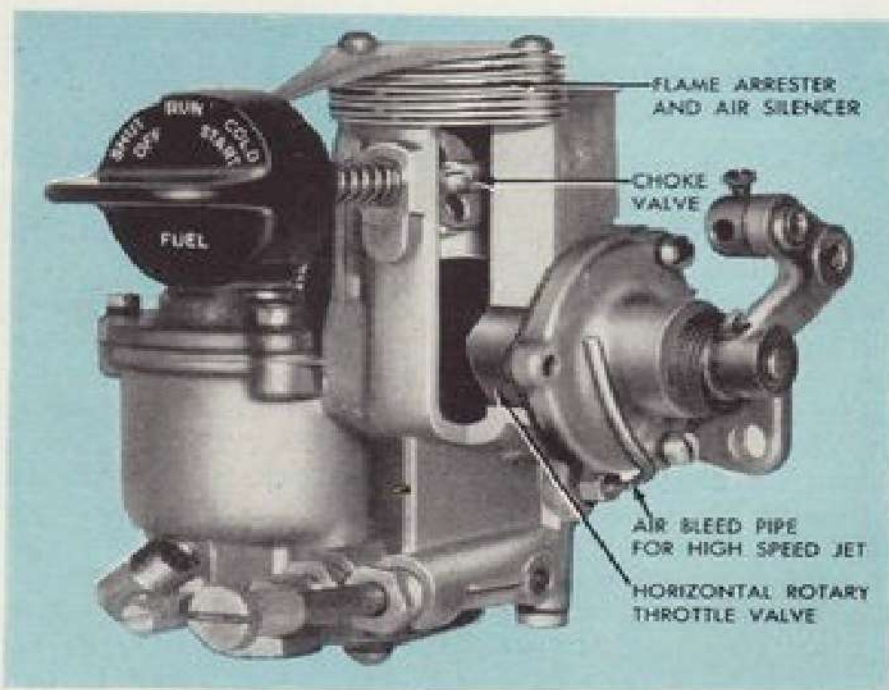


Fig. 4



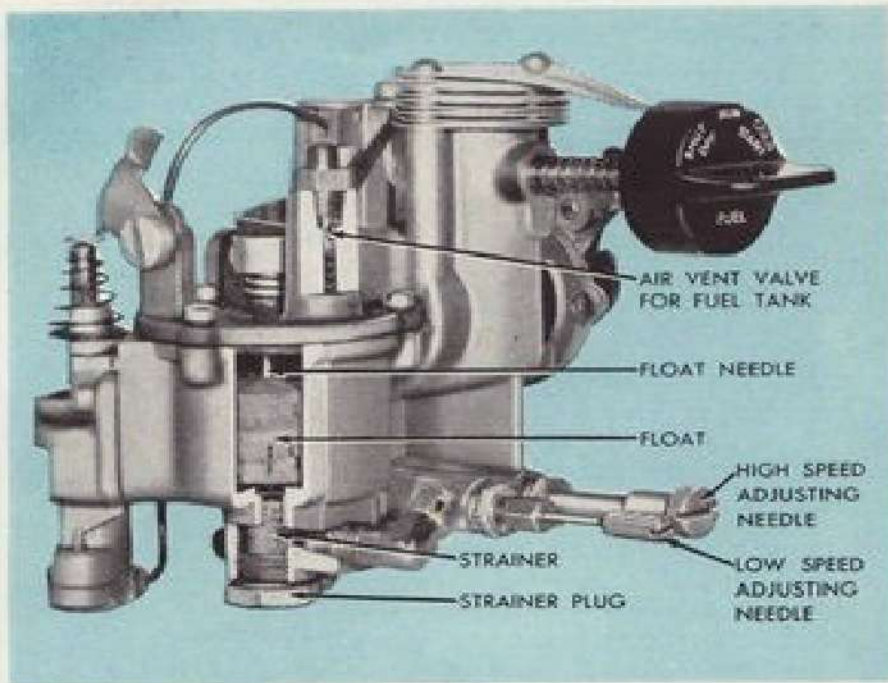


Fig. 5

The primer is attached to the float chamber of carburetor (see Fig. 6) and supplies the fuel to the reservoir for cold starting. For added convenience the air vent valve to the fuel tank is also attached to the top of the float bowl (see Fig. 5). This eliminates the need for a separate manual air vent.

**IMPORTANT — KEEP CARBURETOR CLEAN** No matter

what precaution is used in straining fuel before filling fuel tank, there is always a chance of dirt, sediment, or water accumulating in tank or pipe, therefore it is advisable to clean the carburetor at regular intervals. To do this, first close the FUEL SHUT-OFF VALVE at fuel tank. Then remove both the HIGH and LOW speed CARBURETOR ADJUSTING NEEDLES, by turning them out to the left. Then, tilt the motor as far as it will go. This will drain the needle channels and float bowl and will remove any sediment that may have ac-

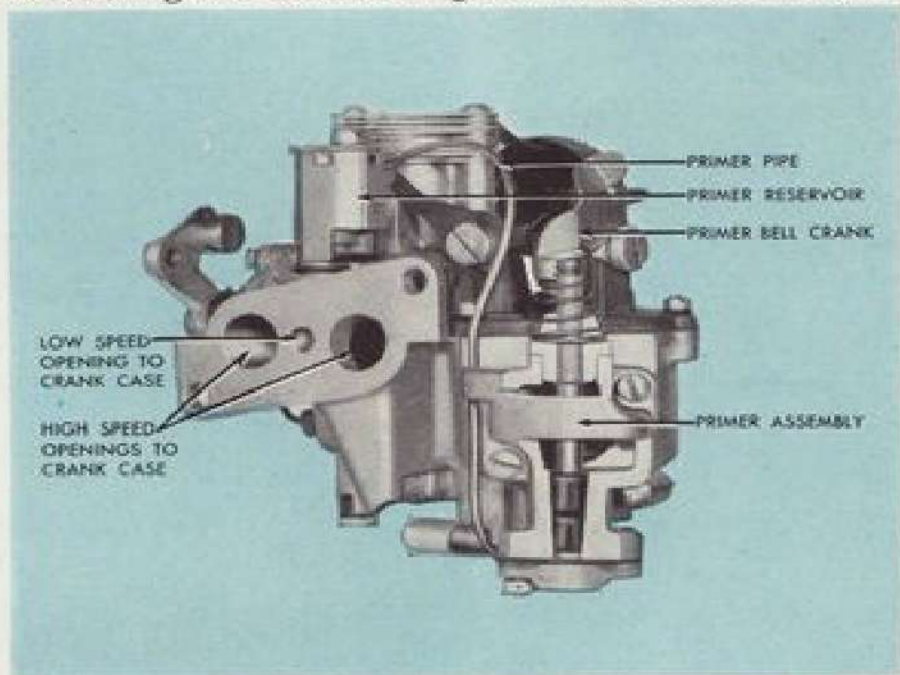


Fig. 6

pletely, leaving only the low speed jet to supply the fuel mixture. So it is important that the carburetor throttle speed control grip is completely closed while trolling.

The high speed air opening is covered by a "Flame Arrester" or air silencer (see Fig. 4). The low speed opening is covered by the primer reservoir (see Fig. 6) through which the motor is primed and which is also a silencer.



cumulated. Replace both needles carefully so as not to damage point or seat. Now remove strainer plug and strainer (see Fig. 5) at bottom of carburetor float bowl and clean the strainer screen. Before replacing screen and plug, open the FUEL SHUT-OFF VALVE for a moment, permitting the fuel to flush out the valve and fuel pipe.

Re-insert screen into carburetor very carefully to prevent crushing it, as this might prevent proper float needle performance, as needle seat is located at top of the screen.

**CARBURETOR ADJUSTING NEEDLE FRICTION** Should adjusting needles become too loose and not retain proper setting, they can be tightened to the desired friction by drawing up on the packing nuts. After considerable use, it is desirable to add new packing in these nuts.

**PRIMER** (See Fig. 7) The primer assembly, attached to the carburetor float bowl, provides a sure, quick method of starting motor.

Pressing the PRIMER BUTTON on front of motor hood moves a bell crank, which presses down the primer plunger (see Fig. 6). The plunger consists of a rod with a cup shaped rubber plunger attached to it. Another similar rubber which is stationary at the bottom of the primer cylinder acts as a check valve.

As the plunger is depressed, fuel is forced past the check valve through the small discharge tube, to the reservoir which covers the low speed carburetor opening, located at back of carburetor (Fig. 6). From the reservoir the fuel is then drawn into the crankcase for starting, through the low speed channel.

Should motor refuse to start after priming a number of times, primer can be tested by removing motor hood and then carefully pulling the small primer pipe from the hole in the reservoir. By pushing several times on bell crank, it can then be determined whether fuel is being delivered through the pipe.

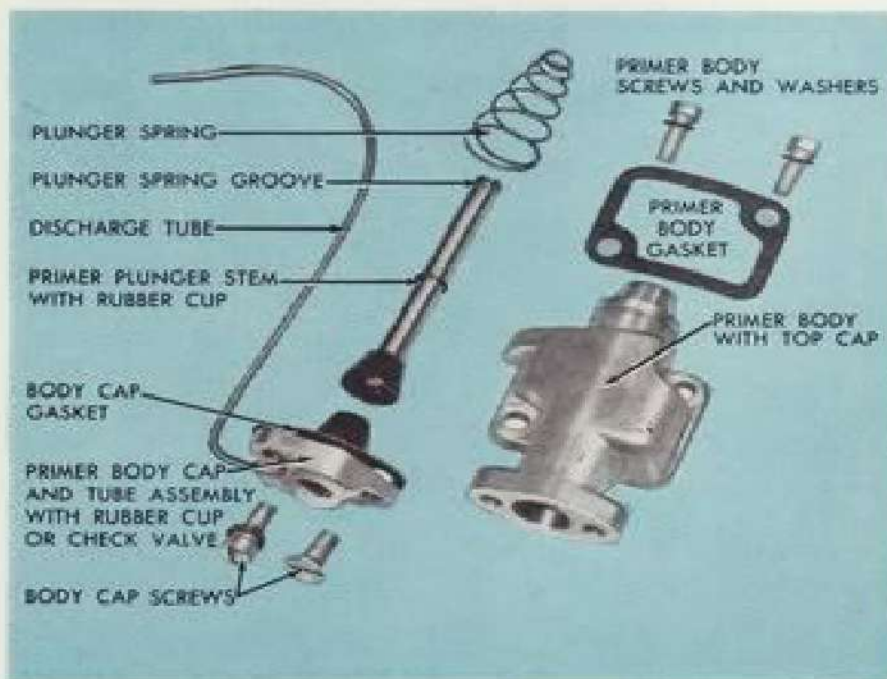


Fig. 7

To examine primer plunger, carburetor must be removed from crankcase by removing one nut and one screw which hold it in place and also removing vent and fuel pipes, as well as the throttle control rod. Then remove the two bottom body capscrews and body cap can be removed from primer. This holds the stationary rubber check valve, also the discharge tube. Next remove the plunger spring from the groove holding it



in place, spring it out with a small screw driver. Plunger can then be pushed down and removed from the bottom.

If either of the rubbers appears to be imperfect or worn, replace them. Also check to see that the discharge tube is not obstructed.

When re-assembling body cap, be sure that the gasket is perfect or replace with a new one.

**FUEL TANK AIR VENT** A gravity feed fuel tank must be properly vented to the atmosphere to insure a constant flow of fuel to the carburetor.

For operating ease this vent is operated from the FUEL DIAL on the motor hood. It consists of a small vent pipe fastened on the inside of the fuel tank. The top opening of this pipe is just inside the fuel filler cap opening. The other end is attached to a fitting at bottom of tank. An outside vent pipe runs from this fitting to a fitting on top of the carburetor float bowl, which contains a spring loaded inverted valve (see Fig. 5). This valve is opened or closed by the FUEL DIAL.

Should motor run irregularly or stall at any time, to determine if vent is functioning properly, remove the fuel filler cap from fuel tank, then start and run motor in this manner. If this corrects the trouble it is then advisable to check the air vent valve and also both vent pipes to be sure that air is being admitted to the fuel tank.

**FUEL DIAL** The Fuel Dial serves a triple purpose. When starting a cold motor, dial is turned to "COLD START". This closes a choke valve in the carburetor air intake (see Fig. 4) and enriches the mixture without the necessity of opening the carburetor HIGH SPEED ADJUSTING NEEDLE during the "warming up" period.

After motor has warmed up, Fuel Dial must then be turned to "RUN," in which position choke valve is open.

When motor is not in use, dial should be turned to "SHUT OFF" position. This shuts off the fuel at the carburetor float bowl, by raising and holding the float needle valve up into its seat; at the same time the AIR VENT to fuel tank is closed by the spring loaded inverted valve on top of carburetor float bowl (see Fig. 5.)

**COOLING SYSTEM** The Zephyr is equipped with a single stage rubber impeller centrifugal type water pump. This pump supplies water at the lowest possible motor speed. At high speed pump wear is reduced by the bending action

of the rubber impeller blades due to the increased water pressure. Under average conditions it should give satisfactory service for many seasons. Water enters pump through the four slots, two on each side of gear housing (see illustration, Fig. 12, pages 14-15). When operating at full speed and motor shows signs of slowing down, immediately check water discharge at "Water Outlet Slots" (see Fig. 9, page 12) at back of upper pump housing. In case of failure, determine whether "inlet slots" in gear housing, are obstructed. If not, then examine pump. After

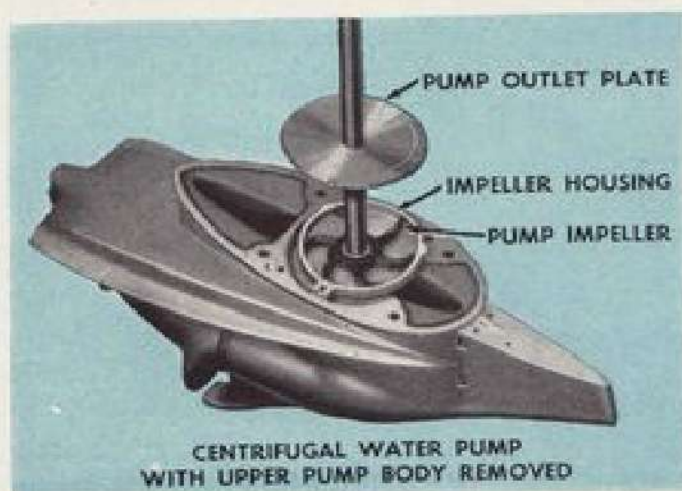


Fig. 8



first removing the four screws holding pump together (see Fig. 13, page 18) the pump can be separated and impeller examined. This is pressed into place on drive shaft. If either the impeller or impeller casing, which is separate from the housing, show considerable wear, it is best to replace them.

**AUTOMATIC EXHAUST RELIEF** While the motor is being started, the Exhaust Relief automatically provides a bypass from which exhaust pressure instantly escapes into the air through the "WATER OUTLET SLOTS" see Fig. 9, unchecked by water seal.

As quickly as the motor attains normal revolutions, the relief is automatically closed by a flow of circulating water, and the noise and fumes diverted to the water-sealed exhaust outlet behind propeller.

At slow speed, therefore, the water will emit in a spray forced out by exhaust gases. At higher speeds more water flows through the slots.



Fig. 9

**SPARK PLUGS** The Champion J6J are the proper spark plugs to be used. They are carefully adjusted to .030 inch gap at factory, but after continued use it may be necessary to reset them. A gauge for this is provided in tool kit. Use end marked "Spark Plug".

When placing spark plugs back into cylinders, be sure gaskets are intact, and tighten plugs securely. Since spark plug holes are at an angle, be careful not to cross threads when inserting plugs. (Wrench furnished in tool kit.) It is important that spark plug nuts are tightened with pliers.

Should motor be run in extremely hot climate running at full speed for sustained intervals, pre-ignition (slowing down) may develop, necessitating the use of the next grade colder spark plug which is the Champion J10 or J3.

In trying to detect a possibly fouled spark plug, remove hood. Start motor and temporarily short out each plug with screwdriver. A fouled plug will show no response in power when shorted out.

## IGNITION TROUBLES AND HOW TO LOCATE THEM

In locating ignition trouble, the first and most common cause may be spark plugs. Remove plugs, and examine them carefully. Should the points and inner porcelain appear wet from either oil or water, plug is definitely fouled. Also check plugs for dirt across points, proper gap and for cracked porcelain.



If no faulty spark plugs are found, proceed to check strength of spark from magneto, leaving plugs out of cylinders. Ground any three high tension wires onto motor, then holding the remaining one  $\frac{1}{4}$  inch away, pull on starter handle. A good spark should jump this gap. Repeat this procedure on the remaining wires, and if there is any evidence of spark failure, it will then be necessary to check magneto.

After extensive service, the breaker points may become dirty or out of adjustment. To check, it is necessary to remove Simplex starter and flywheel.

**HOW TO REMOVE FLYWHEEL** Never remove the flywheel of your motor unless it is absolutely necessary to do so. The only reasons for removing flywheel are for checking breaker points, condenser or coil, and for replacing the high tension wires. First remove the Simplex starter by removing the 3 screws.

Holding the flywheel rigid, unscrew the flywheel nut several turns. Pull up on the flywheel and tap flywheel nut several sharp blows with a light hammer. When the flywheel comes off, use care not to lose the key by which the flywheel is held in engagement with the shaft.

## **ADJUSTMENT OF MAGNETO BREAKER POINTS**

*(See Figs. 10 and 11)* After removing flywheel, place speed control lever to "Start" position, and turn crankshaft until flywheel key is about in line with breaker assembly to be checked. In this position, the timer cam pin rides the high point of cam, and breaker points should check .020". Use gauge furnished, marked "Breaker".

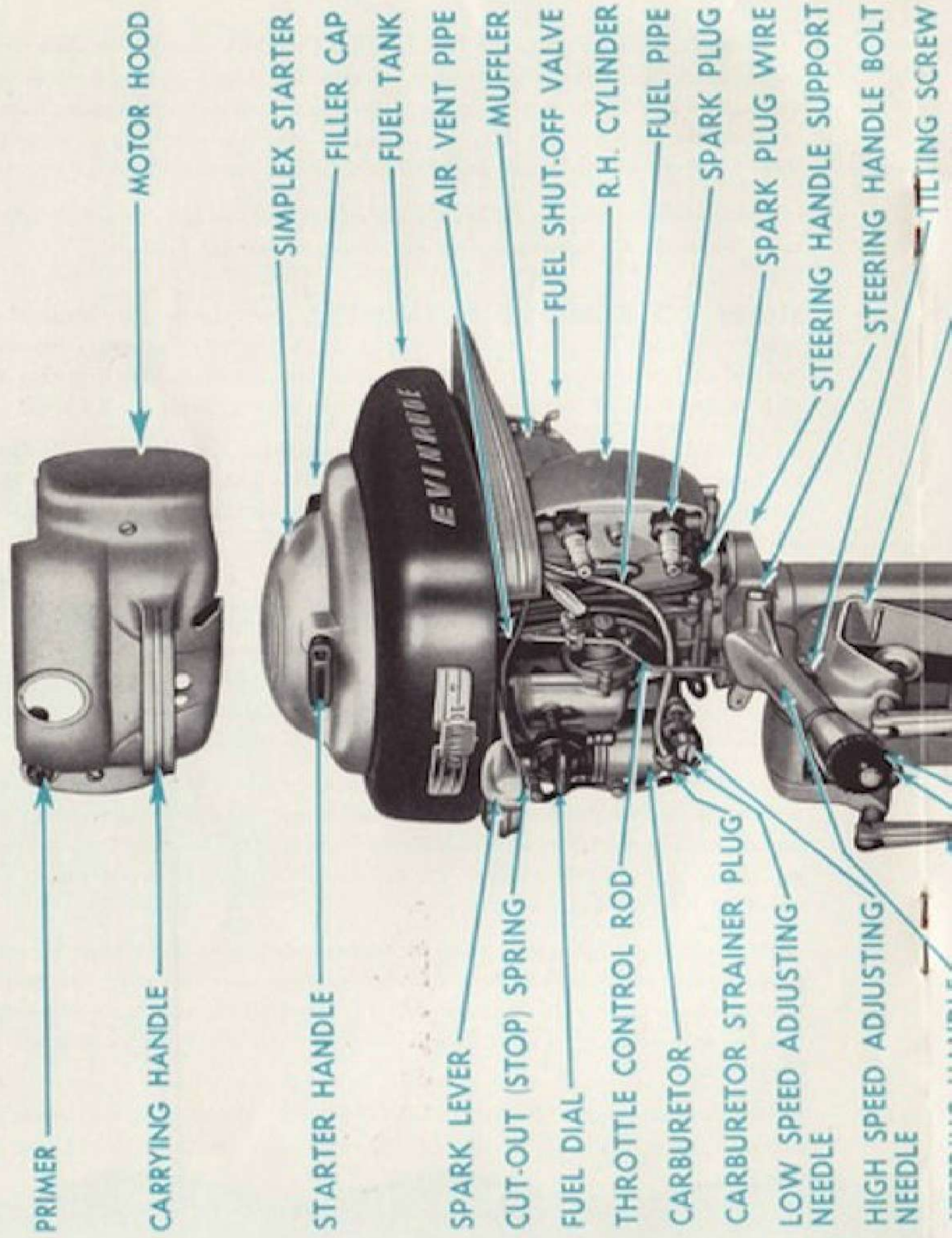
If necessary to re-adjust, loosen top clamp screw which locks breaker assembly to base. Press assembly inward against shaft to open breaker points to required gap, then hold assembly steadily until clamp screw has been locked. Then, re-check gap. Now, turn crankshaft until key is in line with opposite breaker assembly and repeat checking and adjusting operation.

If trouble does not appear to be in breaker points, then check over the complete magneto base. Search for any broken or loose wires on coils, condensers, breaker assemblies, etc. If no visible defect is apparent, the trouble may be either in a coil or condenser, in which case it is advisable to send complete magneto to nearest dealer.

The flywheel magnet, composed of the improved "Alnico" steel, will retain its magnetic charge practically indefinitely. Therefore, the magneto should not be



# Evinrude ZEPHYR With Hood Removed





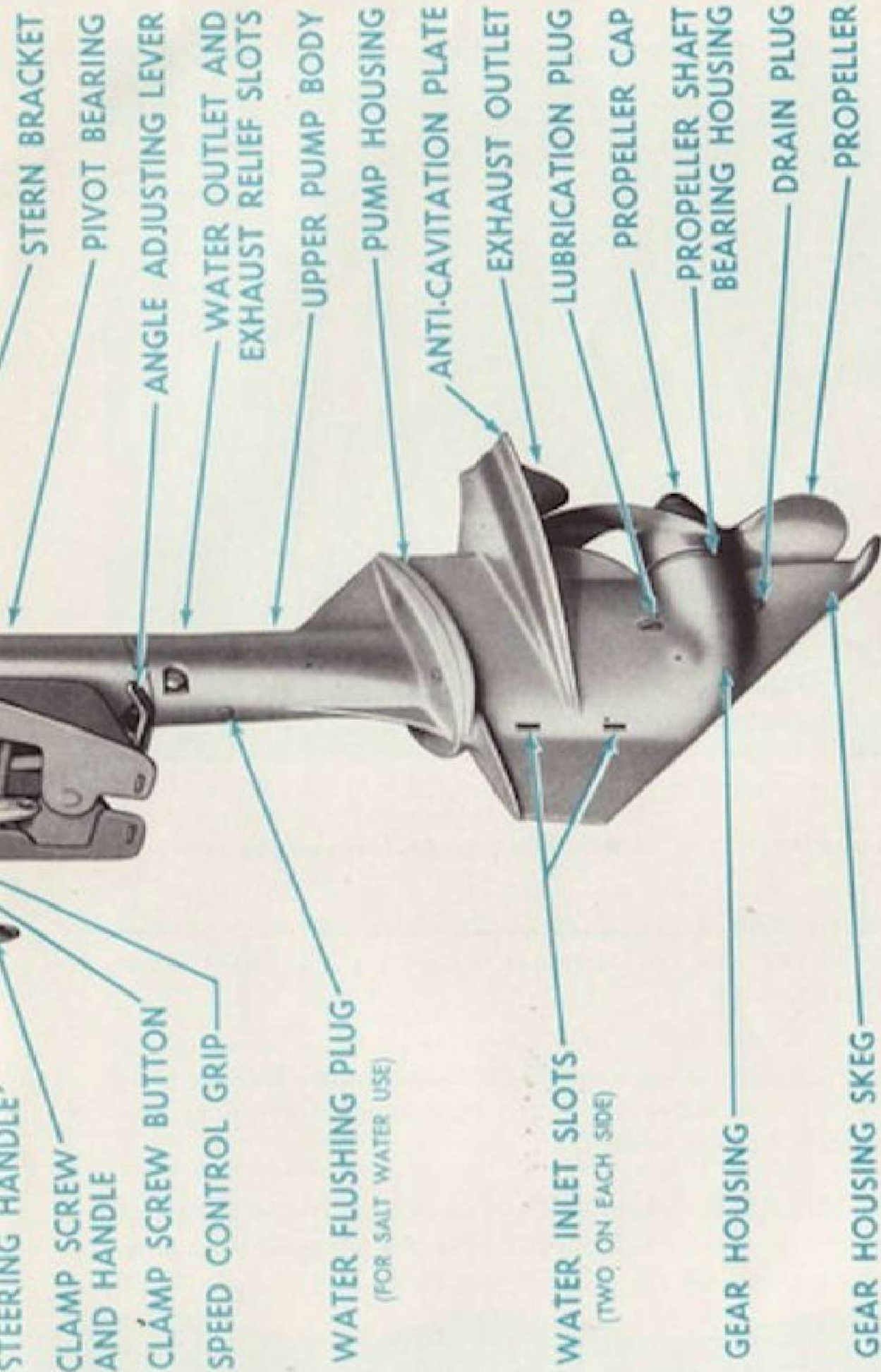


Fig. 12

When writing for instructions on motor refer to above illustration for names of parts  
 Right and left hand are designated while facing motor on carburetor side



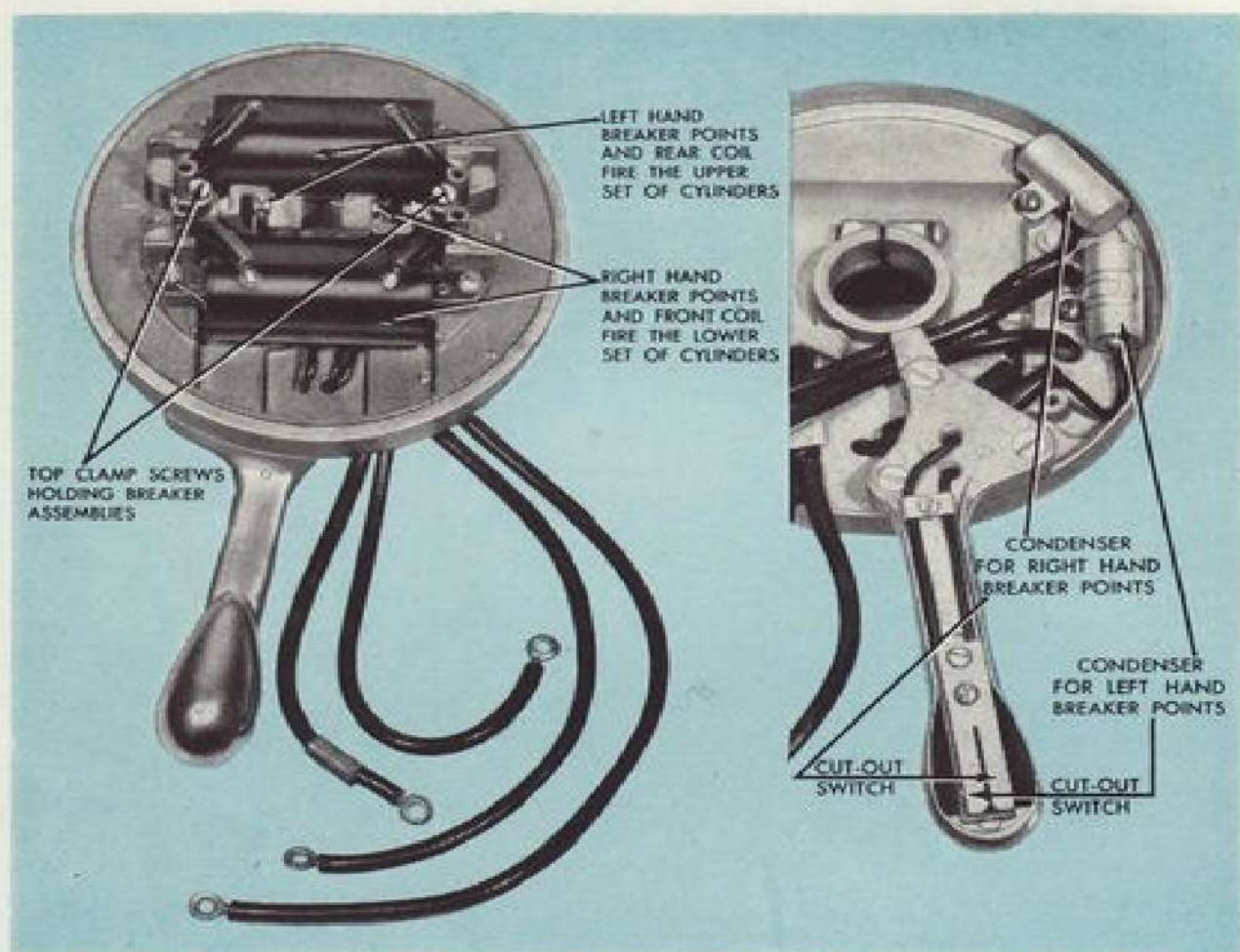


Fig. 10

Fig. 11

considered to have lost its "pep" until such diagnosis has been made by a competent authority.

Before replacing flywheel, place a few drops of oil on felt oilers, and be sure breaker points are clean and dry. Make sure flywheel nut is tightened securely. Use a hammer on wrench.

As illustrated, the left hand breaker points fire the upper set of cylinders through the rear coil, and the right hand breaker points fire the lower set of cylinders, through the front coil (see Fig. 10). Bottom view of Fig. 11 shows condenser location and cut-out switches.

**SPEED CONTROL** The SPARK LEVER and SPEED CONTROL GRIP are linked together in a manner which permits practically full speed range control on the carburetor speed control grip on the steering handle, only when the SPARK



**LEVER** is in full advance position. When the **SPARK LEVER** is in slow or retarded position it is then impossible to open the carburetor throttle.

This control consists of a cam plate, fastened beneath the magneto base, which travels with any movement of the spark lever. Riding against the cam is a follower pin, rigidly fastened to a bell crank, which drives a connecting rod link to the carburetor throttle lever.

Whenever removing the carburetor from the motor, it is necessary to disconnect the linkage at the carburetor throttle lever, as this is where the correct synchronization adjustment is set and locked at the factory.

**CYLINDER CONSTRUCTION** The Zephyr cylinder construction is of the hot head type, therefore, the cylinders normally become quite hot, even when cooling system is operating properly.

**SPARK LEVER FRICTION** Should the spark lever become too loose, it can be tightened. There is a clampscrew provided for this purpose. To locate this screw, remove hood from motor, place spark lever to extreme right, and find screw directly below base, on left side of neck of crankcase.

**TILTING FRICTION** The motor is designed to permit self-tilting when striking any submerged object, thereby preventing any serious damage to lower unit. Nevertheless, care should be taken in obstructed waters, not to operate motor at too high a speed. This tilting feature is also used when motor is not in operation, as in boat launching, beaching, rowing in shallow water, etc. Tilting is accomplished by placing both hands on starter dome and pulling motor toward you. Never try to tilt motor by bearing down on steering handle.

Proper tilting friction is set at factory, but through continued use, this friction may have to be increased occasionally, so motor will retain a tilted position. To increase friction, first tilt the motor as far as it will go. Then, tighten the friction screws on both sides of stern bracket, using a brace and bit screw driver. It is also necessary to hold the jam nut on the inside while tightening.

**CO-PILOT AND STEERING ADJUSTMENT** The patented Co-Pilot is your relief steersman, helps you keep a true course. It provides a cushioned, yielding grip, holding motor in selected position, whenever you let go of steering handle.

Proper adjustment is made at factory. Should Co-Pilot steering become too loose, adjustment can be made by tightening screw on upper right side of pivot bearing.



## HOW TO REMOVE PROPELLER SHAFT BEARING HOUSING AND DRIVE SHAFT ASSEMBLY *(See Illustration Fig. 13.*

This design differs considerably from most of our previous models. To remove these assemblies, first remove the set screw (1) then loosen clamp screw (2). This permits removal of the entire lower end, including drive shaft, from the motor. Next, remove the four screws (3) holding pump housing together. Housing can then be separated at this point. After separating pump housing, the bearing housing lock screw (4) can be removed. This screw is covered by a slotted cap (5) which must first be removed. There is also a bakelite washer (6) under cap. Do not lose this, as it is a seal for oil leakage. After removing the lock screw, the entire assembly consisting of propeller shaft, gear and shaft housing with bearings can be slipped straight out of gear housing.

To remove drive gear (8) first, remove bakelite thrust bearing (7). This is held in gear case by a turned fit and can be slipped out. Next pull upward on drive shaft so shaft and complete pump assembly can be removed. Drive shaft gear (8) and gear thrust washer (9) can be removed from gear housing.

The needle bearing (10) should not be removed or replaced without the proper tool. This should be done by a dealer who is equipped for this work. Oil seal (11) can be easily removed or replaced, as it snaps into a recess in the housing. There is a snap ring (15) inside the drive shaft gear (8) which supports the drive shaft.

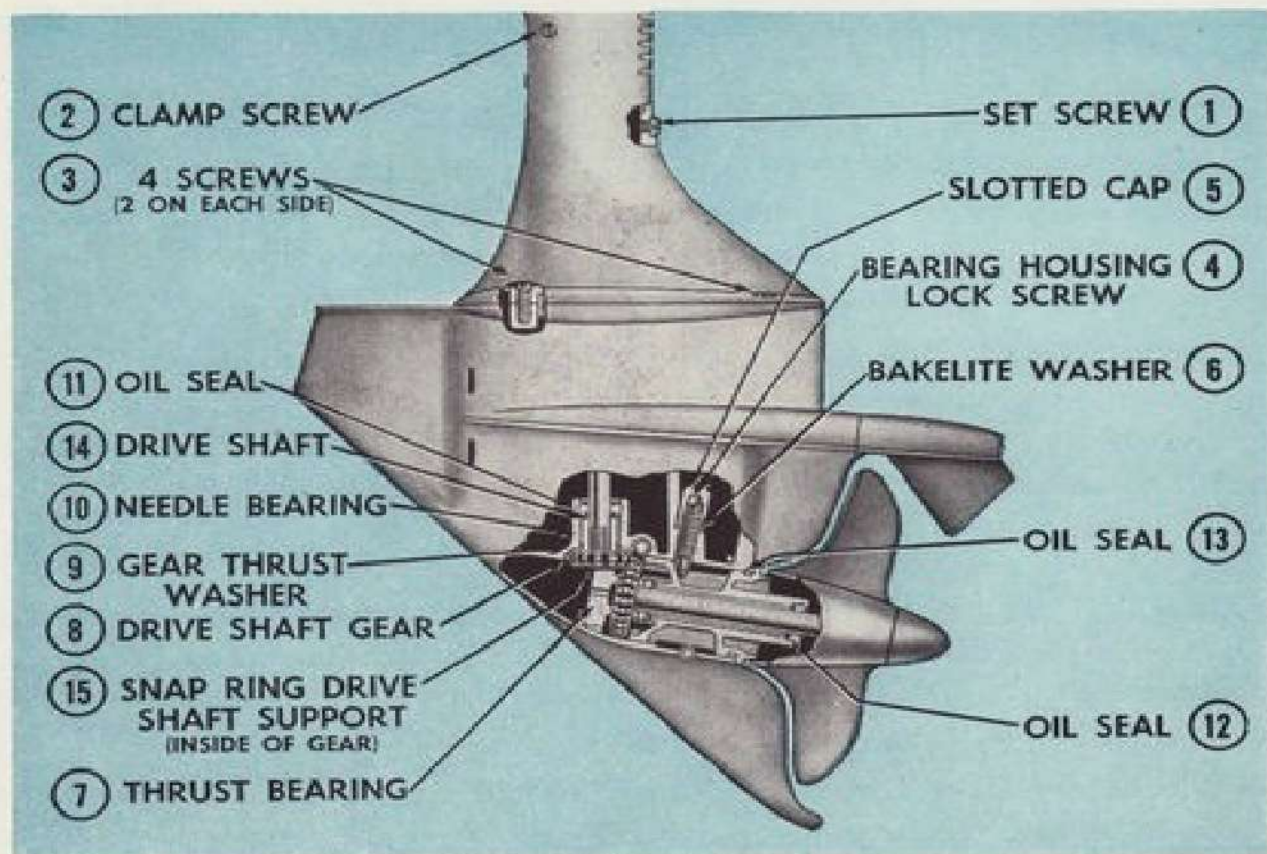


Fig. 13



Oil seal (12) in rear of propeller shaft bearing housing is also easily replaced, as it snaps into place in a recess in housing. The oil is also sealed by a radial fit oil seal ring (13) at the rear of housing. There is no gasket on face of housing.

Always refill housing with S.A.E. 30 or 40 oil and NOT GREASE. Permit housing to drain thoroughly before refilling, removing both "LUB" and "DRAIN" plugs in housing.

**IN CASE OF TROUBLE** Gasoline and ignition troubles are by far the most prevalent ailments among all types of gasoline engines. Therefore, if your motor does not behave properly, it is wise to look for the most common form of trouble before attempting to dismantle the engine—don't try to find something when you don't really know what you're looking for.

If your motor has fuel properly mixed and carefully strained, but refuses to start, or behaves badly, consult the check chart. If you have no idea what the trouble may be, start making a systematic check through the list of symptoms described below. If you do this, the chances are ninety-nine out of a hundred that you'll quickly locate your trouble and be ready to remedy it.

**CHECK CHART** The following chart aims to provide an outline for the systematic tracing down of trouble with the least amount of effort. Finding the cause of trouble usually suggests the remedy.

**Motor won't start—**

**GASOLINE TROUBLE**

- Tank empty.
- Shut-off valve closed.
- Carburetor flooded, if motor is warm.
- Mixture too lean, if engine is cold.
- Too much oil mixed with gasoline.
- Water in carburetor, tank or strainer.
- Pipe clogged.
- Spray nozzle or feedhole in carburetor clogged.

**NO SPARK**

- Wire to spark plug too close to motor hood.
- Wire to spark plug disconnected.
- Water, oil, on breaker points.
- Breaker points do not come together when flywheel is revolved.
- Breaker points do not separate when flywheel is revolved.

**SPARK PLUG FAULTY**

- Fouled with carbon, oil or moisture.
- Porcelain cracked.
- Center pole loose.
- Points not properly adjusted—should be apart .030.

**Motor overheats—**

- Lack of oil or water.

**Motor knocks—**

- Spark lever too far advanced.
- Carbon in cylinders (caused by too much oil in gasoline).
- Motor too hot, causing pre-ignition.
- Bearings loose or worn.
- Piston or cylinder worn.
- Flywheel nut loose.

**Motor is stiff or cranks hard—**

- Rust in cylinder.
- Bearings out of line.
- Crankshaft bent.
- Gear shaft bent.
- No oil on bearings.

(Continued on next page)



Check Chart Continued

**Water stops circulating—**

- Obstruction in water intake.
- Leak at water pipe connections.
- Motor not setting deep enough in water.

**Poor compression—**

- Piston rings carbonized and stuck in groove.
- Cylinder scored.
- No oil in cylinder.

**Motor misses—**

**WIRING**

- Spark plug wire shorting on motor hood.
- Broken or loose wiring.
- Poor insulation.
- Wires short circuited with moisture, oil or foreign material.

**MAGNETO**

- Breaker points corroded.
- Breaker points improperly spaced.
- Weak coil.
- Weak condenser.
- Weak magnet.
- Foreign matter or oil on breaker points.

**CARBURETOR**

- Foreign matter in spray nozzle or needle valve or feed hole.
- Supply impeded.
- Water in carburetor.

**Motor loses power—**

**IMPROPER MIXTURE**

- Too rich (will slow down and knock).
- Too lean (will knock).

**LACK OF COMPRESSION**

- Lack of oil.
- Scored cylinder.
- Worn rings or stuck in groove.

**Motor runs but propeller does not revolve—**

- Propeller pin sheared off.
- Plain gear key sheared off.

**Motor vibrates—**

- No spark in one cylinder.
- Loose pivot bearing.
- Bent propeller wheel.
- Motor loose on boat.
- Too lean a mixture of gas.

**Motor runs but boat makes little or no progress—**

- Propeller blades bent.
- Rope or other obstruction dragging in water.
- Weeds on propeller.

**SALT WATER INSTRUCTIONS** EVINRUDE AND ELTO

MOTORS ARE BUILT FOR USE IN EITHER FRESH OR SALT WATER. Yet science has not succeeded in developing any metal which is totally impervious to the corrosive action of salt water. The materials with which your motor is built are commercially "salt water proof".

A few instructions, easily carried out, will extend the life and satisfactory performance of your motor when it is used in salt water.

If you've been out on salt water all day, it isn't much trouble to flush your motor with fresh water when you come ashore. The cylinder jackets, water pipes and muffler jacket can all be easily flushed with fresh water by using the flushing nozzle described in our accessory catalog. (See Fig. 12, pages 14-15 "Water Flushing Plug")

Drain and fill Gear Housing per instructions on page 4 "GEAR LUBRICATION."



**CARE OF MOTOR IN COLD WEATHER** Your motor will freeze in cold weather just as the radiator of an automobile will, if not given proper attention. A frozen motor usually means cracked pipes and water jackets.

There is not the slightest danger of your motor freezing while running. But, when your motor is idle, or before storing it away in cold weather, drain the motor by setting it in an upright position and revolving flywheel. This lets the water out of the cylinder jackets and pipes, preventing costly freezing and bursting of parts.

Drain and fill Gear Housing per instructions on page 4 "GEAR LUBRICATION."

**STORING THE MOTOR AWAY** If you are not going to use your motor for a while, don't store it away in a cellar or other place where it will be exposed to dampness or dust. No sportsman would do such a thing with his guns or fishing rods, and there is no reason why your motor should not receive the same care that would be accorded to other personal property of even less value. Dampness and dust may injure the magneto of your motor, cause deterioration and do other damage almost beyond repair.

When storing your motor away **PUT IT IN A DRY PLACE**. If it has been used in salt water, flush it thoroughly with fresh water, and let it dry before putting it away. Be sure to drain all **FUEL** from fuel tank, fuel pipe and carburetor. Drain the water out of the pipes and cylinder jackets as instructed under "CARE OF MOTOR IN COLD WEATHER". It is also a wise precaution to remove the spark plugs, put a couple of teaspoonfuls of pure lubricating oil into the cylinders, and then revolve the flywheel several times to spread the oil over the cylinder walls before putting the spark plugs back. Drain and fill gear housing with oil. Wipe the entire motor with a cloth saturated with oil. An exterior film of oil won't hurt any piece of machinery, but dampness and rust **WILL**. When these instructions have been carried out, wrap the motor in a piece of canvas, an old blanket, or in heavy paper, and store in a dry place.

If these simple instructions are carried out, storing will not injure your motor in the least. Further, it will be ready to run faithfully when you are ready to use it again.

**WHEN READY TO USE IT AGAIN** If your motor has been idle for some time, or has been stored without following the instructions, "Storing the Motor Away", it is a good plan to squirt a little pure lubricating oil into the cylinders through the spark plug holes. This done, the flywheel should be revolved a few times, to spread the oil around the cylinder walls.

When you take the motor out, clean it up. Inspect the gears, propeller shaft and bearings to see that they are in good condition. Fill the gear housing as per instructions on page 4 "GEAR LUBRICATION".

Remove the flywheel, and clean the breaker points by running a piece of hard paper or cardboard between them. If they are very dirty or rough, use a very fine file to polish them. See that the points are adjusted to correct gap.



Clean the screen in the carburetor. Clean out the fuel tank, the fuel feed pipe and the carburetor.

Mix your gasoline and oil in a clean can, and in the right proportion. Fill the tank. See that the fuel is flowing to the carburetor.

Thoroughly clean the spark plugs. Replace with new ones if cracked, broken, or badly burnt.

If, in going over the motor, you find any parts damaged, replace them at once. Tighten up all screws and nuts.

Put the motor on the boat and start it. Carefully adjust the carburetor. See that cooling water is flowing.

After long, continuous, hard service, a very complete overhauling may be advisable. This should be done by an expert. If you desire, return the motor to our distributor or dealer, and you will get a workmanlike job at a fair charge for time and materials.

**MOTORS THAT HAVE BEEN SUBMERGED** Accidents may happen to the most careful person, and it is by no means impossible to drop an outboard motor overboard. Careful boatmen safeguard themselves against such mishaps by tying a length of rope to their motors and tying the other end to the boat. A motor so secured cannot be lost.

A motor that has been submerged is temporarily out of commission. Such a motor must, of course, be dried out thoroughly before it can be restored to service.

For cleaning and drying motor, proceed as follows:

1. Drain and clean fuel tank, flushing thoroughly with clean gasoline.
2. Remove and clean carburetor, fuel line and spark plugs. Make sure all water has been removed from these parts.
3. Hold motor in position with carburetor opening in crankcase down, and revolve flywheel slowly to remove water from cylinders and crankcase.
4. Check spark, by grounding three wires from magneto to some part of motor, then holding remaining wire about one-quarter inch from cylinder, pull flywheel over rapidly with starter handle. Continue above procedure until all wires will be checked.
5. If no spark or a very faint spark is produced it is an indication that there is some water on the armature base or breaker points. Remove magneto. (See instructions, page 13—"How to Remove Flywheel".) After flywheel has been removed, thoroughly dry armature base, also breaker points and check points for proper spacing (.020).
6. Replace magneto and again check for spark as above. If still no spark is apparent, again remove flywheel and check complete magneto. (See instructions, page 12—"Ignition Troubles and How to Locate Them".) If after thoroughly